THE STANDARD CYCLOPEDIA OF HORTICULTURE
L.XXXI. Ray peach.
THE STANDARD CYCLOPEDIA OF HORTICULTURE


BY

L. H. BAILEY

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PACHIRA (native Guiana name). Bombacaceae. A group of tropical American trees of variable size, some of which are known to be deciduous, all with striking showy flowers and exceptionally large fruits.

Calyx almost tubulose, mostly short, truncate; staminal column long, divided at the top into 5 short branches, each of which in its turn ends more or less regularly in 3 bundles of about 15 stamens, with unequal slender filaments: caps. dehiscent, rounded-depressed to elongate-oblong, 5-celled, each cell containing several seeds coated in fleshy tissue. Allied genera are Bombax and Adansonia; the first one differs in having the small seeds imbedded in the woolly inside lining of the caps. (whence their name of silk cotton trees), the latter (the African baobab) in its 5-lobed calyx. In Bombax, the arrangement of the stamens is distinct and their number much greater. Over 30 species of Pachira have been listed, of which at least 3 belong to Bombax, 4 are synonyms, and among the remainder several are likely to be dropped on one account or another. Botanically speaking, only 7 species are well known, all of which may be distributed into 3 main groups. The fls. may reach 13 in. long with a spread of 9 in. in certain species; the petals are narrow and gracefully recurved in some cases, obovate and somewhat stiff in others. The color varies from a rich pink to white or pale brownish yellow, distinct shades occurring in every species. The digitate foliage also contributes to give the trees their peculiar appearance. As to distribution, P. aquatica is found all over trop. Amer., 3 species are restricted to cent. Amer., 2 to the W. Indies, and the others are natives of S. Amer. They are easily cult. under glass and prop. either by seeds or cuttings, but, on account of their large size, most species are hardly desirable for conservatories. One species, P. insignis, has edible seeds which taste and flavor to the chestnut and on which account it is sometimes cult. in Venezuela and some of the Lesser W. Indies. The seeds of P. macrocarpa are sometimes used as a cacao substitute; it is probably the xipochochil of the Aztecs, being still called by that name (jelinjoche) in Nicoya (Costa Rica).

A. Caps. globose-depressed, i.e., its diam. greater than its length. (Brachycarpae.)

insignis, Savigny (Carolinea princeps, Linn. f.). A small tree: lvs. 5-7-foliolate, the lfts. glabrous, subsessile, oblong, 8-24 in. long; fls. 7 in. long, erect; calyx cup-like, short and broad; petals obovate, long-cuneate, crimson or dark purple, covered without with a thick brownish down; staminal tube short, the stamens not reaching the end of the corolla; caps. about 5 in. long by 7 in. diam. Trinidad and Lesser W. Indies; also in Venezuela. J.F. 3: 295.

AA. Caps. ovate-rounded, its diam. more than half the length. (Mesocarpae.)

b. Calyx covered with large, crater-like glands; fls. sessile.

Pustulifera, Pittier. A small tree: lvs. 7-foliolate; lfts. briefly petiolulate, ovate, 4½-9 in. long, minutely tomentose beneath; fl. about 7 in. long; calyx stipitate, truncate, pubescent within and irregularly covered with large glands without; petals laciniate, pinkish, yellowish pubescent without; staminal tube short, pubescent, the stamens much shorter than petals; caps. 10 in. long by 8 in. diam. Costa Rica.

bb. Calyx smooth or with only a few glands at the base; fls. pedunculate.

Macrocarpa, Schlech (P. tuba, Decc. P. longifolia, Hort.). Fig. 2694. A small or medium-sized tree: lvs. 5-7-foliolate; lfts. subsessile or briefly petiolulate, oblong or obovate, 2½-8 in. long, glabrous: fls. up to 9 in. long; calyx stipitate, cup-like, smooth or nearly so; petals laciniate or linear, brownish to greenish pubescent without, pink to white or pale yellow within; staminal tube glabrous, the stamens about as long as the petals; caps. ovoid, 9 in. long by 8 in. diam. Cent. Amer., from Mex. to Costa Rica. B.M. 4595. G.C. III. 54: 325. J.F. 2: 109, 110.

Villousula, Pittier. A tree reaching 90 ft.: lvs. 5-7-foliolate; lfts. petiolulate, obovate or elliptic-lanceolate, 2-7 in. long, villous beneath; fl. up to 10 in. long; calyx funnel-shaped, truncate, ferrugineous-pubescent outside; petals laciniate, pubescent on both faces, pinkish...
within, rusty colored without; staminal tube long, pubescent, the stamens shorter than the petals: caps. ovoid, 7 in. long by 5 in. diam. Panama.

AAA. Caps. ovate-delonctate, its diam. less than half the length. (Dolochocereus.)

b. Fls. hardly over 4 in. long.

Pachystima, Planch. & Lind. A tree about 150 ft. high: lvs. 7-foliate; lfts. briefly petiolulate, cuneate-oblong or lanceolate, glabrous; fls. about 4 in. long; calyx cup-like, tomentose-pubescent outside; petals linear-oblong, greenish pink within, tomentose and brownish without; staminal tube short, the stamens hardly as long as the petals: caps. not known. Oceafa Mts., Colombia.

BB. Fls. 10 in. long or more.

speciosa, Triana & Planch. A tree about 150 ft. high: lvs. 7-foliate; lfts. briefly petiolulate, cuneate-oblong, glabrous, 4-8 in. long: fls. about 10 in. long; calyx cup-like, brownish pubescent without; petals oblong, long-attenuated, yellowish white inside, minutely tomentelllose outside; staminal tube long, pubescent without, the white stamens nearly as long as the petals: caps. not known. Colombia.

aquatica, Aubl. (P. grandiflora, Tussac). A small tree: lvs. 5-7 (9) -foliate; lfts. subsessile, obovate to elliptic-lanceolate, glabrous, 4-12 in. long: fls. 8½-14 in. long; calyx tubulose-truncate, often warty at the base; petals lanceolate, more or less deeply pinkish or purplish; staminal tube long, red or scarlet filaments about as long as the petals: caps. 7-15 in. long, 8-9 in. diam. Trop. Amer., including W. Indies. Q.C. III. 40:308.—P. aquatica varies considerably according to the nature of the soil in which it grows and to its environment, and it is not unlikely that most so-called species described in horticultural reviews should be considered as simple varieties of the same. This species is the best known in the genus and its area of distribution is very extensive; its culture in hothouses has been very successful and its growth is more even and regular than that of the plant in cult. under the above name is a true Pachycereus and not the Pilocereus chrysomallus, Brit. & Rose, is Lemaireocereus queroatesensis, Brit. & Rose, rather than a Pachycereus (see page 1836, Vol. IV).
PACHYCEERUS

Colômbia-Trajânó, Brit. & Rose (Pilo-breus Colômbia-
Trajânó, Salm-Dyck). TRAJAN'S COLUMN. Tbidile,
attaining a height of 50 ft. in the form of an obelisk
simple below: areoles large, elliptic; radial spines 10–12,
the upper very short, the lower longest, nearly an inch
long; centrals 2, the upper an inch long, the lower 4–5 in.
fls. about 2 in. long, scarcely projecting from the
unilateral woolly and bristly cephalium. Mex. R.H.
1890, p. 129.—The specific name refers to the famous
Trajan's Column.

margaritâ, Brit. & Rose (Cereus margaritâ, DC.
C. gemmâtus, Zucc.). Simple or branching at apex, 2–3
in. diam., with 5–6 oblong ribs, which are woolly
their whole length; spines short-conical, rigid, 7–9, all nearly
alike: fls. brownish purple, about 1½ in. long; fr. globu-
lar and spiny. Mex.— Frequently used for hedges in
S. Mex. The st. is often covered with a woody crust.

Pachypodium, Brit. & Rose (Cereus pâcten-
aboriginum, Engelm.). This species is sometimes cult.
but does not do well under glass. The large burly frs.
used by the Sonoran Indians for hair-brushes are some-
times seen in museums and curio stores.

Pachypodium, Brit. & Rose (Cereus Pachypodium,
Watson). Fig. 2695. One of the cordon cereus of N. Mex.
Not so tall as Carnegiea gigantea, ribs, fewer, and fls. scattered.
Not in cult. G.F. 2:65 (adapted in Fig. 2695).

J. N. Rose.

PACHYPHIUM (Greek, thick plant). Crassu-
lâceae. Succulents, likely to be found in the under-glass
collections of amateurs, and out-of-doors far South.
See page 870, Volume II.

Caudicent, more or less branched, with very thick
lvs. with brown or grey tendencies; fls. solitary or in secund
racemes; calyx deeply lobed, the lobes shorter than the
corolla, and appressed to it; corolla 5–7-parted
and not at all 5-angled; petals erect below, spreading
above; stamens 10, the 5 alternating with the petals
free from the corollas, the other 5 borne on the petals
each usually with a pair of appendages at the base;
secales broad: carpels 5, erect, free to the base.—About
7 species from Mex. Pachyphyllum is usually included
in Coyledon but some recent American botanists keep
the genus distinct. P. uniflorum, Rose, is a stout spe-
cies usually woody below with green hardly glaucous
terete lvs., appendaged stamens and acute calyx-
lobes, said to be cult. in shady courtyards at San Luis
Potosi, Mexico. P. brevicaulis (Kocheriu, brin-
tobosa, Lindl. & Paxt.). This species has oblanccloate
to spatulate thickish lvs. and a curved, finally erect,
twining race which is 12–18-ft.: its calyx is deeply
campanulate with unequal lobes and a bright red

PACHYPODUM (Greek, thick foot, alluding to the
root). Apocynaceae. About 15 remarkable succulent
shrubs and trees of Mexico, S. Afr. and trop.
Afr., a very few of which are mentioned in horticultural
literature. They are grown with succulents, and prop.
by cuttings. Frequently the trunk is much swollen:
lvs. simple, in spirals; stipules represented by rigid
spines; or, according to Stapf, the lvs. suppressed with
the exception of a terminal rosette, and the spinous
stipules crowded more or less irregularly on the swollen
branches: cymes terminal, with few or many sessile or
peduncled pink, white or yellow fls.; sepals 5; corolla
valver-shaped, constricted at base, or funnel-shaped
to campanulate, 5-lobed; anthers coiling into a cone,
with appendages longer or shorter than the pollen-
bearing part: stamens complex. P. Goës, Cost. &
Bois. Tree, 30 ft. or more, with succulent carpals
like spiny trunk, branching at summit: lvs. in terminal
tufis, long and narrow. Madagascar. R.H. 1907,
p. 413. P. namagnasimum, Welw. St. 5–6 ft. high
and 9–15 in. in diameter: lvs. ovate-oblong, crowded
in a little
crown at the top of the trunk: fls. reddish tinged
yellow and green. S. Afr. G.C. III. 40:27, showing
the strange plants in the wild. P. pâcten-trajani, DC.
Tubercous at base, 1–2 ft. high, producing several some-
what branched sts., bearing lvs. scattered on long
shoots: lvs. oblong-linear or linear, ½ in. long, pubes-
cent above; stipules terminal, spiny: fls. 1 in. or more across,
the oblong lobes white and purple. S. Afr.
L. H. B.

PACHYRHIZUS (Greek, thick, and root). Lepu-
bariaceae. Climbing herbs bearing large tuberous roots
often 6 to 8 feet long and weighing fifty to seventy
pounds, which are used for food and as a source of
starch.

Leaves pinnately 3-foliate; lfts. stipellate, lobed, 3–4 in.
lng.; racemes with swollen nodes and fasci-
celled pedicels, bracts and bract-
lets setaceous, caducous; calyx 2-
limbed, limb as long as the tube,
upper lip emarginate, lower lip
deply 3-lobed; corolla much
expanded, petals sub-
-equal, keel obtuse;
stamens diadel-
palmitillosus.

PACHYRHIZUS (Greek, thick, and root). Legu-
bereae. Root tuberous; st. twi-
ing, shrubby, hirsute, becoming glabrâte with age: fls.
pinnately 3-foliate, often long-petioled; stipules del-
ted or ovate-lanceolate, short; terminal lft. long-
pedicelled, broadly cuneate at base, deeply or shallowly
lobed in the upper half; lateral lfts. oblique, short-
pedicelled, stipels subulate: racemes 6–12 in. long, long-
peduncled, base often branching, branches ascend-
ing; calyx ½ in. long, as long as the pedicel; corolla redish,
1 in. or more long; pod 6–9 in. long, ½–2½ in. broad.
S. 12–seeded, straight glabrescent. Tropics of both
hemispheres. H.I. 19:1842.—Eaten both raw and
boiled.

erhosus, Urban (Dolichos erhosus, Linn. D. bulbosus,
erhos, Kurz). Yam Bean. Root tuberous; st. twi-
ing, hirsute, branching, becoming glabrâte with age; fls.
pinnately 3-foliate, often long-petioled; stipules del-
ted or ovate-lanceolate, short; terminal lft. long-
pedicelled, broadly cuneate at base, deeply or shallowly
lobed in the upper half; lateral lfts. oblique, short-
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ing; calyx ½ in. long, as long as the pedicel; corolla redish,
1 in. or more long; pod 6–9 in. long, ½–2½ in. broad.
S. 12–seeded, straight glabrescent. Tropics of both
hemispheres. H.I. 19:1842.—Eaten both raw and
boiled.

tuberosus, Spreng. Jicama. Root tuberous, much
larger than the above; st. twining, 10–20 ft. long; lvs.
entire or obscurely sinuate; racemes densely fl.; pod
8–12 in. long, ½–2½ in. broad. Trop. Amer. H.I. 19:
1843.—Young pods superior to many cult. beans
in the absence of fibrous strings about the sutures of the
pods; seeds said to be poisonous. Perhaps only a cult.
form of the above species. The root is said to be a
great favorite with travelers, as it quenches thirst
and is nutritious. They are cut in thin slices and
sprinkled with sugar. Two forms are recognized in
Mex., one called tuber and one

called leche, with a watery juice; and one

called leche, with a milky juice. It is said that they
PACHYRHIZUS

2697. Pachysandra procumbens. (Flowers X1. Leaves X ½.)

AA. Lfts. lobed.

palmatifolius, Benth. & Hook. (Dolichos palmatifolius, Moc. & Sees6). Fig. 2696. St. twining, glabrous or pubescent: lvs. pubescent, often long-petioled, pinnately 3-foliate, terminal lift. broadly ovate, deeply 5-lobed, with lateral lobes often somewhat 2-lobed, lateral lfts. less deeply 2-4-lobed, lobes ovate, mucronate: fls. purplish, in long-peduncled racemes. Trop. Amer.—Not so common, root smaller and less cult. than the proceeding. P. L. RICKER.

PACHYSÁNDRÁ (Greek, thick stamen). Buzáceae.

Perennial herbs or subshrubs of some value as ground-cover in shade for their more or less evergreen leaves. Stems prostrate or ascending, 6-12 in. high, from rootstocks, scaly below: lvs. alternate, usually coarsely toothed, evergreen or deciduous, 3-nerved: spikes stamineate, terminal lift. broadly ovate, deeply 3-lobed, with lateral lobes often somewhat 2-lobed, lateral lfts. less deeply 2-4-lobed, lobes ovate, mucronate: fls. purplish, in long-peduncled racemes. Trop. Amer.—Not so common, root smaller and less cult. than the proceeding. P. L. RICKER.

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PACHYSTOMÁ (Greek, meaning thick mouth, referring to the thick lip). Orchidíceae.

Terrestrial orchids with leafless scapes from underground nodose rhizomes: pseudobulbs producing 1-2 lvs.: sepals and petals similar, the lateral sepals occasionally forming a chin, all upright; labelum 3-lobed, forming a sack with the base of the column; anthers bent over; pollinia S, lying in pairs and bound into 4 by elastic threads. About 10 species, chiefly E. Indian and Malayian, but 1 from Trop. Afr. P. Thomsoniána, Reichb. f. (Ancistroschilus Thomsoniánum, Rolfe), is the most commonly cult. species. It has large fls. with white sepals and petals, and the lip has green erect side lobes thickly dark purple-spotted and a narrow recurved midlobe which is white nearly covered with deep purple lines. Trop. Afr. B.M. 19471. J.H. III. 51:147. G.C. II. 12:582 (note), 624, 625; 18:501. Gt. 30:1061.—A warmhouse plant. P. Thomsoniana is now referred to Ancistrochilus by Rolfe. Ancistrochilus has 2 species and is readily distinguished from Pachystoma by the pollinia being united to a single stipitate appendage as well as by the remarkable lip and spreading segments.

PACHYSTROMÁ (Greek for thick layer). Euphar­bíceae.

The one species, P. ulicifólia, Muell. Arg., is a shrub or tree of S. Brazil rarely cult. and chiefly in botanical gardens; the oily seed has been used in medicine. Juices milky: lvs. simple, pinnately veined, spinulose dentate: fls. apetalous; sepals valvate or slightly imbricate; stamens 3; styles 3, undivided; ovules I in each cell of the ovary. Related to Manihot. J. B. S. NORTON.

PACKAGES for horticultural produce. The choice of a package and the method of packing horticultural products are very important factors. The grower who is interested in establishing a reputation for his goods. The commercial value of well-grown produce of choice varieties may be greatly lessened or utterly destroyed if the attempt is made to market it in poor uninviting packages, or if it is poorly packed. Inferior produce or poor varieties are sometimes sold for prices above their real value when packed in an extra attractive way.

PACKAGES

2698. A good pack of apples in a box-tray.
The choice of a marketing package for horticultural products is based largely on customs. These customs have developed gradually along with the growth of the industry in any special region, and when suitable and valuable they persist and become firmly fixed for the crop in that section. However, the supply of the raw material and the possibility of securing large quantities of it at a low price are important considerations besides custom. Examples of the custom of adopting a special package in a certain region might be cited, as barrels for apples in the eastern states, boxes in the western states. Peaches are generally packed in flat boxes in the western orchards, and each fruit is wrapped in paper; the same varieties of peaches are marketed from the southern states in six-basket carriers and the fruits are not wrapped, while from Michigan the same variety may be shipped in bushel baskets and from New York orchards in the Delaware type of basket. In general, it would not be advisable to pack any crop in a way that would widely violate the general custom of the community, unless the grower has a special market to receive his produce prepared in his special way.

The illustrations accompanying this article (Figs. 2698–2718) show some of the diverse forms of packages for fruits and vegetables now in use in North America. The methods of packing cut-flowers are discussed in the article devoted to that subject, pages 922–925, Volume II. The separate fruits may also be consulted under their alphabetic entries.
uniform size, and this is of value to dealers and restaurant-keepers.

Boxes cost about one-third as much as barrels, and they hold about one-third as much, but more time is required properly to pack three boxes with apples than to pack one barrel properly. The Government standard bushel box for apples is 18 by 11\(\frac{1}{2}\) by 10\(\frac{1}{2}\) inches, inside measurement. There are various styles, those used in the western states being made with solid ends, and two pieces each for the top and bottom, and one piece for the sides. In the East, where the box is used, panel ends instead of solid pieces are used; otherwise the same as the western style.

Apples are usually packed into barrels in the orchard, but sometimes may be carried to a packing-house or shed. A common way is to empty them from the picking-basket or sorting-table. From this pile, the "facers" are selected. These are fruits of a uniform size and should be of such a color as will honestly represent the average of the crop. The facers are then laid by hand in the then bottom, but later top, of the barrel. Sometimes two layers are placed in by hand. The barrel is then filled by emptying the apples from a basket that can be lowered into the barrel, or emptied from the apron attached to the lower end of the table. The barrel should be frequently "racked," i.e., given several short, quick, vigorous shakes, to settle the fruit and cause one to roll or slip over the other and thus become firmly lodged. When the barrel is well filled, a layer of apples is placed by hand on top. This operation is known as "tailing," and the cover is pressed into place and held there by driving the hoops down toward the larger part of the barrel, and sometimes by nailing.

Appliances or machines to size the fruits are used when apples are packed in bushel boxes, and with the recent enactment of laws in several states requiring that the minimum size of the fruits be marked upon the package this becomes necessary when packed in barrels. This sizing may be done by the eye and hand or with the aid of a sizing-board, but for rapid work a machine is necessary. There are a great many kinds, and new styles are manufactured and offered for sale every season. (Figs. 2700-2703.) These machines are shown not necessarily for recommendation but to illustrate some of the types.

Grading is the operation of selecting the fruits that are similar in appearance and value. No machine can do this; it must be done by hand.

Grades are variable, depending upon the general crop of the season, the ideals of the packer, and the governmental requirements. Usually there is a "Fancy," "Grade A," and "Grade B," or it is frequently designated as "Fancy," "Standard," and "Choice."

The art of properly packing the graded and sized apples in the bushel box requires skill and practice. There are well-known standardized ways of doing this work. Details of this operation may be found in Cornell Bulletin No. 298.

Apples are also packed in one-bushel hampers, a commonly used package for summer varieties in the Atlantic Coast states, and also in peck and one-half-bushel market baskets (Fig. 2690), and peck crates.

It is always necessary to exercise the greatest care in the picking of the fruit and in handling it from the tree. A good lined picking-basket, with swing handle, is shown in Fig. 2704.

Citrus fruits.

Citrus fruits are cut from the trees with shears. Care always should be taken to make a smooth close cut, as any injury to the skin or a long stem that may puncture a fruit that it comes in contact with may lead to serious decay. The picked fruit is placed in a bag, or sack, or basket, and, when filled, it is emptied into a "picking," "field-" or "lug-" box. It is then hauled to the packing-house, where it is graded by skilled workmen and then carefully sized. The different sizes are packed into standard-size boxes. The orange box, which is made of wood and is 12 by 12 by 26 inches outside measurement, with a partition in the center, may hold from 40 to 400 fruits, but the common sizes are 96, 112, 120, 150, 176, and 200.

Lemons are very carefully graded and sized by hand. A lemon box has outside measurements of 11 by 14\(\frac{1}{2}\) by 27 inches and holds from 180 to 540 fruits, but the most common and valuable sizes are 300 and 360 fruits.

Pomelos, commonly called grapefruit, are handled in the same way and packed in the same kind of package as is used for oranges.

In a few cases, half-boxes of all these fruits are packed. All citrus fruits are wrapped in tissue paper.

In Fig. 2705 is shown an interesting native basket or hamper in the Philippines. (Wester.)

Cherries.

Cherries are hand-picked from the tree with
the whole stems adhering to the fruit, or the stems are cut with shears; rarely, when the fruit is to be canned soon after picking, it is pulled from the stem. In this case it is carried to the canning plant in boxes which are lined with newspapers. As the fruit is picked, it is placed in baskets or pulps and carried to the packing-station, where it is weighed or measured, graded and packed. The packages may be Climax baskets, ten-pound flat boxes, or sixteen-quart crates. The fine varieties of sweet cherries, especially from the western states, are often packed in the ten-pound box. The bottom layer is carefully placed in by hand and enough fruit to make a firm tight pack distributed over the bottom layer, and the cover pressed on.

Grapes.

Grapes are cut from the vines with special grape shears. Fine varieties for fancy market are handled with care, so as not to rub off the bloom. They may be packed in the shipping package in the field, but are usually carried to the packing-house in trays. Some growers prefer to hold them in the packing-house for a day or two, to allow the stems to "wilt," as they can then be more easily handled. The packing is usually performed on a table or bench, and from the picking-box or tray into the shipping package.

The most common package is a five-, eight- or ten-pound Climax basket with a solid wooden cover. Grapes intended for wine are marketed in peck or half-bushel baskets, and in New York flat trays are commonly used.

Pears.

Pears were formerly packed in a small barrel or keg holding about five pecks, and more recently pear barrels were commonly used. These held about a peck less than the standard apple barrel. The packages now used are the standard barrel and the bushel box, the same as the apple. When the box is used, each fruit is wrapped in paper.

Plums.

Plums are shipped in a great variety of packages. Fancy grades are wrapped in paper and packed in two-quart baskets and four of these are held in a flat wooden box or crate that weighs about twenty pounds. Large fruit varieties are wrapped in paper and packed in flat twenty-pound boxes the same as peaches. Climax baskets, holding from five to twenty pounds are used, also half-bushel and bushel baskets. Small-fruit varieties, like the Dawson, may be shipped in sixteen-quart cases.

Small-fruits (Figs. 2708, 2709).

The berry-like fruits, as blackberry, currant, dewberry, gooseberry, loganberry, raspberry, and strawberry, are almost universally packed in the sixteen-quart crate. In the past, these fruits, especially the strawberry, have been marketed in a great variety of packages, but in recent years the sixteen-quart crate has rapidly become the standard and widely recognized package. This package is also commonly used for the small-fruit plums, especially Damsons, and for cherries, both sweet and sour.

The quart boxes are often taken into the field and “picked into,” and then carried to the packing-station and placed in the case; or the fruit pickers use a special picking-basket or -box, and this is delivered to the packing-station and the quart boxes filled there, where
the fruit may be graded and the work of the pickers examined.
Cranberries are picked from the vines by special machines or by hand, and packed in barrels. Occasionally twenty-pound wooden cases are used.

Vegetables (Figs. 2710-2718).

Packages used for the shipment of vegetables are not so evenly standardized as those used for fruits. Custom, however, seems to be of about the same importance, for similar vegetables grown in different regions are packed in different ways.

Asparagus is cut and tied in bunches of various sizes. In a few sections the loose stalks are packed in small boxes or crates, but the usual form is a "bunch," and these bunches are packed in any handy-sized box.

Hamper baskets holding from twenty-eight quarts to one and one-fourth bushels are commonly used for packing beans, corn, cucumbers, lettuce, peas, radishes, spinach, sweet potatoes; but a variety of packages is used for some of these products and for most of them ventilated barrels are used.

Beans are packed in crates, the same as cabbage.

Brussels sprouts are shipped in quart boxes like small-fruits, and these are placed in cases holding thirty-two, forty-eight or sixty quarts, the forty-eight-quart size being the most common.

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Field-grown cauliflower is packed in ventilated barrels; the greenhouse product is packed in small flat boxes or trays that will hold six heads (Fig. 2714).

Packages for shipping celery are of many kinds. Each producing district has its own packages. A common one is a slat crate that varies from 6 by 8 by 24 inches to 10 by 26 by 24 inches. The plants, after being trimmed, are packed upright in these crates, which may or may not be lined with paper. With a fancy product, each bunch is wrapped in paper. A tight flat box, holding twenty-four or more bunches, is frequently used for express shipments.

Cucumbers are packed in baskets (Fig. 2715), hampers, flat boxes, and barrels. Lettuce is packed in barrels, is wrapped in paper. Special retail packages for celery and sweet corn are shown in Figs. 2717 and 2718.

Onions are shipped in bags holding two bushels, in slat crates holding one bushel, in half-barrel hampers, and various other types of packages, and also in bulk.

Potatoes are commonly shipped loose in a box-car. In cold weather, the car must be lined with paper and a heater in each car keeps them warm enough to prevent freezing. In some sections, the practice is to use bags holding about two bushels. Barrels are frequently used. Ventilated barrels are commonly used for sweet potatoes. Special baking potatoes from some regions are wrapped in paper and packed in bushel boxes. Squash is usually packed in ventilated barrels. Sweet potatoes from New Jersey are packed in hamper baskets; those grown in Virginia, in barrels.

Tomatoes are packed in flat boxes, Climax baskets, six-basket Georgia peach-carriers, and hamper baskets. They may or may not be wrapped in paper. For local markets, a great assortment of packages are used, but the peck and half-bushel market basket is the most common.

H. J. EUSTACE.

PÆDERIA (Latin, pâder, bad smell, referring to P. frûtida). Rubiaceae. Tropical shrubby twiners.

Slender twining plants, fetid when bruised, with terete flexuous branches: lvs. opposite, rarely in whorls of 3, petioled: frs. small, mostly reddish or whitish, in axillary and terminal dichotomous or trichotomously branching paniced cymes, with or without bractlets; corolla tubular or funnel-shaped; throat glabrous or villous; lobes 4–5, valvate, with crisped margins, often 3-lobed at apex: fr. a small berry. Distinguished from allied genera by the 2-locular ovary and 2 capillary twisted stigmas.—Species about 25, India, Burma, Malay Archipelago, China, Madagascar, Mex. to Brazil. They are little known in cult., the following being a warmhouse climber. It is sometimes known as Chinese fever-plant.

P. frútida, Linn. Glabrous or nearly so; lvs. long-petioled, ovate or lanceolate, base acute, rounded or cordate: frs. pink, the cyme branches opposite: fr. broadly elliptic, much compressed: pyreneres black, with a broad pale wing, separating from a filiform carpophore. India, Malay.—Oliver writes that it is
LXXXII. Peony, Baroness Schroeder.
“usually grown as a stove and greenhouse climber, but it is harder than is generally supposed. It is rather an attractive-looking but not true-blooming vine. The leaves, or any part of the plant, when bruised emit a most offensive odor. Cuttings should be put in any time after the growths are matured.”

P. Rittani, Hesse. A strong climber from China, with hairy branchlets; lvs. long-petiolate, ovate-lanceolate, to 6 in. long; fls. cream-white with a purple-red eye, less than 1 in. across, in a cluster somewhat like that of the hibiscus; corolla-tube ½ in. long. This species stood two winters at the Arnold Arboretum, Boston, and blossomed, but was finally winter-killed.

L. H. B.

PEONIA (from pederos, a name applied by the ancients to a species of Acanthus). Scrophulariaceae. Hardy perennial herbs suitable for garden use: low, many-stemmed, puberulent or pilose, with opposite serrate or cut lvs. and dense terminal spikes: fls. short-peduncled, solitary in the axis of small bracts; calyx 5-parted, the segments narrow; corolla with a cylindrical tube and a sub-2-lobed limb, the lobes erect or erect-spreading; stamens 2, affixed to the tube; caps. acute, tube and a sub-2-lobed limb, the lobes erect or erect-spreading. Specially prized for the showy spring and early summer bloom.

PEONIA (after the mythical physician Paeon). Ranunculaceae. Peony, Pinky, Peony. Specially attractive and important flower-garden perennials, prized for the showy spring and early summer bloom. Hardy perennial herbs with showy flowers: fls. numerous, short-peduncled, solitary or in small clusters; calyx 5-parted, the segments narrow; corolla with a cylindrical tube and a sub-2-lobed limb, the lobes erect or erect-spreading. 2717. Basket-packed celery, for home trade.

2718. Paper packages or cartons for sweet corn, and other vegetables supplied direct to consumer.
to be worked out from living material combined with a study of the historical development. It is commonly understood, however, that the present race of herbaceous peonies is mostly the progeny of P. alibiflora, but many are from P. officinalis. The importance of the shrubby or tree peonies is not now

unions is made in late summer, the tuber and its cion then being handled through the winter in a frame, to be ready for planting out in the spring. A yellow-flowered shrub-peonies is lately offered by Lemoine (La Lorraine) as a cross between P. lutea and P. suffruticosa. This bloomed first in 1904; it was awarded a prize in Paris in 1909. The flowers are soft sulfur-yellow with a salmon tinge when opening, becoming lighter when fully open.

The herbaceous peony has come into great prominence in recent years. In this country, the merits of the plant have been recognized by the organization, in 1905, of the American Peony Society. This Society has now begun the publication of bulletins. It early undertook the study of varieties in a systematic way, cooperating in an extensive test at Cornell University, Ithaca, New York. The test grounds and the studies corollary to the work, under the leadership of the late Professor John Craig, have yielded four publications: "Peony Check-List," by Coit, 1907; "The Peony," by Coit, Bulletin No. 259, Cornell Agricultural Experiment Station, 1908, in which is given a historical account of the peony, description of the species, and bibliography, as well as cultural advice; "Classification of the Peony" (varieties), by Batchelor, Bulletins Nos. 278 and 306, 1910 and 1911. The reasons for the popularity of the modern race of herbaceous peonies are chosen as follows, and the species. Non-blooming shoots are chosen as canons, and the propagation is propagated by grafting them on the fleshy roots of the herbaceous peonies. Non-blooming shoots are chosen as such, and the propagating plants are chosen as such, and the propagation of herbaceous peonies.

Propagation of herbaceous peonies.

The easiest and most satisfactory method of propagation is by division of the large, thick roots. The roots may be lifted and divided any time from the middle of August until the stalks appear again in the spring. The best time, however, is in early autumn, when the cut surfaces soon callus over and new roots form before the frost sets in. Choose a large stool, cut off the leaves and separate into as many divisions as can be made with an eye to each tuber. In digging, care should be taken that all of the tubers are dug up, for if not they may remain dormant a season and then produce a shoot, giving rise to the many straying plants frequently found in old beds. Tubers divided without an eye should also be planted, as they often act in a similar way and make a showing above ground in two years' time. Peonies, like most tuberous plants, when dormant stand considerable exposure and can be shipped long distances with safety.

Grafting is resorted to in herbaceous peonies when new and rare varieties are to be rapidly increased. An eye of the desired sort is inserted into the tuber of some strong-growing variety, from which all the previous eyes have been removed. This operation is usually performed in August. The grafted plants should be placed in frames for the winter and transplanted the next year into nursery rows.

Propagating by seed is somewhat tedious, and is employed only for increasing distinct species and for obtaining new varieties. The seeds should be gathered as soon as ripe and kept damp until sown in November. A mulch the first season will keep the ground moist and prevent weeds from growing. Usually two years are required for the seed to germinate and three more before a well-developed bloom can be expected.

Soils and culture.

Peonies grow in all kinds of soil, but do best in a deep, rich, rather moist loam. A clay subsoil, if well drained, is very beneficial when blooms are desired, but the tubers ramify more in lighter soil if grown for propagating purposes. In preparing the bed, trench the soil thoroughly 2 or more feet deep, working in a great quantity of well-rotted cow-manure, as the plants are gross feeders. The ground should be kept well tilled, and an annual top-dressing put above the plants in November; this should be forked into the earth the next spring. They should have a liberal supply of water at all times, especially when the mother tuber is in bloom. Liquid manure, when applied in the growing season and at a time when the ground is dry, gives good returns, both in the growth of the plant and size of the bloom.

The eyes should be set 2 inches below the surface. In transplanting, it is a good plan to remove all the old
When planted in a border with fall-blooming perennials, such as phlox and funkia, their rich glossy foliage is very effective. The old flowers should be cut off, so that no unnecessary seed follicles will be formed, and thereby exhaust the plant. It is important to remove the faded foliage on all peonies in November so that it may not interfere with the next year's shoots.

Because peony buds admit of being shipped long distances without water, and arrive in good condition, they are now used very extensively on Decoration Day and for June weddings. When cut in tight buds and transported for upward of twenty years. During the period of blooming for herbaceous peonies ranges from the middle of May through June. They grow 1 to 4 feet high and are therefore suitable for planting in front of shrubbery, along driveways, and are especially pleasing when entering into a distant vista. The richly colored shoots, which find their way up through the soil in the early spring, have considerable value for striking effect.

For forcing, lift the plants in September and place in a coldframe where they will be accessible when the time for forcing arrives. When brought under glass, a uniform temperature of 55° to 60° should be maintained. By feeding well with liquid manure, strong rest is necessary before the plants are forced again. To secure extra-fine blooms on double-flowering varieties, the first lateral bud is retained instead of the terminal one, and for June weddings. When cut in tight buds and transported for upward of twenty years. During the period of blooming for herbaceous peonies ranges from the middle of May through June. They grow 1 to 4 feet high and are therefore suitable for planting in front of shrubbery, along driveways, and are especially pleasing when entering into a distant vista. The richly colored shoots, which find their way up through the soil in the early spring, have considerable value for striking effect.

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2434 PÆONIA

PÆONIA

concave; stamens very numerous, the filaments twice as long as anthers: carpels 3, oblong, whitish tomentose, the stigmas subsessile and purple. Caucasus; discovered by Mlokosiewicz and only recently intro.; said to be the most handsome of the yellow-flowered species. B.M. 8173. G.C. III. 44, suppl. July 25 (1908). R.H. 1911, pp. 492, 493.


6. Delavayi, Franch. Woody or subshrubby, branching, glabrous, 3 ft., more or less stoloniferous: lvs. ternate, somewhat glaucous beneath, 1 ft. long; segms. lanceolate or ovate-lanceolate, 2-4 in. long, cuneate, decurrent and confluent at base: fls. small (about 2 in. across), dark purple or velvety crimson; petals suborbicular, 5-9, remarkable for their firm substance; stamens yellow; carpels 5, glabrous, spreading. July, China at high altitudes. Var. angustiloba, Rehd. & Wils., has more finely divided lfts., the lfts. being narrow-lanceolate. G.C. III. 53:403 (as P. Delavaysi).—In Ireland P. Delavaysi is said to be cut to the ground sometimes by the winter but it throws up new shoots in spring. Somewhat like P. lutea except in color of fls.

cc. Disk little if at all expanded and not enveloping base of carpels: plants herbaceous.

d. Blooms several on one st.

7. Veitchii, Lynch. Herbaceous, 2 ft., with 6 or 7 lvs. on st.: lvs. shining, light green, with many (about 15) very acute lance-oblong segms. which are about 3 in. broad; petiole of lowest lft. about 4-8 in. long; fls. several on the st. rather than solitary, nearly 4 in. across, often nodding and sometimes becoming flat, purplish crimson. W. China. G.C. III. 46:2. Gn. 73, p. 533. R.H. 1914, pp. 196, 197.—A recently described species; a compact, attractive plant.

dd. Blooms mostly solitary or single on each st. (partial exception in No. 8 and others under cult.).

e. Lfts. all entire, sometimes confluent at base.

8. albiflora, Pall. (P. edulis, Salisb.). Fig. 2722. Root of fusiform parts or tubers: st. 2-3 ft., often branching and bearing from 2-5 fls.: lower lvs. biterminate; parts netiolulate or the lateral ones sessile, the lfts. (secondary lfts.) 3-4 in. long, oblong, lanceolate or elliptic, veining red: peduncle long, often with a large bract; lower segms. oblong, frequently spreading, with spiral or reflexed stigmas. June. Siberia, China, Japan. B.M. 1756. F.S. 8:812. Gn. 38:588 (var. Adrian); 50, p. 179: 51:448. J.H. III. 58:493. Gt. 7: 360 (forms). A.G. 23:643; 25:234-3-4 in. long, cuneate, deciduous and confluent at base: fls. small (about 2 in. across), dark purple or velvety crimson; petals suborbicular, 5-9, remarkable for their firm substance; stamens yellow; carpels 5, glabrous, spreading. July, China at high altitudes. Var. angustiloba, Rehd. & Wils., has more finely divided lfts., the lfts. being narrow-lanceolate. G.C. III. 53:403 (as P. Delavaysi).—In Ireland P. Delavaysi is said to be cut to the ground sometimes by the winter but it throws up new shoots in spring. Somewhat like P. lutea except in color of fls.

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lower lvs. twice ternate; lfts. membranaceous, broadly ovate or oblong, more or less pubescent, especially beneath, the central one stalked; fls. not fragrant, 4-5 in. across, white according to G.C. III. 57:290 (usually described as red-purple); petals about 6, obvate, concave, very obtuse; sepals white or pale rose; carpels recurved, the seeds blue-black and berry-like. June. Siberia, N. China. Japan.


11. corallina, Retz. Tall, from carrot-form roots: lower lvs. biterminate or rarely ternate; lfts. ovate or obvate, glabrous, or pubescent beneath: fls. purple or rarely whitish or even yellowish: carpels about 5, spreading or recurved, densely tomentose when young but glabrous at maturity; seeds round, reddish to dark blue and becoming black. April. May. S. Eu.

12. Camdessedéz, Willk. Like P. corallina, but that species has glaucous-green, never purple lvs. and hairy carpels; herbaceous perennial, about 1½ ft., simple, erect and glabrous: lvs. ternately pinnatisect, with ovate-lanceolate or oblong acute entire glabrous segms. that are deep green above and purple beneath: fls. deep rose-pink, solitary, erect, ¾ in. across, the petals 5-10, broadly ovate and crenulate; stamens many, with purple filaments and yellow anthers: carpels 5-7, erect, glabrous and shining, purple. Balearic Isls., Corsica. B.M. 8161.

13. tenuifolia, Linn. Fig. 2723. Root or rhizome creeping, tuberosous: st. 1-1½ ft. high, 1-fl., densely leafy up to the fl.: lvs. ternate, glabrous, cut into numerous segms. often less than 1 line broad: fl. erect; petals dark crimson, elliptic-cuneate, 1-½ in. long; anthers shorter than the filaments; stigma red, spirally recurved; follicles 2-3, about ¾ in. long. June. Caucasus region. B.M. 126. A.G. 17:638. Var. fibre-pléna, Hort. (Fig. 2723). Fls. double, crimson. F.S. 4:308. Var. hybrida, Hort. Fls. of a rich crimson color: lvs. very pretty.

14. anómala, Linn. Root tuberous: st. 2-3 ft., 1-fl., glabrous: lvs. bitermate, glaucous beneath, cut into numerous, confluent lanceolate-long-acute segms.: fl. bright crimson, very large; outer sepals often produced into compound leafy points; petals obvate to oblong: follicles 3-5, ovoid, ararate, tomentose or glabrous. June, July. Eu. and Asia. B.M. 1754. Gn. 67, p. 375.

15. officinalis, Linn. (P. fuligem, Sabine). Fig. 2724. Sts. stout, 2-3 ft. high, 1-headed: fls. dark above, pale beneath, the lowest more divided than the others; having 15-20 oblong-lanceolate tips. 1 in. and outer sepals leaflike; petals dark crimson, 1½-2 in. broad, obvate; stigmas crimson, recurved: follicles 2-3, becoming 1 in. long. May, June. Eu. One of the old forms in gardens. B.M. 1784. Gn. 53, p. 293.—By some combined with P. peregrina.


Var. festiva, Tausch. Fls. white, with red centers. Native of Eu.

16. peregrina, Mill. Sts. about 1½-2 ft. high: lvs. 5-6 on a st., deep green and glabrous above, pale green and pilose beneath; otherwise the lvs. and fls. are much like those of P. officinalis. Eu.—Two garden forms with double fls. are: amaranthéum sphericum, and pulchérimum, the latter differing from the former in the purple shade of crimson fls. This species-name is used by Huth to cover a number of the forms that by others are regarded as tenable species.

17. paradoxa, G. Anders. Plant one of the dwarfiest: lvs. in a dense tuft; lfts. 3-lobed and incised: fls. purple-red: carpels pressed closely together. S. Eu.—Differ from P. peregrina by smaller ovate and more glaucous lvs., lfts. more divided and crowded. Var. fimbrilata, Hort. Double purplish fls., with projecting purple stamens: very pretty, but not much cult. in Amer. The species is sometimes referred to P. peregrina.

18. arietina, G. Anders. St. 2-3 ft. high, hairy toward the top: lvs. 5-6 on a st., rather glaucous and pubescent beneath; segms. oblong to oblong-lanceolate, strongly confluent, decurrent: fls. always solitary, dark red, large: follicles 3-4, densely tomentose, ovoid, spreading widely, becoming 1 in. long, strongly arched; stigma recurved. S. Eu. B.R. 819 (as P. critica).—There are a number of horticultural varieties, under vernacular names, as: Andersomii, bright rose; Rotert, crimson; critica, blush-pink. The species is by some combined with P. peregrina.

19. decóra, G. Anders. Tubers oblong: sts. 2-3 ft. high: lvs. horizontal, diminishing to the top; lfts. oblong-obtuse: fls. rather small, deep purple: 1 in. or more broad; narrow, peduncle long; follicles hairy, large, spreading from the base when mature. S. Eu. Var. álba, Hort., has satiny white fls., slightly tinted pink. Gn. 72, p. 291.

Paeonia

Var. elatior, G. Anders. Lvs. broadly oblong; fls. rich crimson, very large; receptacle with few processes, and a compound calyx at the base of similar surface and appearance to that of the carpels.


Paliurus

PAINTED CUP: Castilleja

PAINTED LEAF: Zauschitia heterophylla.

PALÁXIA HOOKERIANA: Poaepisperma.

PALAÚA: Isonandra.

PALABÁ (after Anton Palau y Verdera, professor of botany at Madrid the latter half of the eighteenth century). Also written Palaua, under which name it appears in lists. Malaxeae. Flower-garden herbs.

Annual or perennial, tomentose or somewhat gla­brous: lvs. usually lobed, dissected or sinuate; bractlets 0; fls. purple or purplish, axillary, pedunclated, solitary, calyx 5-cut; stamens in a column which is much divided at the top; ovary many-seeded; style stigmatose at the apex: carpels crowded without order.—Species 9 in 1908, as accepted by Ulbrich in Engler's Jahrb. 42; Per. 5:147. Palaua or China.

dissécta, Benth. (P. flexuosa, Mast.). Slender annual, branched from roots: sts. 8-12 in. long, ascending, flexuous above; fls-stalks 1-2 in. long; blades 1-2 in. long and broad, triangular in outline, pinnatifid, acutish, 5-cut; stamens in a column which is much divided at the top; ovary many-seeded; style stigmatose at the apex: carpels crowded without order.—Species 9 in 1908, as accepted by Ulbrich in Engler's Jahrb. 42; Per. 5:147. Palaua or China.

PALAVA: Palava.

PALSÍÓTA (named in honor of A. M. F. J. Palicot de Beauviaux, 1752-1820, French administrator, traveler and botanist). Commelinaceae. Perennial herbs, sometimes grown as pot or tub specimens under glass, as in palm houses, for the foliage.

Stem or caudex either long or very short, simple or nearly so, with the lvs. crowded at the top or base: lvs. long, parallel-veined, hairy when young and the mar­gins with reddish or grayish hairs; fls. mostly white or purplish or rose, in small cymes which are arranged in a dense or elongated panicle on mostly 1 peduncle that is terminal or essentially so; sepals and petals 3, the latter obovate; stamens 5, perfect, and 2 or 3 bearded staminodes; ovary 3-celled, with I-several ovules in each: drupe a colored fleshy or succulent inde­candent berry.—Species about 15, in Trop. Afr. Little known in cult. outside of collections. The lvs. are often narrower than those of the species cultivated, e.g. Commelina, p. 535.

P. Ábereri, Gentil. Sub-caulecent; much like P. Elisabethae, but lvs. not variegated and petals without marginal hairs, also shorter and wider; fls. from bright red to rose, from 3 ft. long and 4-10 in. wide, long-attenuate to petiole, the latter widely branched. Habituated not given.—P. Brotéreii, Hook. I. Sta. 1-5 in. high; petals from 1-3 in. long, red, to 3 ft. long and 4-10 in. wide, long-attenuate to petiole, the latter widely branched. Notated not given.—P. ramosissimum, Poir. (P. ramosissimus, Linn.). Habituated not given. Shrub similar to P. Spinacristi, but with both spines straight, and larger lvs. pubescent beneath, and small flowers with narrow wing. China, Japan.

Alfred Rehder.
The members of this family are essentially tropical in habitat, are highly ornamental in appearance, and many of them also of very great economic value, their fruits, stems and leaves not only entering largely into the manufactured products of both Europe and America but also providing both food and shelter for thousands of the inhabitants of tropical countries. One notable characteristic of palms in general is their unbranched stems, the exceptions to this rule being very few and mostly limited to the members of one genus, Hyphaene, of which the dune palm of Egypt, H. thebaica, is the best example. While these unbranched stems form a prominent feature in connection with this order of plants, yet great variations are found in size and habit, some of them towering up like a slender marble shaft to a height of more than 100 feet and then terminating in a crown of magnificent plume-like leaves, while others may reach a height of only 3 to 4 feet when fully developed, and some species are permanently stemless. In some examples the stems are so long and slender that a scendent habit is the result; these rope-like stems of the rattan palms in particular are described as wandering through the top of some of the great trees of the Malayan Peninsula to a length of several hundred feet, reported as long as 1,700 feet, but report unreliable.

The foliage of the palms is of two chief kinds, the fan-veined leaves, in which the venation radiates from a common center, and the feather-veined, in which the veins run out from the sides of a long midrib, the leaf being frequently divided into long narrow segments. Of the first group, the common fan palm, Livistona chinensis, is a good example, while the date palm, Pho­nix dactylifera, and also the coconut, Cocos nucifera, are common examples of the feather-veined class. There are also minor characteristics of foliage that mark many of the genera, some having pinnate leaves with erose tips, others with flabellate leaves having cross segments, and many with the segments of the leaves bifid or split at the tips.

The flowers of palms in general are not specially attractive either in size or coloring, many of them being greenish white or yellow, and some orange or red; but these flowers are produced in prodigious quantities by some of the species, perhaps the most prolific in this respect being the talipot palm (Corypha umbraculifera), which throws up a branching inflorescence to a height of 30 feet above the foliage, such an inflorescence having been estimated to include fully 60,000,000 flowers! This, of course, applies only to wild specimens. The seeds of palms are also found in many sizes and various shapes, ranging from the size of a pea in some of the Thrinax to the unwieldy fruit of the double coco-
nut, Lodoicea maldivica, which will sometimes weigh forty pounds each and require several years to reach maturity.

As a rule, the members of any single genus of palms are found in one hemisphere, either the eastern or western as the case may be, probably the greater num-

ber of species being of Asiatic and American origin, rather than African. An apparent exception is found to this system of hemispheric distribution in the case of the coconut, this plant being so widely distributed throughout the tropical world that its original habitat is still in doubt. On the other hand, some species are known to be very local in their natural state, in proof of which the howeas may be cited; this genus has been found only within the circumscribed area of Lord Howe's Island, which, from a comparative point of view, may be termed merely a fragment of land (probably of volcanic origin), a mere dot on the broad bosom of the South Pacific.

Few palms are found within the limits of the United States as natives, the most common being the well-known palmetto, Sabal Palmetto, a member of the fan-leaved section, to which many of the American palms belong. But while the species of palms native in the United States are limited in numbers, yet there is at least one unique species in the group in the form of Pseudephalnix Sargentii, a monotypic palm, that is known to exist in a wild state only on certain of the Florida Keys, and in limited numbers even there, and recently in Cuba and Santo Domingo.

Europe is even less favored as to native palms, there being but one species known there in that condition, Chrysozora humilis, also a fan-leaved species and comparatively hardy, being capable of enduring moderate frosts.

The palm tree of the Bible is doubtless the dactyl palm, Phoenix dactylifera, which is found in large numbers throughout Syria to this day; and in fact the small grove of dates within easy reach of the Syrian householder forms one of his most valuable assets, for it provides food not only for his family, but frequently for his horses or camels also.

The act of producing flowers does not necessarily terminate the life of a palm, though in some instances such an effect may be produced by this cause; but a singular habit has been noted in regard to the flowering of the fishtail palm, Caryota urens, which when it reaches maturity begins to throw out a flower-spike from the top of the stem, this being followed by successive spikes of flowers, and ultimate bunches of seeds from the top of the plant downward, the flower-spires appearing at the joints of the stem, and when this process of flowering has proceeded down to the ground, or until the vitality of the plant has been exhausted, death ensues.

There are also a number of species of palms that develop a soboliferous habit, throwing up a number of shoots from the base of the plant, Rhapis flabelliformis, sometimes known as the ground rattan, being a good example of this class, among which the wide- grown and elegant Chrysalidocarpus lutescens is also found, together with the geonomas, some of the phoenix and various other genera. Many of the palms are unisexual, but there are also many others in which both male and female flowers are produced on the same spadix, in some examples the males being grouped together near the ends of the branches of the inflorescence and the females nearer to the main stem, while in others a female is placed between two males, thus arranging the flowers in threes.

Cross-pollination of palms by artificial means has probably been seldom practised, there being few cultivated collections in which the opportunity for such an operation has presented itself; but it seems highly probable that such cross-fertilization has been accidentally effected among wild plants, for in large lots of seedlings, intermediate forms are frequently seen; this peculiarity having been noted among howea seedlings, where forms intermediate between H. Belmoreana and H. Forsteriana are found, and sometimes seedlings that seem to combine the characteristics of H. Belmoreana and those of its near relative Hedyscepe Cantburyana. Similar variations from a given type have also been noted among the phoenix, several so-called species being most likely merely varieties.

Many palms are armed with stout thorns or prickles, not only the stems but also the leaves and even the fruits in some species being thus guarded, these prickles being usually very hard and tough. In some cases, notably Acothoriktea owalea, the prickles around the stem are often branched, and are decidedly unpleasant to come in contact with. In the case of Desmocnus, this being the western representative of the rattan palms, the tip of the midrib of the leaf is continued in the form of a hooked spine, and helps to support the plant in its scandent career. The sharp spines of certain palms are used for poisoned arrows by some of the South American tribes, these arrows being projected through a blow-pipe formed from a section of the hollow stem of another palm. Among the species of Phoenix, it is often found that several of the leaflets nearest to the base of the leaf are developed as spines, these thorny leaflets becoming stiff and hard, and capable of making a very sore wound.

The very great economical value of many of the palms can only be touched upon within the limits of the present article, the uses to which not only the fruits but also the stems and leaves are put by the natives of many tropical countries being enough of themselves to fill volumes. One prominent example of this great utility is the Palmyra palm, of which a Hindoo poet enumerated over 500 different uses. Other notable examples include

2727. Flowers and fruits of Acoelosperma Wrightii— a, part of flowering branches; b, unopened flower; c, flower full open; d, fruit; e, kernel of fruit; f, seed as seen on the radial side; g, lengthwise section through embryo.

2728. Flowers and fruit of Coccothrinax Miraguan.—a, part of flowering branches; b, flower from which ovary has been removed, inner view; c, flower viewed, from behind; d, seed, with hism in center; e, seed, upper surface; f, seed in transversal section; g, lengthwise section of seed, through embryo.
the coconut palm, the fruits of which are imported by hundreds of tons every year, and in addition to providing a valuable food, either fresh or in a desiccated condition, also produce that very valuable fiber from which cordage, matting and a great variety of goods are manufactured; also the Phoenix family, which produces the dates of commerce in apparently endless supply, and the date sugar of Bengal, this being contributed by Phoenix sylvestris, while the stems of date palms are often used in house-building in the East. Another very valuable palm product is found in palm oil, this being largely derived from the fruits of Elaeis guineensis, the oil being expressed from the ripe fruits in much the same manner that olive oil is manufactured. The ratten of commerce is chiefly composed of the flexible stems of various calami, the plentiful supply of this material being sufficiently attested by the great variety of articles manufactured therefrom. Various palms have been mentioned under the name of "wine palm," but it seems likely that some species of Raphia are most used for liquors, some portions of these palms giving a large amount of sap when tapped, and as the juice is rich in sugar, the sap soon ferments and may become strongly alcoholic. The best sago is produced from the pith of Metroxylon or Sagus, the trees being cut down and split into segments for the removal of the pith, the latter being then prepared in a rough granulated form for export. Sago is also procured from Caryota and some other genera, but the product is not equal to that of Metroxylon. The so-called whale-bone brooms are frequently used in street-cleaning are mostly made from Piassaba (or Piassaba) fiber, this being gathered from around the base of plants of attaleas, mostly A. funifera. A. funifera

The attaleas also produce large seeds or nuts, those of A. funifera being known as coquilla-nuts, and very largely used for ornamental purposes, being very hard and capable of receiving a fine polish. Many small articles are manufactured from vegetable ivory, this being secured from the nuts of Phytelephas macrocarpa, a singular palm from South America, bearing a large fruit in which are contained from six to nine of the ivory-nuts, the plant itself having a short and sometimes creeping stem from which proceeds a noble head of pinnate fronds that are frequently 15 to 20 feet in length. The seeds of Areca Catechu, after preparation with lime and the leaves of the pepper-plant, become the betel-nut of the East Indies, so much used by the natives of that portion of the world as a mild stimulant. The cabbage palm of the West Indies is Oreodoxa oleacea, the smooth and straight stems of which are frequently 80 to 100 feet high and the removal of the "cabbage," so-called, means the destruction of such a tree, for the portion eaten is composed of the central bud in which the young leaves are compactly gathered together.

Botanical structure.

As the trunk of the palm rises, the leaves underneath the crown die and fall. Usually the old petioles, or their bases, remain for some time, forming a shaggy capital to the column; this is well marked in the large or cabbage palmetto of the South. The palms are mostly trees, and sometimes rise to the height of nearly 200 feet, but some are climbing and others are low shrubs. Some palms are only a foot or two tall at

2729. Flowers and fruit of Copernicia Corticeii—a, summit of flowering branch; b, single flower; c, flower in longitudinal section; d, fruit; e, seed, from the raphal side; f, seed, side view; g, seed in longitudinal section through embryo.

The flowers of palms are not greatly differentiated or specialized. The essential structure may be understood by comparing the details in Figs. 2725 to 2731, which are adapted from Beccari's account of palms indigenous to Cuba in Pomona College Journal of Economic Botany, February, 1913. Of most palms, the flowers are small or minute, quite regular, and they may be either hermaphrodite, monocious, or dioecious. Often the whole flower is nearly woody, even the perianth-parts being hard and scarcely resembling petals. In most species there are two series of perianth-parts: three distinct imbricated sepals enclosing three distinct or partially united petals. Many modifications of this arrangement are known, however, as in the case of cer-
tain species of Thrinax where the perianth is reduced and deformed, and of Nenga where the sepals are longer than the petals. There are nearly always six stamens, both in the pistillate and staminate flowers, and except in certain species of Oreodoxa (Royocenia) they are always included. They are often in two series, one opposite the sepals, the other opposite the petals, always free, and nearly always inserted on the short perianth-tube. The anthers are linear, obovate or arrow-shaped, two-celled, the pollen usually ellipsoid or nearly round, very rarely minutely spiny. The ovary is free, ovoid or oblong or globose, and often found in a rudimentary form even in staminate flowers, but sometimes lacking in the latter. There are mostly three cells, but four and even up to seven cells are known in rare cases. The ovule in each cell is solitary and almost always erect.

Great variety characterizes palm fruits. Some are dry and hard almost stone-like fruits, others are fleshy and even drupe-like. In many species there is a hard fibrous coating to the fruit, as in the case of the coco-nut. In other species the seed is free, but often it adheres to the inner coat of the fruit; it nearly always contains a copious albumen.

The individual flowers and fruits of palms are borne on a large inflorescence (spadix) which may or may not be inclosed in a sheath-like structure (spathe). The form and branching of this spadix varies much. One character that seems to hold is that of the branching, in one group of genera the spadix being either simple or imperfectly branched, if compound then paniculate such as is found in Geonoma, Euterpe, and allied genera; in others the spadix is always pinnately branched, the ultimate branches distichous if greater ramification is present.

Horticultural importance, and culture.

Palms have been favorite greenhouse subjects from the period of the first development of the glass plant-house. The stereotyped form of conservatory is a broad or nearly square structure, with narrow benches around the sides over the heating-pipes and a palm-bed in the center. In these conservatories a variety of palms will succeed, requiring neither a very high temperature nor much direct sunlight. (Fig. 2732.) In fact, palms usually succeed best under shaded roofs. The palms are most satisfactory in their young state, before the trunks become very prominent, and before the crowns reach the glass. The larger number in houses have pinnate or pinnatisect leaves, and these species are usually the more graceful in habit, although the fan palms are also much prized. Small palms are now in great demand for room and table decoration, and a few species are grown in enormous quantities for this trade. They are sold when small. They usually perish before they are large enough to be cumbersome. Among the most popular of these palms are Chrysalidocarpus lutescens, Roquea Belmoreana and H. Forsteriana, cocos Waddeliana, Livistona chinensis, and possibly one or two species of Phoenix.

Some palms endure considerable frost without injury. Of such are the sabals and the palmteces of the southern states. The saw palmetto (Serenoa serrulata) and the blue palmetto (Rhapidophyllum Hystrix) occur as far north as South Carolina. In Asia, Nannorhops occurs naturally as far north as 34° and grows in the mountains of Afghanistan where snow falls, and in Europe. Chamaerops (the only palm indigenous to Europe) reaches 44°. The genera chiefly known to horticulturists are the following:

TRIBE ARECCEAE. Les. pinnatisect, the leaves free or joined so as to form a plated limb, the sides in vernation reduplicate: fls. monocious or dioecious; seeds umbricate, with ventral raphe and dorsal embryo.


TRIBE PHCENICEAE. Les. pinnatisect, segms. acuminate and with induplicate sides in vernation: spadices interfoliar, the spathes solitary: fls. dioecious: carpels 3, only 1 maturing, the stigma terminal; seed strongly ventrally sulcate, the embryo usually dorsal.

Phcenix.

TRIBE CORYPHAE. Les. fan-shaped, wedge-shaped or orbicular, more or less cut, the lobes with induplicate sides: spadices interfoliar, the spathes many: fls. usually perfect; ovary entire or 3-lobed or sometimes the 1–3 carpels distinct, the ovule erect; pericarp usually smooth; seeds with ventral raphe and small hilum.


TRIBE LEPIDOCARYAE. Les. pinnatisect or fan-shaped, the segms. with reduplicate sides in vernation: spadices terminal or axillary, the spathes numerous: fls. polygamo-monocious; ovary entire, more or less 3-lococed: fr. clothed with reflexed, shining, imbricate, appressed scales; seed with dorsal raphe and ventral embryo.

Calamus, Cenatolobus, Raphia.

TRIBE BORASSAE. Les. orbicular, the segms. fan-shaped and the sides induplicate: spadices interfoliar, the spathes many and sheathing: fls. dioecious, the male minute and sunk in cavities on the spadix, the female very large, ovary entire, 3-lococed, the ovule ascending: fr. various.

Borassus, Lodoicea, Latania, Hyphaene.
There is very little accessible monographic literature on the palms. Martius' "Historia Naturalis Palmarum," Munich, three volumes, 1823 to 1850, is a standard work. Kerchove de Dentergem's "Les Palmiers," Paris, 1878, is an important work. A popular running account of palms and the various kinds, by William Watson, will be found in the following places in Gardeners' Chronicle: 1884 (volume 22), pages 426, 522, 595, 728, 748; 1885 (volume 23), pages 338, 410, 439; 1886 (volume 24), pages 362, 394, 436, 576, 748; 1886 (volume 25), pages 75, 139, 357; 1887 (volume 26) pages 491, 652; 1888 (volume 27), pages 338, 404, 536; 1889 (volume 28), pages 234, 298, 671; 1893 (volume 13), pages 394, 586, 748; 1893 (volume 14), pages 410, 439; 1885 (volume 24), pages 362, 394, 576, 748; 1886 (volume 26) pages 410, 439; 1885 (volume 24), pages 362, 394, 576, 748.

Palm-culture, for decorative purposes in the United States, has made its greatest progress within the past twenty-five years, and now seems to be a well-established business, with the prospect of a steady increase as the adaptability of these plants becomes better understood. A great area of glass is now in use for palm-culture alone, the middle states being the center of this industry, though large numbers are also grown in a few southern states; and owing to a favorable climate and gradually improving business methods, it seems probable that American growers will soon be able to compete with their more experienced brethren of Europe in this class of plants.

The species most used in commercial horticulture in the United States are contained in a very short list, the greater quantity being confined to five species, namely, Livistona chinensis, Howea Belmoreana, Howea Forsteriana, Chrysalidocarpus lutescens, and Cocos Weddelliana, while less quantities of Caryota urens, several species of Phoenix, P. caranensis being very largely planted outdoors in the South and along parts of the Pacific coast. Seoforthis elegans and some others of the Pychosperma group, and some few livistonas cover the extent of the catalogue for many growers.

Of these, the seeds are imported in most cases, and on the quality of these seeds the success of the grower depends, so far as getting up a stock is concerned. Most of these species germinate readily in a warm greenhouse, provided the seeds are fresh, the lowest of the common commercial palms being the howeas. In small quantities these seeds are usually sown in about 6-inch pots, the pots being well drained and nearly filled with light soil, then the seeds sown thickly and covered with ½ inch of soil, watered thoroughly and allowed to remain, where they may receive the benefit of some bottom heat; and at no time should they be allowed to become very dry. The period required for germination varies greatly with different species, Livistona chinesis germinating in two or three weeks if fresh, and being ready for potting in about two months, while seeds of some of the attaleas have been known to remain in the earth for fully three years before starting.

The seedlings of many species are very much alike, the seed-leaf in many instances being a long narrow simple leaflet, this description often applying equally to the seedlings of both fan-leaved and pinnate-leaved species; and from this fact it is somewhat difficult to recognize a species while in the juvenile form. Figs. 2733-2736 show stages in the germination of common palms. Special cultural notes for particular species of palms will be found throughout the Cyclopaedia, but at this time a few general remarks regarding treatment of palms as a whole may be admissible. It has already been noted that palms in general are tropical in nature, and while there are a number of species that are found at considerable elevations, where the nights are decidedly cool, yet in a young state the same species may make more progress in a night temperature of 60° F.; and with this in view, a minimum temperature during the winter of 50° to 60° is safest for young and growing palms, while an advance of 15° to 20° during the day will not hurt them.

An abundance of water is required, for many palms grow on the banks of rivers or in swampy ground; and even those found on high and rocky ground send their roots down to such a depth as to find a liberal water-supply.

Rotted sod is the basis for the best soil for palms, and a fair proportion of stable manure is a safe fertilizer, such a soil being mixed with various proportions of peat or sand, to make it lighter and more open for some delicate species.

Insects are frequently troublesome if allowed to gain headway, various scale insects doing the greatest damage, while red-spiders and thrips may become established unless forcible syringing is persisted in. The most successful practice requires close observation on the part of the grower, and the prompt removal of all insects. Many other pests are also known and in the report of the Missouri Botanical Garden for 1898, Trelease gives an account of many of these. Bush in a report on investigation of diseases of the coconut palm in United States Department of Agriculture Bulletin of Entomology II. 13, 1902, gives an account of a disease that threatened the coconut industry in Trop. America.

Summer care of palms.

Some shading throughout the summer is best, the foliage grown under glass being more tender than that

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**2734. Germination of Livistona.**

**2735. Germination of Cocos Weddelliana.**

**2736. Germination of Chrysalidocarpus lutescens.**

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**TRIBE COCOCINEAE.** Les. pinnatisecis, the, lips, with reduplicate sides: spadices interfoliar, unisexual or androgyne, the inferior fls. often in 3's, the middle one female; ovary 1–7-loculed: fr. large, drupe-like, 1–7-loculed, the stigma terminal, the endocarp or shell hard and woody and provided with 9–7 pores.
naturally produced outdoors. Repotting should be done during the spring and summer months, preferably, there being comparatively little root-action on the part of most palms between November 1 and March 1. Give only moderate-sized shifts, that is, use pots only 1 or 2 inches larger, and always ram the soil firmly.

Florists especially must understand the summer treatment of decorative palms. The usual weather of midsummer, which includes not only high temperature, but also fairly high humidity, is a help for the grower of palms, for such conditions do much to promote the growth of the stock, provided that watering, syringing, and proper attention to ventilation be given. A little ventilation at night, in addition to fairly liberal airing during the day, tends to prevent an over-accumulation of moisture on the foliage, and also has an influence toward the prevention of fungoid growths on or about the plants, for in houses so continually warm and moist as is the average palm-house, there is much encouragement for fungus on the woodwork of the benches and about the plants.

A sprinkling of slaked lime under the benches is also a help to the atmosphere and discourages snails to some extent, the latter pest being sometimes very troublesome, especially on the young growths of kentias. Two of the worst periods for the reproduction of scale insects are in the months of May and September, and if these pests can be kept down at those periods, there will be much less trouble in the remainder of the year.

Those who grow palms in quantity have to depend upon dips and spraying with various insecticides, from the fact that it is practically impossible to give the time to each plant that may be afforded by those who carry only a few dozens of palms in stock, but in either case most of the work of this character is likely to be done in the summer season, when there may be a little more time devoted to such work than can be spared in the busier seasons of spring and fall. This fact probably accounts for some of the insect tribulations to which the grower is exposed, as he is seldom able to find time to fight insects at the time of the spring rush, and by this means new colonies are distributed before the danger is appreciated.

Kentias and cocos are undoubtedly the palms for the million at this stage of the florists' art in America, and the necessities of these admirable plants are well understood. Seaforthias and ptychospennas were rather more common to the trade fifteen to twenty years ago than they are now, and were used for decorative work before the kentias absorbed so much attention. Instead of using seaforthias for decorating, persons are adding them to the outdoor garden in those parts of the South where palms add so greatly to the permanent effect in the outdoor planting.

The common Phenix canariensis and other strong-growing members of that subfamily are also frequently in demand for outdoor use, while the dwarf date, Phenix Roeblingi, is continually to be in demand for house decoration, under which condition it is eminently satisfactory; it has found further usefulness even in small sizes, in being used to some extent for the centers of fern-pans. Lobster claw or roystonea is one of the most charming of dwarf palms, but is easily spoilt by insects, requiring constant vigilance on that account, while a comparatively high temperature and moist atmosphere are also essential to its welfare.

W. H. Taplin,
L. H. B.
N. Taylor.

Palms in California.

Palms grown in the open in California gardens do not exceed about twenty-six genera, and numbering about eighty species. Instead of using seaforthias for decorating, persons are adding them to the outdoor garden in those parts of the South where palms add so greatly to the permanent effect in the outdoor planting.

2735. Gernination of Howea Belmoreana.
days and is one of the hardiest of palms (Fig. 2738). The most popular palm for the masses, who look for grace and beauty combined with cheapness, is *Phoenix canariensis*. More of these are planted at present than of any other three species. In Los Angeles and vicinity they may be counted by tens of thousands. Like these two for hardiness is *P. reclinata*; and all may be seen growing north of San Francisco some 200 miles. All the genus is hardy in southern California. *Trachycarpus excelsus* and *Chamaerops humilis*, the latter varying greatly in appearance, will grow as far north as any palms and are popular everywhere. The former in thirty years will grow to the height of 25 feet, while the latter will make 8 to 10 feet of trunk in the same time. *Livistona australis* and *L. chinensis* are both popular, though not hardy outside the southern part of the state, and the latter must be shaded from noonday sun. *Erythea armata* and *E. edulis* (often known as braheas) grow around San Francisco Bay luxuriantly. The dwarf sections of Cocos, represented chiefly by the one known in the trade as *Cocos australis*, is hardly even farther north than the erytheas, and are by far the most ornamental palms to be found in that section. Other cocos in southern California are *C. flexuosa*, *C. plumosa*, *C. coronata*, *C. Romanzoffiana*, and many others. Any cocos will grow here in protected places except *C. Wel- delliana*. Palms of the *Cocos flexuosa-plumosa-Romanzoffiana* type are the most graceful grown, and at present very extensively planted in the southern citrus belt, sometimes for street or sidewalk trees. It is also one of the fastest growers, and will reach 20 feet in fifteen years, with ordinary care. *Archontophoenix Alexandri* and *A. Cunninghamii*, the most elegant of our palms after the *Cocos plumosa* type, are not quite so hardy but will thrive from Santa Barbara southward, in warm locations. The same exposures, with shade during the hottest part of the day, will do for *Hedyscepe Canterburyana* and *Hovea Forsteriana* and *H. Bellmoriana*; also *Rhapalostylis Baueri* and *R. sapida*. The four species of sabals seem to thrive and seed well in this section, though *S. Palmetto* and *S. Blackbournanum* grow much faster than the others. *Rhapidophyllum Hyptis* is perfectly hardy, but on account of its dwarf habit is not so extensively planted as its merits deserve. *Rhapis flabelliformis* and *R. humilis* need protection from sun alone, though there is a rhapis growing for ten years without protection from either sun or frost, and in the coldest section of Los Angeles, but its color is not all that could be desired. Chamedoreas are planted only where they can be protected from both frost and sun, though they thrive better under such circumstances than they do under glass. In such situations they are just the plant for the purpose, as they do not grow away from the protecting tree as do sun- and light-loving palms, but remain erect. *Brahea dulcis* may occasionally be seen, but grows too slowly to be popular. One of the grandest and hardest palms, one that deserves for many reasons to be more extensively planted, is *Jubera spectabilis*. There are a few specimens 20 feet in height with a bole 4 feet in diameter.

**List of California palms. (Wright.)**

The following list of palms for southern California has been compiled from many years of observation by J. Harrison Wright. While not entirely complete as regards the newest and untried introductions, it covers all the harder species and it is made with special reference to the effects of the severe frosts of January, 1913.

**I. HARDY PALMS.**

Withstand a minimum temperature of 18° to 20° F. with little or no injury.

**Chamaeropsis humilis** (in a dozen varieties).
*Cocos Alphanzii*.
*Cocos Bonneti*.
*Cocos campesira*.
*Cocos eronapfa*
*Cocos flexuosa* (of Hort.).
*Cocos Gaertneri*.
*Cocos Yatay*.
*Erythea armart*.
*Erythea edulis*.
*Jubera spectabilis*.
*Phoenix canariensis*.
*Phoenix dactylifera*.
*Phoenix reclinata*.
*Phoenix sylvestris*.
*Sabal Adansonii*.
*Sabal Blackburniana*.
*Sabal mexicana*.
*Sabal Palmetto*.
*Sabal princeps*.
*Serenoa serrulata*.
*Trachycarpus excelsa*.
*Trachycarpus Martiana*.
*Washingtonia gracilis*.
*Washingtonia robusta*.
*Washingtonia Sonora*.

2737. A sentinel palm.—Washingtonia filifera, San Jacinto Mountains, California.

2738. Date palms at Old Town, San Diego.
The following require protection from sun in the interior valleys:

- Livistona australis
- Livistona chinensis
- Phoenix reh-beliana

The above are rather generally found and to them may be added the following, equally hardy but not yet in general cultivation:

- Brahea calcarata
- Brahea Pino
- Cacoa Acres-vallartana

Above are tall-growing Cocos of the plumosa type but hardy:

- Cocos odora
- Cocos pulmosa
- Erythacus flammeus
- Erythaus elegans

All the above can be grown wherever oranges are planted, and in addition the following are at home on the hill section of Los Angeles, in the frost-free foothills and sheltered coastal valleys like Santa Barbara and the Montecito.

II. TENDER PALMS.

Chamaedorea desmonconoides
Chamaedorea elegans
Cocos botryophora
Cocos plumosa
Cocos Maria-Reynas
Cocos Mammillaria
Howea Reh-beliana
Howea Reh-beliana
Livistona Jenkinsianon

The following have been recently introduced, but are not thoroughly tested:

- Ceratoxyylon andioides
- Ceratoxyylon sinddioides
- Livistona australis
- Livistona decipiens
- Sabal Urnsana
- Sabal Exul

[Juania australis, Drude, representing a monotypic genus in the Island Juan Fernández (and for the first word of which it is named), is an unarmed palm with pinnatisect terminal leaves, allied to Ceratoxyylon: 11-segmented, long and narrow, acuminate, whitish beneath, thickened on the margins: fr. globular, size of a cherry.]

Ernest Braunton.

Hardy palms in Florida.

A large proportion of the various species of palms tried by the writer in Florida have succeeded from moderately to exceedingly well. Close to 200 species belonging to some 60 genera have been in cultivation and of these more than 150 are surviving. The state itself is rich in palms for a region lying wholly outside the tropics, there being not less than fifteen native and one naturalized species, the latter the common coconut, found within its borders. A few of these, such as Sabal Palmetto, Serenoa Serrata and Rhipidophyllum among native forms, and one or two species of Trachycarpus, one or two of the dates, Jubas Spectabilis and Washingtonia should be fairly hardy, especially along the coastal region, throughout most of the northern part of the state.

Most of the palms which do well in this state succeed on ordinary pine land, but their growth would be improved if a liberal amount of muck or leaf-mold was incorporated with the soil, and a heavy mulch is always necessary; the seeds should be planted in good soil, and during cold nights the whole may be heavily covered with fertilizer sacks. It should have a southern exposure and be well protected from the wind. In the southern part of the state such a pit, if covered early and thoroughly on cold nights, will generally answer all purposes, but if one could have a small glass house with a bench along one side it would be better. The space in front and below it could be closed up and under the shelf a small kerosene stove or lamp could be kept going during cold nights. This would furnish bottom heat for the seeds planted on the bench and thus insure their germination.

Fairly good-sized palms are best for planting in the open ground, say from 4- or 5-inch pots. Water well and mulch, then shelter by setting palmetto leaves around the plant so as to shade it. In case of danger of frost, mound up around the stem to above the growing point with dry soil and if the leaves are frozen the plant will not be seriously injured.

The following notes are drawn from experience in the cultivation of these palms in central and southern Florida.

Acrocloraphus Wrightii grows in marsh land on the southern shore of the main land of Florida. It forms very dense, attractive clumps 30 feet or more across.

Acoeenia. Rapid growers, and A. Total is hardy in the southern half of Florida. It will not grow in dry or poor soils, but thrives in rich moist lands. Like most palms, this species is very responsive to an application of commercial fertilizer—from a pound to ten pounds according to the size of the plant. A. medica, from Porto Rico, is an exceptionally vigorous grower.

Archontophency. The two species, A. Cunninghamii and A. Alexander, which are such favorites in the North, are among the best palms in Florida, and will, without doubt, become favorites in the lower third of the state. They succeed well in shade or sunshine, on pine or hammock land, and are fairly rapid growers, the former being somewhat the stronger plant.
Arms polianthus is a superb, rapid-growing palm which grows well in pine land; A. triandra is an elegant species which should probably be grown in the shade, and the same may be said of A. albertoi.

Arms estubera is a noble palm and does well in pine land. 

Aequorea. "Jadbulla", a. and should be hardy throughout the greater part of the state. 

Carvalho, Several species are cultivated in lower Florida. Some times the specimens do well; at other times they fail. When in bloom the most beautiful of palms. The ends of the leaves are subject to a blight which decidedly injures the growth of the plant. 

Chamaerops. Lovely, often epiphytic palms with reed-like stems. They are probably all tender, and do well in southern Florida in sheltered, more or less shaded places.

Chamaerops. All of these do well in southern Florida and would doubtless prove hardy throughout a large part of the state. 

Cocos. All species of Cocos do well in southern Florida except C. novifolius, which seems to make bold and abundant growth. C. nucifera, save that it sometimes is injured by frost, does as well as in many parts of the tropics and is grown more than any other palms put together. 

Cocos. The species and varieties of the species grown are beautiful, rapid growers, and all the native palms succeed admirably. 

Cotyledon. The species are sometimes attacked by what is apparently a fungus disease. There is no remedy. The leaves of the infected plants should be pulled apart and cut out the injured parts of the leaves.

Chrysalidocarpus. A well-known palm in the North, and should be hardy throughout the greater part of the state. C. humilis thrives best on high dry soils. The flowers, resembling a fleshy bunch of grapes, appear in March, and exude a very strong, aromatic perfume. It produces numerous suckers which should not be removed. Planted in small groups to 10 or 15 feet apart, they soon form very beautiful specimens which look best in the foreground of mangroves or other taller palms. Each plant should have a number of stable manure in March or April, and some good commercial fertilizers during the rainy season.

Dypsis. This palm has been introduced into southern Florida and seems to do best in a sheltered and partly shaded situation.

Euphorbia ameana. The species of this genus are unsurpassed for majesty and grace in any part of the tropical kingdom. The common royal palm, O. regis, grows in the greatest abundance almost everywhere throughout the island of Cuba and is universally respected and loved by the natives. It is generally a slender, graceful tree, rarely over 70 feet tall, and, as a rule, has a swelling somewhere along the stem. O. F. Cook considers that the species growing in the extreme lower end of this state is distinct and has named it Euphorbia floridana. It grows to a height of 100 feet or more, the stem is not often swollen and the nodes are smaller than those of Cuban trees. It will flourish on rich or moist soil over the lower thirds of the state. O. Bontonga in a stouter species which will probably do well where the Cuban species will, while O. denticornis is a fairly hardy species that has been treated with much, especially if they are irrigated.

Phoenicium. All species and varieties of the date palm grow exceedingly well in Florida. 

Plam. A few species of magnificent fan-leaved palms from all parts of the South Seas, all of which are excessively tender in Florida. 

Pseudophycus. Sargentii has been found rather abundantly on Elliott's Key, one of the northernmost of the lower chain. It is cultivated somewhat in southern Florida where it is often destroyed by frosts. 

Rhaphiodon. This beautiful little palm is native of northern and central Florida where it grows on low sand land. The leaves are covered with a thick spongy mass of a peat-like substance. It is easily removed and thrives in any soil, even on high pine land. It does not need much water or fertilizer.

Rhaphiolepis. Young plants of R. mekonechacanthos do well in southern Florida, in sheltered situations.

Sabal. In good rich moist soil all the sabals grow well and soon form fine specimens. All need full sun and good applications of fertilizers are necessary, if fine-looking and thrifty specimens are desired. All are best grown on dry dry pine land soils if well watered and fertilized. If not well taken care of they are exceedingly slow growers. S. Blackburnianum has immense leaves, while those of the species S. humilis are strikingly beautiful. S. macarthuriana is a species of considerable size. S. magnifica has the native S. Palmae, and are strikingly beautiful. S. mirosa is a species of considerable size. S. humilis, and S. prunifera. The species which do not form a trunk, like S. Adamantii, are only desirable for large palm collections.

Serenoa. Common on high pine lands as well as in rich hammocks. It grows in dense clumps and when given an opportunity to grow makes a very ornamental plant.

Stevensia grandiflora is a magnificent palm but seems to be excessively tender in Florida. Proper care would succeed with protection until it attains considerable size.
Tephros. The species of this fine genus do remarkably well in all kind of soils. They are all tropical and the beauty of the leaves is destroyed by frost. T. Woodiana, T. forbesii and T. cornicarpa and T. reginum are natives of the extreme southern end of the state and are all fine. T. forbesii is usually hardy, but T. cornicarpa is an elegant species, the latter being dwarf. The magnificent leaves of T. carthusiana are liable to be injured by winds if planted in an exposed position.

Trachycarpus. These palms do not seem to thrive well in Florida, although a few specimens of T. celsis in the central part of the state are doing well.

Vaccinella also does not thrive in Florida.

Wallichia carpophila thrives in shady positions in southern Florida.

Washingtonia. Three distinct species are grown in Florida. W. robusta is one of our finest palms, growing rapidly and vigorously in pine land and is used to some extent for planting along streets and roads. W. difera is cut into handsome pieces or so rearranged as W. robusta but is doing well. W. amorosa promises well here. Everywhere in Florida where the soil is moist, the washingtonias grow to perfection. They will not thrive on high dry ground. They will occasionally require good applications of fertilizers.

CHAS. T. SIMPSON.

H. NEHRING.

PALMERELLA (Dr. Edward Palmer, American botanical collector, discoverer of the original species). 

Campylocarpaceae. A genus of two or three species, with small blue fleshy leaves those of a lobelia. The genus differs from Lobelia in the adnation of the stamens, as well as in the entire or closed corolla-tube, at least its upper part, but which soon splits from the base upward for a good distance, and before withering the lower part of the corolla is much disposed to separate into five claws (liberating also the lower part of the filaments); filaments adnate to the corolla-tube near the throat and then more or less obtusely angulate; ovary 4-5-merous, sessile, one side or the other, or free; nectary an imperfect tubular cavity in the throat of the corolla.—Herbs of S. Calif. and Mex., very little known horticulturally.

Débìlis, Gray. Slender glabrous branching perennial herb, 2 ft. high, very leafy: lvs. alternate. linear-lanceolate, entire, sessile, 2-3 in. long; floral ones gradually reduced to bracts; raceme lax, few-fl.; corolla-tube whitish, 9 lines long, lobes light blue, 2 of them smaller than the others, the larger ones 3-4 lines long. S. Calif. and Low. Calif. Var. serratæ, Gray, was offered in 1881 but it is probably not in cult.: inf. and corolla-tube somewhat puberulent: lvs. (except the upper ones) sharp-serrate, the lowest spatulate and obovate. S. Calif. L. H. B.

PALMETTO; Sabal.


Cerzoyla. Wine P. of E. Indies, Can. yoda wrenii, Phanez sylvasteris and Borassus flabelliformis; of New Granada, Cocos butyracea.

PALUMINA (said to be from palumbi, wood-pigeon; from a supposed resemblance of the fts.). Orchidaceae. A monotypic genus greatly resembling Oncidium, with which it was formerly united. It differ, principally in having the lateral sepals entirely united, forming a single sepal resembling the dorsal sepal in shape and size, the labellum scarcely larger than the petals and resembling them in shape.

cándida, Reichb. f. The only species is a small plant with narrow, compressed pseudobulbs, each with a single slender leaf, ½-12 in. long: fls. few, small, white, in a slender raceme, sepals, petals and labellum oblong, acute, differing but little in size and shape. Guatemala. B.M. 5546. C.G. 1865:793; II. 20:233 (as Oncidium candidum).—May be easily grown in a temperate house. Blooms in summer, the fts. lasting a long time.

HEINHIL HASSELLING.

PAMBURUS (from the Singhalese name Pamburu). Rutaceae, tribe Citrea. Small trees distinctly related to Citrus but bearing fts. filled with gum; young branches often angled; older ones rounded, spines solitary or paired on the stem; the seeds are very large and referred to as a "naked" nut: Cocos nucifera: fls. 4-5-parted (usually 4) with 8-10 stamens; pistil supported on a subcylindric disk.—Only one species is known.

missionis, Swingle (Limnadia missionis, Wall. ex Wight. Atalantia missionis, Oliver). Lvs. simple, elliptic-oblong, short-petioled, showing veins only very obscurely, wrinkling at the margins on drying: fts. in axillary racemes, shorter than the lvs; filaments slender, anthers linear-oblong, disk long and slender; ovary 4-5-celled, with 2 ovules in each cell: fr. 1 in. diam., filled with a mucilaginous fluid. III. Wight, Ill. Ind. Bot. v. 3, pl. 33. Swingle, Journ. Wash. Acad. 6:336.—This tree occurs in India and Ceylon in sandy soil near the seacoast. It should be tested as a stock for Citrus. The wood is light-colored, but when variegated is used for furniture.

WALTER T. SWINGLE.

PAMPAS-GRASS (Cortaderia argentea, which see. Vol. II, p. 856). A showy tall perennial subtropical grass grown for its whitish fluffy plumes of inflorescence; native in Argentina and southern Brazil.

The growing of pampas plumes for profit in California has been undertaken for over forty years. Pampas-grass was introduced into the United States about 1848. In the northern states it is frequently planted on the lawn in summer, and upon the approach of cold weather transferred in a tub to a cellar for winter protection. In California, a hill will sometimes attain a height of 20 feet, a diameter as great, and a weight of 2,000 pounds. Such plants would be very inconvenient for our northern friends to handle in the cellar.

Plants are easily produced from seed, but as the sex and variety are very uncertain, stock is usually increased by division. The female plumes are much more beautiful than those of the male. The growing of pampas-grass in North America on a commercial scale dates from 1874, when the difference in sex was discovered. In 1872 the writer sowed seed which in two years gave several hundred plume-bearing plants. Even then the variations in color and fineness were very marked. In 1874, it was found that by pulling the male plumes from the heads, and exposing them to the hot sun, the male plumes would hang heavily like oats, while the female plumes would become fluffy, and light and airy. In November, 1874, samples of the female plumes were sent to Peter Henderson & Co., New York. Three hundred were ordered at once, and the following day instructions were received to double the order and send by express. This was the first lot of good plumes
LXXXIII. An avenue of palms in southern Florida.—Oreodoxa regia.
ever sent east from California, and was the beginning of the present pampas industry. The writer’s plantation was increased each year until 1889, when it comprised about 5,000 hills. There were a number of other extensive plantations in the neighborhood of Santa Barbara. The crop of 1889 was estimated at 1,400,000 plumes. The demand has been good, but the prices have never been so high as at the beginning of the industry. The first prices were $200 for 1,000 plumes. The decrease in price was gradual until the sale was slow at $50 for 1,000 plumes. Some of the growers did not harvest their crops that year, and destroyed their plants. In the fall of 1887 plumes were in demand at $40 the 1,000, and in 1888 they were scarce at $50 and $60 the 1,000. The following spring there was an increase in acreage. Since then the industry has had its ups and downs, and the price has ruled low for several years, the present prices being $8 to $10 for first-class, and $5 to $6 for second size.

Pampas-grass should be put on the best valley land, and set 10 by 16 feet apart. Before planting, the ground should be deeply plowed and put in first-class condition. In selecting stock, divide only for plants that produce the finest white plumes. Young hills produce the best plants. From old hills the best plants are obtained around the outside, those in the center of the stool being mostly worthless unless planted in large clumps. Some plumes will be produced the first year after planting. They will not be first-class, but are worth saving. The second year, if well grown, they should produce 50 to 150 plumes to the hill. Not all plantations will yield this much. The third and fourth years there will not be much change in the yield. As a plant gets older the plumes are larger but the yield is less. After 8 to 10 years a quantity of dead matter will have accumulated, and the hills should be trimmed or burned.

The appearance of the plumes is a signal for great activity among those who have large fields. The grass should be so trimmed early in September, before the plumes appear, that each hill will be easy of access. Young plants ripen their plumes two or three weeks earlier than old ones, and some varieties are earlier than others. It requires exercise of judgment to pick the plumes at the proper time. They are generally ready when they are exposed from the husk a few inches and have a fluffy look. It is well to try a few at this stage, and if they cure well at the stem end when dry they are all right, but if they do not become fluffy at the stem end they have been picked too young. If the plums look dark and seedy at the top when cure is complete, it was too old when picked. Some varieties, especially those producing very long plumes, should be allowed to remain somewhat longer on the plant than those of the short-plumed varieties. By trying a few of each variety, the time of opening can be ascertained. Some varieties are pulled from the husk in the field; others use a knife set in such a way as to split the husk without injuring the plume. When the husk has been split, a quick jerk or strike on the table will extract the plume. The plumes are then taken to the drying ground and spread on leaf. This ground should be made smooth and free from any trash that is liable to adhere to the plumes. Clean stubble ground is the best. The plumes are left on the ground three days and two nights to cure, and are turned and shaken once each day. When they are next packed away as second-class, they are packed smoothly and evenly they will withstand heavy pressure. Careful all-round cultivation is necessary to produce good plumes.

The best market at present is London, the next Hamburg, Berlin, Denmark, New York and Philadelphia. A few. Pampas plumes are colored in London. In America the pure white plumes give the best satisfaction.

JOSEPH SEXTON.

PANCRA (old Greek name, meaning all healing or a panacea). Araduex. A genus of seven or eight species of hardy perennials none of which is of cultural importance except P. quinquefolium, Linn., the Ginseng, which see (Vol. III). They have aromatic roots, digitately compound leaves and greenish white flowers in a terminal umbel. They are all natives of the North Temperate Zone, mostly in Asia and North American. For an account of the tender plants heretofore included in this genus, see Polyscias.

The genus as now defined is distinguished by the thickish roots or tubers from which arise erect simple short stems bearing 1 whorl of 3-5 leaflets. Some of them grown outside in mild climates with summer- and winter-flowering bulbs, bloomed inside or polygamous flowers in a terminal umbel. They are all natives of the Temperate Zone, mostly in Asia and North American. A number of other species, especially P. quinquefolium, Linn. (Ginseng quinquefolium), Wood., Aralia quinquefolia, Deene. & Planch., Polyscias, growing in rich woods Que. to Minn. and south to Ala.: about 1 ft. high from a more or less branching thick root: leaflets usually 5, stalked, the basal pair much smaller than the others, all ovate or obovate, dentate, acuminate; peduncle an inch or two long, bearing a 6-20-fld. umbel; styles usually 2 or 3: fr. a 2- or 3-seeded little drupe. Two species are native in the eastern U. S. and Canada. P. quinquefolium, Linn. (Ginseng quinquefolium), Wood. Aralia quinquefolia, Deene. & Planch., native in moist mostly low or flat woods, Nova Scotia to Iowa and Ga.: delicate little plant about 6 in. high, with a deep globular blackish tuber or root about ½ in. diam.: ifts. mostly 3, sessile, oval to oblanceolate, obtuse, serrate; peduncle an inch or two long, bearing a few whitish often monocious frs.; styles usually 3 or 5: fr. 3-angled or 2-sided, yellowish. An attractive but not showy early spring bloomer, suitable for colonizing in moist shady places.

L. H. B.

PANCRA TUM (Greek, all-powerful; referring to supposed medicinal value). Amaryllidaee. Attractive summer- and winter-flowering bulbs, bloomed inside or some of them grown outside in mild climates with protection.

Very like Hymenocallis, being the Old World representatives of this group, differing botanically in having many superepressed ovules in each cell rather than (as in,
Hymenocallis) 2 basal collateral ovules. Bulb tuni-
cated: Ivs. linear to lorate, mostly appearing with the
fls., the latter in an umbel terminating an erect solid
mostly stout scape or peduncle and white or greemish;
perianth funnel-shaped, with a long tube, the segms.
equal, short and spreading or ascending; stamens
inserted at the throat of the perianth and joined by a
web or cup: fr. a loculeclially 3-valved caps. with

2741. Pancratium: types of three sections.

At the right, the short perianth-tube and small staminal cup of
P. illyricum. At the left, the relatively short tube and large cup of
P. maritimum. At the top, the long tube and small cup of P. veres-
cundum, to which P. tortuosum is very closely allied. (From B.M.
and B.R.)

angled black seeds.—Species 14 or more in the Medit.
region, eastward to India and southward in Afr. Pan-
cratiums and hymenocallis, sometimes called spider-
lies or spirit-lilies, form a beautiful group of bulbs, hardy or tender, some blooming in winter, others in
summer, and all characterized by the beautiful floral
structure known as a staminal cup. This cup is white
and has the texture of petals. It is fringed or toothed
in a great variety of ways. The filaments growing out
of the cup are long or short. The perianth-segms. are
usally long, slender, and gracefully recurved.

The species of pan,cratium, coming as they do from
Africa, southern Asia, and southern Europe, in most
cases need a high temperature while in growth and a
period of rest after flowering. The "rest" is secured by
placing them in a house where there is plenty of ventila-
tion and a cooler temperature. Gradually withhold
water, giving only just sufficient to keep in a life-like
state. The bulbs should be kept in this semi-dry state
through the winter. After the middle of January, they
may be repotted or have a top-dressing. For a compost,
use a good strong loamy soil four parts, well-decayed
cow-manure one part. When the roots get well through
this compost, liquid manure will be useful once a week.

Those bulbs that do not need repotting may have some
of it fine for the top. Sprinkle the seed all over the
surface and cover with the fine mixture, press firmly
and give ordinary stove temperature. Main-
tain an even moisture with these pans. When they
start to come up, place well up to the glass. When
large enough, prick out into other pans or flats, using a
heavier compost. Pot off when larger and grow without
rest through the winter. In the spring they will require
5- or 6-inch pots. Their management from this on will
be that already mentioned. Give light fumigations
often in order to keep down aphids and thrips. Scale
and mealy-bug, which often get into the axils of the
leaves, can be removed by the use of a soft brush.

(J. J. M. Farrell.)

A. Perianth-tube 3-6 in. long.

B. Segms. more than 2 in. long.

tortuosum, Herb. Bulb globose, 2 in. or less diam.,
with long cylindrical neck: Ivs. 6-12, linear, spirally
twisted, 1 ft. or less long, with the fls., the latter 2-4
in an umbel; perianth-tube 3-6 in. long, the segms.
linear and ascendung, greemish; staminal cup over 1 in.
long, distinctly toothed between the short free tips of
the filaments. Autumn and winter. Arabia and Egypt.

BB. Segms. 1½ in. long.

verecundum, Ait. Fig. 2741. Bulb globose, 2 in.
diam., with long cylindrical neck: Ivs. 6-10, 1 ft.
in. long; fis. 2-6, white, with greenish tube, fragrant;
tube 3-4 in. long; segms. linear; staminal cup or corona
1 in. or less long, biled between the free filaments.
India. B.R. 413.

AA. Perianth-tube 1-3 in. long.

B. Staminal cup small, 3-4 lines long.

illyricum, Linn. Fig. 2741. Bulb very large: Ivs.
5-6, strap-shaped, glaucous, 1½-2 in. wide, appearing
with the fls.: scape 1 ft. or more long; fls. white, 6-12
in a centripetal umbel; perianth-tube 1 in. long, green;
segms. 1½ in. long; staminal cup with long narrow,
2-cut teeth; free portion of filaments 6-9 lines long:
seeds not compressed. Summer. Corsica, Sardinia,
Malta, S. Italy. B.M. 718. Gn. 48, p. 246.—Hardest,
commonest and perhaps the best.

BB. Staminal cup large, 1 in. long.

maritimum, Linn. Figs. 2741 and 1936, Vol. III.
Bulb globose, 2-3 in. diam. and with a neck: Ivs.
5-6, linear, glaucous, persistent, becoming 2-2½ ft. long;
fls. white, very fragrant, 5-10 in an umbel on a com-
presed scape or peduncle; perianth-tube 2-3 in. long;
segms. linear, 1½ in. long, ascending; staminal cup
very prominent, the teeth short, triangular and regular;
free part of filaments 3 lines long. Spain to Syria.
B.R. 101.

P. Amanica, Ker=Hymenocallis Amanicae (see suppl. list, p.
1627).—P. umbrum, Andr.=H. umbrum, Linn.
calathinum, Ker=B. calathinum.—P. carthusius, Linn.
carthusiana.—P. corymbosum, Linn.
**Pandanaceae**

The family Pandanaceae comprises 3 genera (Warburg, in Engler's Das Pflanzenreich, IV:9 [hft. 3] 1900): Sararanga, with 2 species, in the S. Sea Isls. and Philippines; Freycinetia, more than 100 species, from Ceylon to Philippines, Austral., New Zealand, and Hawaii; Pandanus, with probably 250 species now described, in Trop. Afr., India, Austral., islands of the Indian Ocean and the Pacific. Pandanus comprises small trees or shrubs, erect or rarely prostrate, usually forked, the trunk annular, often producing aerial roots: lvs. linear and acute, commonly sharp-dentate or prickly on margin and midrib, the base usually vaginate but not petioled: fls. dioecious, in axillary or terminal spadiccs, the male spadices branched, the female always terminal and racemose or solitary, the leafy spadix-bracts usually colored; perianth none; stamens many in male fls., the filaments free or connate; staminodes in female fls. (See Figs. 2742-2744.) Young plants of these are of free or connate angular woody or fleshy drupes, sometimes large (1 ft. long) and cone-like. The screw-pines are characteristic plants in many tropical regions, with long ringed trunks, bracing roots, and crowns of dracena-like foliage. The lvs. of some species are used in manufacture of bags and in other ways, and of some kinds the frs. are eaten. Some of them have very stiff clustered foliage gives them a formal decorative character.

The family Pandanaceae comprises 3 genera.

**PANCRATIUM**

Screw-Pine. Tropical plants often attaining the size of trees, and remarkable for their still-like aerial roots, and the perfect spiral arrangement of their long sword-shaped leaves. They are planted in tropical and subtropical regions, and are also grown as pot and tub specimens for greenhouse, residence, veranda and lawn decoration, where their stiff clustered foliage gives them a formal decorative character.


WILHELM MILLER.

L. H. B.†

**PANDANUS** (Latinized form of a Malayan name). *Pandanus*. Screw-Pine. Tropical plants often attaining the size of trees, and remarkable for their still-like aerial roots, and the perfect spiral arrangement of their long sword-shaped leaves. They are planted in tropical and subtropical regions, and are also grown as pot and tub specimens for greenhouse, residence, veranda and lawn decoration, where their stiff clustered foliage gives them a formal decorative character.

Every conservatory has them, and occasionally *P. utilis* is grown to a considerable age and height for the sake of a perfect specimen of the spiral habit of growth on a large scale. (See Fig. 2743.) Some of the species have red- or purple-tinted lvs., but these appear not to have become popular. In the tropics, *P. utilis* is as valuable to the natives as many palms. The frs. are edible, and the roots furnish fiber for ropes, baskets, mats and hats, as do also the lvs. which are used in making paper and nets. The numbers of species in commercial cult. are very few, although many names occur in horticultural literature. Without fls. and frs., it is difficult to know what species are actually in cult., or how accurate may be the popular descriptions and illustrations. For the same reason it is impossible to construct an accurate botanical key that will be of practical use to the gardener. Some of the good garden kinds are unplaced botanically, particularly the variegated or striped-lvd. kinds, which are sterile or the fructification insufficiently studied.

Pandanuses are among the best decorative plants and they are not difficult to manage when grown under favorable conditions. They are usually at home in palm-houses, and some of the species may be treated as semi-aquatics in victoria tanks. As a rule, they thrive in much heat and with plenty of water. From the latter part of January on, these plants become active in growth. It is at this time that one must make the atmosphere of the house more congenial in the way of supplying abundance of atmospheric moisture. To supply this condition, damp down the benches, paths and under the benches two or three times a day in bright weather. Before they have made too much headway any necessary repotting should be done, such as renewing with new compost or shifting into larger pots. A good compost to use is fibrous loam four parts, well-decayed manure and leaf-mold one part each, with enough sand added to give it a porous texture. See that the pots have plenty of drainage and pot firm enough to get the new compost well around the roots. In February and on, as the days become longer and the sun more powerful, they will require more water at the roots, with frequent syringings. The temperature may be increased from 60° to 65° at night, and in late spring and summer they will need a night temperature of 70° with a rise of 10° to 15° in bright weather. During summer when the sun is powerful, they will need a little shade, but only enough to hold them in good color as they like plenty of diffused sunlight at this
period. In autumn, winter and spring, they like plenty of sunshine. When autumn comes, do less watering and syringing, as root-action is becoming less active. To keep them in good health, it is very important to use great care in watering them in the winter months, as any unskilful or careless watering will surely cause a ruin. Also give ventilation strict attention at all times.

Most of the species of pandanus can be increased from suckers, which are more or less produced from the main stem. These may be taken off and a few of the bottom leaves removed, and placed singly in small pots, using a mixture of loam, peat, and sand in equal parts. Plunge in a warm propagating-bed where they may have a brisk bottom heat. The best time to increase this stock is after January. Some species are grown from seed. Seeds may be sown whenever they can be secured fresh, which is usually in the spring. Sow the seed in pans in a mixture of loam, peat, and sand in equal parts. Cover and press firmly. Keep moist, but not in a soaked condition. It will aid the germination to soak the seed twenty-four hours in tepid water. Give plenty of heat and keep shaded and they will germinate without much trouble. When large enough, pot off and keep on shifting and grow under the above cultural directions and they will form good stocky plants.

J. M. Farrell.

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slightly incurved spines; lower midrib furnished from the middle with distant spines of the same character. Mascarene Isls. I.H. 19:97.

10. pygmaeus, Thouars. Low spreading shrub, not over 2 ft. high in the center, but sending out from the base numerous horizontal, rooting, annulated branches; lvs. about 1½-2½ ft. long, spirally arranged in 3’s, linear-subulate, with a clasping base; margins and keels fringed with small fuscous spines. Madagascar. B.M. 4736.—Said sometimes to be cult. as *P. graminifolius*.

11. graminifolius, Kurz. Lvs. 12-18 in. long by 3-4 lines wide, glaucous beneath: marginal and carinal spines minute, straight. Burma, and the true species of and well watered during the dry spring months or it will dwindle away in a very short time. The flowers are interesting but comparatively hardier and more floriferous than those obtained from seed imported from South Africa, but the flowers of both are exactly alike. In order to flower profusely.


13. caricosus, Kurz. *Low, cespitose; lvs. 5-8 ft. by about 2 in., glaucous beneath; margins and dorsal costa densely spinulo-serrate, the spines very small and acute. Java. R.H. 1878, p. 405.


PANDOREA (Pandora, Greek mythological name). *Bignoniaceae*. Ornamental woody vines grown for their beautiful flowers and also for their handsome foliage.

Evergreen shrubs, climbing without tendrils or roots; lvs. opposite, odd-pinnate; lfts. entire or serrate; fls. in axillary or terminal few- or many-fld. panicles; calyx campanulate, with spreading superposed anther-cells; disk thick, ring-like; ovary linear, the seeds in many series: pod oblong, with thick not keeled valves; seeds broadly elliptic, winged.—Five species from Austral. to Malay Archipelago and in S. Afr. Formerly usually included under Tecoma.

The pandoreas are vigorous-growing vines or lianas with handsome evergreen foliage and beautiful white or pink rather large flowers. They can be grown outdoors only in the southern states and in California and stand few degrees of frost; in the North they are sometimes cultivated in the greenhouse. They require rich soil and sunny position. Propagation is by seeds and by greenwood cuttings under glass. See also *Bignonia* for culture.

The wonga-wonga vine, *P. australis*, is rather difficult to grow on high pine-land, as it needs a soil rich in humus. In rich soil, however, and liberally fertilized, it is a rampant grower with beautiful dark green glossy foliage. The flowers are interesting but comparatively small, and not showy. However, the species is worth cultivating for foliage alone. It must be well taken care of and well way secured during the dry spring months or it will dwindle away in a very short time.

*P. Ricasoliana*, from Natal and Caffrraria, demands a very rich soil and a heavy mulch of stable manure. Its leaves easily drop from the woody branches after a cold night, and 6° or 7° of frost kill the plant down to the ground. For this reason the vine should be banked with dry sand every fall and if killed down to the bank it must be cut off immediately or the entire plant will be lost. Plants raised from seed received under the name of *Tecoma Ricasoliana*, from Italy, are much harder and more floriferous than those obtained from seed imported from South Africa, but the flowers of both are exactly alike. In order to flower profusely,
PANDOREA

this species must be planted in the full sun. It usually requires a few years before it starts into a vigorous growth, and it rarely flowers before its fifth year or before it has attained considerable size. In Florida, P. Ricassiana should be planted on tall stumps, or on arbor and sheds by itself, never mingled with other species. (H. Nehring.)

A. *Fla. white*: lfts. 3-9.


**PANICULÀRIA**: Glyceria.

PANICUM (old Latin name of Italian millet, *Setaria italica*). Gramineae. Annual or perennial grasses with usually flat blades and paniculate inflorescence.

Spikelets with a terminal perfect floret and below this a second floret which may be stamine, neutral or reduced to the sterile lemma; fertile lemma characterized by being of a much firmer texture.—An immense genus of grasses scattered over the world, especially in the tropics. Several hundred species have been described, while conservative authorities place the number at about 300. Their importance as forage grasses is very insignificant when the number of species is taken into consideration. This is largely from the fact that the species, as a rule, are not gregarious, and to the fact that they are not well represented in the meadows and prairies of temperate and northern regions. Guinea-grass and para-grass are, however, important forage grasses of the warmer regions.

A. *Plant annual.

*capillâre*, Linn. *Old Witch-Grass*. A common native annual grass and weed, has been recommended for cult. on account of its ornamental purple panicle, which is ample and loose, the spikelets being borne on slender hair-like pedicels. R.H. 1890, p. 525; 1896, p. 572. Dept. Agric., Div. Agrost. Bull. 17:34.


*textum*, Buck. *Coloradograss*. TEXAS MILLET. Commonly decumbent at base and rooting at the lower joints; culms stout, 2-6 ft.; foliage softly hairy; panicle narrow, the large, pointed, hairy spikelets somewhat crowded; seed cross-wrinkled. Dept. Agric., Div. Agrost., Bull. 7:50.—The common name refers to the Colorado River of Texas where the species is native. Sparingly cult. in the southern states.

AA. *Plant perennial.

B. *Blades long and narrow, not plicate.*

*virgatum*, Linn. *Fig. 2746*. An upright grass with stiff culms, 2-6 ft. high, and with stout panicles; spikelets in loose, compound panicles, usually more or less purplish, sharp-pointed; first glume half as long as spikelets, 5-7-nerved, second glume and sterile lemma of about equal length, 5-7-nerved. Native throughout U. S. except in the extreme W. R.H. 1880, p. 572. Gn. 14, p. 215; 23, p. 235; 37, p. 243. G. 10: 103. Dept. Agric., Div. Agrost. Bull. 7:60. A hardy perennial used for ornamental purposes.

*máximum*, Jacq. *Guinea-grass*. Four to 8 ft., or sometimes taller, forming dense tufts; culms robust; nodes hairy: sheaths more or less hisrate; blades 20-30 in. long; panicle 1-2 ft. long, the long stiff branches arranged in whorls; spikelets short-pedicelled, smooth,

2746. *Panicum virginatum.*
rather glossy, the seed minutely cross-wrinkled. Native of Afr., early intro. into the W. Indies and Trop. Amer. —Cult. for forage in the Gulf States.

**barbinode,** Trin. (P. mörle of authors, not Swartz). **PAPA-GRASS.** Strongly stoloniferous, as much as 20 ft. long; culms decumbent, rooting at the joints. 6-10 ft. high; robust; sheaths more or less hairy, the blades smooth, 6-20 in. long; panicles 8-15 in. long, consisting of numerous ascending racemes with rather crowded spikelets.—Intro. from Brazil. *P. numidicum,* Lam., is a closely related species of the E. Indies, sometimes confused with true para-grass.

**Blades an inch or more broad, plicate:** panicle narrow, the spikelets interpersed with bristles.

**sulcatum,** Aubl. A tall perennial, 4-6 ft., native of Trop. Amer.: lvs. large, 1 in. or more broad, somewhat hairy, conspicuously plicate: panicle narrow, about 1 ft. long, with many ascending branches, bearing short-pedicellate spikelets throughout their length, and also scattered bristles; spikelets pointed; lower glume half, second glume two-thirds the length of the sterile lemma and fertile floret, all strongly curved.—This and the next species belong to the section Psychophyllum, which is better referred to Setaria.

**palnfolium,** Willd. (P. plicatum of authors not Lam.). **Palm-Grass.** (Fig. 2747). Resembles the preceding, but lvs. broader and nearly smooth, the panicle larger and more bristly: spikelets similar. G. 3:101. Gr. 12, p. 517; 31, p. 457; 37, p. 245. R. H. 1862, p. 290. —A variegated form is figured in F.S. 17:1743-44 under the name *P. folius nito-ovitatis.* Cult. in the S. for ornament. Native of E. Indies. Woolson, of Passaic, N. J., says it grows 4-6 ft. high in the hardy border and makes a fine, stately grass; useful for winter bouquets. This grass is known in the trade as *P. plicatum* or less commonly as *P. excurrens,* but the real *P. plicatum,* Lam., through an allied species, is a smaller, narrower-leaved plant of no particular beauty and unknown in cult. The true *P. excurrens =* *P. plicatum,* Lam.

**P. atrospicatum** of htsa is apparently *Pennisetum ruppellii*—*Cyanathed.-Edmondchis.*—*P. frumentum* = *Echinochloa.*—*P. germundicum* = *Setaria.*—*P. variabile* = *Ophiopogon burnhamii.*

**A. S. HITCHCOCK.**

**PANIESA** (Greek, entirely like, referring to the fact that the labelium is like the other floral parts). **Orchideae.** Epiphytic herbs, densely cespitose: sepals and petals somewhat similar, narrow, free; labelum: narrow, with a long sigmoid-flexuous claw; column slender, broad-winged above; pollinia 4, almost without appendages.—About 4 species in the Himalayas and Assam. *P. trilollosa,* Rolfe, having pale translucent yellowish green fls.; with 3 yellow calli on the disk tipped with brown, has been grown in botanic gardens. Assam.

**PANSY.** A favorite garden perennial, commonly known as an annual; prized for the beauty and individuality of its flowers. The pansy is everywhere a familiar flower. It is also scattered in character in it. The flower is often likened to a face. It appeals to personal feeling. In fact, the word pansy is only a corruption of the French pensee, meaning thought. The old folk-name, heartsease, is also associated with the familiar place which the plant has occupied; it signifies remembrance. The pansy is one of the oldest of garden flowers. Parkinson mentions it as a flower-garden subject in 1629. When critical study began to be given to the kinds of plants, the pansy was so distinct from wild species that its specific identity could not be determined with precision, and, in fact, this is the case to the present day. It is generally considered, however, that it has descended from *Viola tricolor* (see *Viola*), a small perennial violet native to the cooler parts of Europe. In its nearly normal or unimproved forms, *Viola tricolor* is now grown in gardens. (Fig. 2748.) It is a most interesting plant, because handsome-flowered and variable. The flowers of this violet usually have three colors or shades, mostly blue, white, and yellow, but in the different varieties one of the colors strongly predominates. A form with very small and inconspicuous flowers (var. arenicola) has run wild in many parts of the country.

Pansies are perennial, but they are grown practically as winter or spring annuals. Commercial growers sow the seeds in fall, and sell great quantities of the seedling plants before winter sets in. These plants are flowered in frames or cold greenhouses, or they are planted in the open for spring bloom. Plants are also started indoors in late winter for spring bloom. Pansies delight in cool, moist weather; hence the American summer is not to their liking, and they often perish. A new stock of plants is started every year.

The modern improved pansies run in strains or families rather than in definite varieties. These strains are maintained at a high grade by the best cultivation and the closest attention to selection. The seed of the best strains is necessarily expensive, for it represents much human care. The stock usually runs down quickly in other hands. It should be renewed from the seed-breeder each year if the best results are to be maintained. These fancy and high-bred strains require extra care in the growing. Most of the best strains are of European origin. They are usually known by the name of the breeder. The chief points of merit in the high-bred pansy are size of flower, brilliancy of coloring, arrangement of colors. The flowers may be self-colored (of only one color) or parti-colored. The parti-colored flowers are of three general types: two banner petals and three central petals of different colors; petals all margined with lighter color; petals all striped. There are all grades of intermediate differences. The colors which are now found in pansies are pure white, purple-black, pure yellow, different shades of blue, purple, violet, red-purple. Pansy flowers are now grown 3 inches across. (Fig. 2749.)

With the above account may be compared Gerard's description of pansies in 1597. He pictures the heart's ease or *Viola tricolor* with small violet-like flowers, the petals standing apart from each other. The "upright heartsease" or *Viola asphaltina tricolor* is represented as a stouter and more erect plant, with rounder but scarcely larger flowers. These are described as follows:

2747. *Panicum* palmifolium.
Strain, crossed with those of Cassier's and Bugnot's, are devoting much time to the improvement of the various types and strains. The flowers are being steadily improved in all points by which pansies are judged—size, color, substance and form. Nearly all the beautiful colors are to be found among the giant types, and the care that is being taken in the propagation of cuttings. The specialists are being led in introducing new varieties.

It is customary at the present day to make a careful selection of seedlings for new varieties, also to propagate by the means of cuttings. The specialists are devoting much time to the improvement of the various types and strains. The flowers are being steadily improved in all points by which pansies are judged—size, color, substance and form. Nearly all of the beautiful colors are to be found among the giant types, and the care that is being taken in the selection of colors makes it reasonably sure that, when the choicest seed is obtained, a large percentage of the plants will come true to color. The season of blossoming has been extended, the new early-flowering strains blooming five or six weeks earlier in the spring than the old varieties.

There are many beautiful varieties of pansies and it is difficult to make a selection, but the most popular for both amateur and commercial growers are the giant flowers of the Trimardeau type, the Cassier superb strain of blotched pansies, and the Bugnots. One of the newer strains is the "Masterpiece," a very large flower with curled or ruffled petals, which are so undulated and curled that many of its blossoms appear to be double. The new upright giant five-blotched pansy called the "Princess" by Ernest Benary is entirely distinct from all other pansy strains in its great compactness, its upright growth and its hardness. Two other types which should be mentioned are the "Orchid Flowered," whose delicate orchid colors do not exist in any other strain; and the "New Early Flowering Giant," pansy, which blossoms in early March.

It is conceded by European pansy specialists who have visited the United States that the American pansy seed planted on the American soil, will produce larger and finer flowers than the foreign-grown seed of the same strain planted on the same soil. Pansies degenerate very quickly; therefore it is very important to procure fresh seed every year from a specialist.

The four characteristics of the pansy required by the four leading pansy-growing people are as follows:

- Germany: Color, substance, form, size.
- Great Britain: Form, color, substance, size.
- France: Substance, size, color, form.
- America: Size, color, substance, form.

The success of growing a crop of pansies depends largely on having good fresh seed and on how the seedbed is treated the first six to twelve days; for if pansy seed planted on the American soil, will produce larger and finer flowers than the foreign-grown seed of the same strain planted on the same soil. Pansies degenerate very quickly; therefore it is very important to procure fresh seed every year from a specialist.

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The success of growing a crop of pansies depends largely on having good fresh seed and on how the seedbed is treated the first six to twelve days; for if pansy seed becomes dry after once sprouting, it is dead; and if kept too close, it will damp-off.

A coldframe is a good place in which to sow the seeds if the boards are not full of fungus; or a box 9...
inches to a foot high might be made on fresh ground that is a little sandy and was well manured for a previous crop; dig and make the soil fine and water it well before sowing the seeds. Sow in drills 3 inches apart and ½ inch deep. One ounce of seed will sow about 300 to 350 feet of drill, or 90 feet if sown broadcast. Cover the seed ½ inch deep with fresh sand or sandy soil, pat down or roll well and give a light watering. The surface should be dusted with salt or grape dust to keep the damping-off fungus from starting. Cover with boards, leaving space for ventilation; or they can be covered with moss, hay, or straw, being sure to remove the covering as soon as the seed is sprouted. Pansy seed will not sprout well if kept above 75°. After sprouting and until they have the second leaves, it is a good plan to cover them with the thinnest muslin, tacked on frames. Sashes may be used if well shaded and well ventilated.

To secure the best results, pansy seed should be sown from July 10 to August 25. If plants for cut-flowers are wanted, sow the seed the first part of July. The best plants for wintering over in the field for spring forcing are from seeds sown from July 10 to 20 in the northeastern states. Five or six weeks after sowing the seeds, the plants are usually large enough to be transplanted in the field, in good rich ground. The soil should be made too rich, and should be in raised beds so the water will not stand on them in the winter. Plant 7 or 8 inches apart each way. If a coldframe is used, from 50 to 250 plants can be set under a 3- by 6-foot sash. If pansy plants are transplanted the first time into the place where they are wanted to grow, they will have larger flowers; for every time the roots of a pansy are disturbed, the flowers will be smaller. Just enough mulch should be applied to hide the plants from view after the ground is frozen. This mulch is taken off as soon as the frost is out of the ground in the spring.

There are from 25,000 to 28,000 seeds in one ounce of pansy seed. Growers usually allow one ounce of seed for 4,000 plants. With good fresh seed and great care, 7,000 to 8,000 plants should be obtained from one ounce of seed. For commercial purposes, pansy seed should be planted in July and August, but at this time of the year, it is too hot for the seeds to grow well. Seeds planted in the fall or early spring will give double the number of plants and require less care.

If pansies for winter blooming are desired, transplant the plants in August, as the plants are large enough to be in raised beds or in the greenhouse. They will need about the same temperature as for violets, 40° to 45° at night, and 60° in the daytime in bright weather.

Pansies are now being grown very extensively for cut-flowers in the southern states. If wanted for exhibition purposes, keep the pansy plants in a low temperature till January; some freezing, even, will benefit them. Start them slowly into growth at a temperature between 30° to 40° at night, as a higher temperature will diminish the size of the flowers. A weak solution of guano or hen-manure once every two weeks will help them wonderfully. During growth and bloom, maintain a rather low, even, temperature, without actual freezing, carefully avoiding extremes in temperature.

In favored localities pansies designed for early spring bloom receive no glass protection during winter, the plants being transplanted in the fall from the seed-bed directly into their permanent quarters. Good pansies can be grown out-of-doors without glass protection as far north as Nova Scotia. Generally, however, it is much better to winter pansies in a coldframe or other cold shelter. Pansies in bloom should be partially shaded from the hot midday sun, particularly the fancy-colored strains, the petals of which are more delicate in texture.

Charles Frost.
cut foliage and smaller flowers. It is brilliant in the fields of Europe, and it has run wild in this country. The Shirley poppies are the best strain of this species; in gardens the flowers last longer than the common P. rhoeas, and the plants are neat when out of bloom.

3. The Iceland poppy, P. nudicaule, is the glory of the arctic regions. It ranges over an immense territory and varies remarkably both in the wild and the garden. Orange, red, and white are the chief colors, besides shades of yellow, but the flowers never attain the brilliant scarlet of the corn poppy. Although the Iceland poppy is perennial, it is short-lived, and is commonly treated as an annual or as a short-lived perennial. It is known for the satiny texture and crimped character of its petals. The flowers are excellent for cutting, especially if the young flowers are chosen and cut in the early morning, a principle which applies to many flowers often supposed to be useless for home decoration.

4. The oriental poppy, P. orientale, is a longer-lived perennial, and although it has the largest flowers of any species in the genus it has nothing like the fame of the Shirley poppy. However, it has the double advantage of being easily propagated by either seed or division, and it has a considerable range of color, which is said to be largely due to crosses with P. bracteatum. The latter differs in having large bracts below the flower. Of hundreds of species of poppies the oriental poppy, P. alpinum, was considered by Linnaeus to be a distinct species from the Iceland poppy. However, gradations occur between the typical form of P. alpinum of the arctic regions and the poppy found in the Alps. The former has a yellow flower, while the common alpine poppy is white. The alpine poppy is by some regarded as an extreme form of P. nudicaule, characterized by a dwarfer habit and more finely divided foliage. For horticultural purposes P. nudicaule and P. alpinum should be considered to be distinct species, as many botanists indeed consider them to be. The Iceland poppy can be easily grown in the border, while the alpine poppy demands rock-garden treatment. The former does best in a moderately rich and light loam, while the latter does better in a rather poor soil. Both need full exposure to the sun, and P. alpinum probably needs better drainage. See No. 20, p. 2439.

The Shirley poppies are now the prevailing forms of P. rhoeas. The following history of the remarkable race is given by the Rev. W. Wilks in "The Garden," 57, page 385: "In 1880 I noticed in a waste corner of my garden, sitting on the flowerbed of a common wild field poppy (Papaver rhoeas), one solitary flower of which had a very narrow edge of white. This one flower I marked and saved the seed of it alone. Next year, out of perhaps two hundred plants I had, one or two out of perhaps six hundred plants I had, four or five on which all the flowers were edged. The best of these were marked and the seed saved, and so for several years, the flowers all the while getting a larger infusion of white to tone down the red until they arrived at quite pale pink and one plant absolutely pure white. I then set myself to change the black central portions of the flowers from black to yellow or white, and having at last fixed a strain with petals varying in color from the brightest scarlet to pure white, with all shades of pink between and all varieties of flakes and edged flowers also, but all having yellow or white stamens, anthers and pollen, and a white base." Mr. Wilks then distributed it freely to all. "My ideal," he continued, "is to get a yellow P. rhoeas, and I have already obtained many distinct shades of salmon. The Shirley poppies have thus been obtained simply by selection and elimination. . . . Let it be noticed that true Shirley poppies (1) are single; (2) always have a white base with (3) yellow or white stamens, anthers and pollen, (4) never have the smallest particle of black about them. Double poppies and poppies with black centers may be greatly admired by some, but they are not Shirley poppies. It is rather interesting to reflect that the gardens of the whole world—rich man's and poor man's alike—are today furnished with poppies which are the direct descendants of one single capsule of seed raised in the garden of the Shirley Vicarage so lately as August, 1880."

Hybrids between different species of Papaver are described in the monographs, but they do not appear to have given leading forms for cultivation. Hybrids have been produced between the annual and perennial species. Between the different garden varieties, crossing probably goes on continuously, and new strains are constantly arising.

For garden purposes most poppies are to be treated as annuals for best results, with the exception of P. orientale and P. bracteatum, which the gardener thinks of as one group. The oriental poppy is, in fact, the only common long-lived perennial poppy. The Iceland poppy may live for several years, but after the third year it usually degenerates. It blooms the first year from seed and the best results are usually secured the second year. The cultivation of poppies is very simple, except of course in the case of alpine species, for which special conditions must be provided. Seeds usually germinate readily, but as the young plants of the annual kinds do not transplant well, the seeds should be sown where the plants are to remain. In the Shirley and similar poppies, the plants may be thinned to stand 4 to 6 inches apart. For especially large and fine blooms, the plants should be given at least twice more room. A succession in sowings will provide a greatly extended season of bloom; removing the seed-pods will also extend the blooming-time. Open warm soil in a sunny exposure is preferred for poppies.

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B. Species usually annual or biennial (Nos. 1-12).

C. Herbage setose or (perhaps glabrous in No. 2 and in forms of No. 4) green or glaucous: foliage always incised or pinnatifid, the st.-les. not clasping.

D. St. elongated and leafy.

e. Caps. usually glabrous.
divided into toothed or 3-lobed or entire segments: fls. 2 in. across; petals brick-red, with a green spot at the base bordered with rose-red: caps. between club- and top-shaped, flat on top, the disk 6–11-nerved. Santa Inez Mountains and southward in Calif.; also Mt. Tamalpais (near San Francisco).

**PP. Shape of caps. mostly obovate or oblong.**

3. *arentarium*, Bieb. Annual, 12–20 in. high, from a perpendicu
dar root, erect, sparingly beset with bristles which are spreading on the st. and on the foliage: lvs. twice pinnatisect into minute linear or linear-oblong segments; bud obovoid or narrowly obovoid; fls. purple, with a dark spot at the base of each petal; filaments not dilated; caps. obovate to oblong or top-shaped, with a convex disk; stigmatic rays 7–9. Sandy places in Caucasus and Caspian region.

4. *dubium*, Linn. Erect, usually robust annual, hisprous, 1–2 ft. high, branched, few-flowered: lvs. glaucescent, more or less pinnatifid or nearly glabrous above, the lower ones pinnatifid or nearly so with the segments pinnately cut and lobes ovate or roundish or sometimes much narrower; st-lvs. usually pinnatifid with narrow acute lobes; peduncle long; fls. pale rose, vermilion or seldom white, mostly darker in the disk and sometimes at the base of the stigmatic rays, which are 12–20, i.e., nearly double those of *P. rhoas*: the fls., caps., and seeds also are much larger and the stigma broader in proportion.” The fls. attain 3½ in. diam., and vary from pale rose to bright crimson, with a white or black spot at the base. B.M. 6729. Gn. 29, p. 139. G.C. II. 25:9.

Said to revert occasionally to *P. rhoas*.

**Var. Hookeri, W. Miller (P. Hookeri, Baker).** A puzzling plant found in gardens of India, and of unknown parentage. It is nearest to *P. rhoas*, and “differs in its great size, for it forms a bushy herb 4 ft. high and upward, and in the great number of the stigmatic rays, which are 12–20, i.e., nearly double those of *P. rhoas*; the fls., caps., and seeds also are much larger and the stigma broader in proportion.” The fls. attain 3½ in. diam., and vary from pale rose to bright crimson, with a white or black spot at the base. B.M. 6729. Gn. 29, p. 139. G.C. II. 25:9.

**Var. umbrosa, Mott. (P. umbrosa, Hort.).** Has petals of a darker red than the typical *P. rhoas*, and blackish spots. It was intro. by Wilmorn about 1881, and was considered a marked gain in productiveness. The habit is dwarf, compact, much branched. Soon after a double form was distributed. Mottet considers it a form of *P. rhoas*, but some botanists consider it a form of *P. commutatum*, a species apparently not otherwise in garden cult. *P. umbrosus* was found growing wild in Attica.

**Var. Hooperi, W. Miller (P. Hooperi, Baker).** A puzzling plant found in gardens of India, and of unknown parentage. It is nearest to *P. rhoas*, and “differs in its great size, for it forms a bushy herb 4 ft. high and upward, and in the great number of the stigmatic rays, which are 12–20, i.e., nearly double those of *P. rhoas*; the fls., caps., and seeds also are much larger and the stigma broader in proportion.” The fls. attain 3½ in. diam., and vary from pale rose to bright crimson, with a white or black spot at the base. B.M. 6729. Gn. 29, p. 139. G.C. II. 25:9.

Said to revert occasionally to *P. rhoas*.

**The flower-garden forms of *P. rhoas* give remarkable color effects. Probably no plant so quickly and cheaply satisfies one’s love of color.**
as the land can be put in condition. Cover lightly, or the germination may be unsatisfactory. Thin to 6-12 in. apart. Self-sown seeds give earlier-blooming plants.

EE. Caps. more or less setulose.

6. pavoninum, Fisch. & Mey. (P. pavoninum, Stechelg.). Peacock Poppy. Annual. More or less branched, 1 ft. or less high, hispid-pilose: lvs. pinnately parted, the divisions oblong-linear and incised-toothed, pilose: bud ovoid, nodding: fls. about 1 in. across; petals scarlet, dark-spotted: caps. minute, ovate; stigmatic rays 4-7.

Sandy places of Turkestan and Afghanistan. G.C. II. 20:329.—Botanically it is very distinct by reason of 2 short horn-like appendages, one on each sepal near the tip on the back.

EE. St. elongated, sparingly leafy: biennial.

7. caucasicum, Bieb. Biennial, more or less setose, glaucous, 1-2 ft., the root fufurce, erect, pinnately branched: lvs. glaucous, sparingly setulose or the petiole densely so, lanceolate in outline, pinnately parted, the segments, pinnatifid and lobes ovate-oblong: buds ovate: calyx glabrous or sparingly setose; petals somewhat in pairs, roundish, pale red and the claw usually yellowish: caps. oblong, glabrous; stigmatic rays 5-6. Caucasus. B.M. 1675 (brick-red, not spotted).

8. floribundum, Desf. (P. caucasicum var. floribundum, Elck.). Glaucous biennial, yellowish, hispid, the segments of lvs. nearly entire or dentate: fls. vermilion, the stamens obovate, hirsute: caps. mostly oblong, glabrous. Caucasus region. B.R. 134.

9. pérsicum, Lindl. Biennial, setose-hispid, 1-2 ft., pinnately branched, st. pyramidal: lvs. glaucous, oblong-lanceolate in outline, pinnately parted, the segments oblong-lanceolate and entire or dentate: buds oblong; calyx setose; petals overlapping at the margin, deep red or brick-red, green-spotted at the base: caps. large and broad, densely hispid; stigmatic rays 5-6. Persia. B.R. 1570 (petals brick-red, with or without a white spot at the base).—This has been, and may still be, confused in the trade with P. caucasicum.

cc. Herbaceous almost glabrous (or very sparingly setulose), glaucous, the st.-lvs. clasping and nearly entire or incised-dentate.

10. somniferum, Linn. (P. opiferum, Forsk. P. nigrum, Crantz). Opiyum Poppy. Fig. 2751. Robust, glaucous and glabrous annual, 3-4 ft. high, with fls. 4-5 in. across, much larger than of any annual kind: lvs. oblong, unequally toothed at the base: st.-lvs. cordate at the base: sepals ovate-recurved to dentate-separate, very glaucous, clasping: fl.-bud ovoid-oblong, somewhat obtuse at apex, glabrous; petals orbicular, entire, undulate or cut, from white through pink and red to purple, but not yellow or blue: caps. globose, glabrous, with a flat 8-12-lobed disk. Greece, Orient. Gt. B. 9, p. 197; 59, p. 127. Gt. 40, p. 609; 44, p. 593. R.H. 1893, p. 319. S.H. 2:272. G. 3:125 (as var. nigrum).—Sparingly run wild in N. Amer. Very variable in color of seeds, characters of caps., and form and color of petals. Var. álbum, DC. (P. officinale, Gmel.), has fls. and seeds white: caps. ovate-globose.

Among the double horticultural forms of P. somniferum are two main strains or types, the carnation-fid. and the peony-fid. (the latter P. opiferum, Hort.). The former has fringed petals; the latter not. Both include a wide range of color, and even a yellow form has been advertised, but this form is of doubtful authenticity. P. Marselli is another strain of double fringed kinds, of which Mikado is a favorite. P. fimbriatum is another trade name for double fringed varieties. P. cardinale is the French name of another strain of double fringed fls. Chinese poppies are a double-fid. mostly intro. from Chinese garden stocks early in 1890, and comprising dwarfer strains than previously known. R.H. 1893, p. 349. An exceptionally interesting monstrosity has occurred in which there are no petals, and the stamens are supposed to be transformed into pistils which actually ripen seed. It was figured as long ago as 1851 in F.S. 6, p. 212, and again in R.H. 1893, p. 349. It seems to be no longer advertised, but it was considered to be constant.

Among the single varieties, Danebrog is one of the most striking and popular. The white spots at the base of the petals form a cross. This variety is also known as Danish Cross, Danish Flag and Victorian Cross. Of the pure white kinds, Flag of Truce and The Bride are favorites. Mephisto is scarlet, spotted black. About a dozen other varieties are advertised by name.

11. setigerum, DC. (P. somniferum var. setigerum, Elck.). Differs from P. somniferum in having deeply incised lvs. and 7-8 stigma-lobes, the petals violet, the plant more setulose in parts; stigma-lobes 7-8.-P. setigerum is apparently no longer advertised, but according to Nicholson numerous fine strains have originated from it. It is usually considered a hairy form of P. somniferum. It is a violet-fid. plant native to the Medit. region.

12. glaucom, Boiss. & Hausskn. (P. somniferum var. glaucum, O. Kuntze). Tulip Poppy. Annual (sometimes perennial?); glaucous and glabrous except a few small, appressed bristles along the peduncles, sparingly leafy, pinnately branched at the base: st.-lvs. broadly cordate, or lobes triangular, dentate; the teeth obtuse, callous, mucous; bud ovoid, somewhat attenuate at top; petals large, scarlet, spotted at the base: caps. ovate, stalked: stigmatic rays about 12. Syria to Persia. Gt. 40, p. 608, repeated in G.C. III. 10:537; R.B. 20, p. 58, S.H. 2:467 and V. 15:37. R.H. 1892, p. 465; 1893, p. 350.—The plant sold under this name remains one immediately of a tulip because of the color and texture of the fls., but especially because of its cuplike shape. The 2 inner petals are smaller, erect, and make a loose cup. The plants grow about 12-18 in. high and produce 50-60 large fls.

BB. Species perennial.

c. Sts. elongated, more or less leafy: cape. glabrous.

d. Branching dichotomous or corymbose.

e. Fls. racemose.


14. atlanticum, Ball (P. rupifragum var. atlanticum, Ball). Perennial: hairy and everywhere covered with coarse pubescent hairs except the glabrous caps.: height 1-2 ft., from a thick woody root, the sts. scape-like: lvs. oblanceolate, coarsely and irregularly crenate-serrate or pinnatifid, the segms. entire or crenate-serrate; at-lvs. smaller and sessile: bud broadly ovate, hispid, nodding; fls. 2-3 in. across; petals orange-red or scarlet; stigmatic rays 6-8; caps. club-shaped. Morocco, 6,000-7,000 ft. B.M. 7107.

15. rupifragum, Boiss. & Reut. Perennial, cespitose and many stemmed: lvs. mostly radical, oblong-lanceolate in outline, pinnatisect with rounded sinuses, the segms. irregularly oblong or lanceolate and dentate or nearly entire, glabrous or pilose on the nerves, but the scape-like sts. sparsely hispid; at-lvs. smaller and narrower: bud broadly ovate, glabrous, nodding; fls. 5-6 in. diam., pale red: caps. oblong-clavate, glabrous, the disk 8-rayed. Spain. Gt. 2, p. 66.

Dd. Branching slight, the sts. mostly peduncle-like although bearing lvs.

16. orientale, Linn. ORIENTAL POPPY. Figs. 2752, 2753. Plants grow 3-4 ft. high, perennial, stiff-hairy, and bear fls. sometimes 6 in. or more across: lvs. hispid, pinnately parted; lobes oblong-lanceolate, the upper lobes coarsely serrate and the lower incised-dentate: petals sometimes 6, obovate, narrowed below, scarlet with blackish base: caps. obovate, with a flat disk; stigmatic rays 13-15. Medit. region to Persia. B.M. 57. Gn. 24, p. 459; 42:584. Gn. M. 5-16. V. 12:123.—A popular perennial, new in many forms. The petals are originally apparently scarlet with a black spot. It was not until late in the 80's of the past century that this species made a decided break in color. A considerable class of hybrids with P. bracteatum has arisen which extends the color range through several shades of red to orange, salmon, and pale pink. Some are unsuited, some are adapted to cutting, and doubling has made some progress. Among the Latin names of varieties belonging to this class are grandiflorum, hybrida, immaculatum, nánum, spléndens, Pérkmanii, plénnum, semi-plénnum, and Sintenisii. Several have received common or personal names. Possibly some of these names belong rather with P. bracteatum.—Oriental poppies are better divided after blooming, in late July, or Aug., when they are dormant; but the roots should not be disturbing if the best bloom is expected the following season. They always grow in the autumn, and these divided plants would start away and make good growth. If divided in spring, they would not recover in time to bloom. Any extra-good variety may be increased largely by cutting the roots into short pieces. This also is best accomplished in summer. No plant is more brilliant in late spring or early summer than the oriental poppy, with its large fls., silken petals and flaming colors, although its season of bloom is short.

17. bracteatum, Lindl. (P. orientale var. bracteatum, Lehm.). Differing from the preceding in having large leafy bracts below the fl.: perennial, erect, setose; radical lvs. pinnate-parted, the upper ones incised, segms. lanceolate or oblong; petals sometimes 6, obvate attenuate to base, blood-red and not spotted or the claw dark violet; stigmatic disk 16-18-rayed. Medit. region to Persia. B.R. 658. G.C. 1860:647.—A variety with petals more or less united into one was mentioned in 1862-5 in F.S. 15, p. 186.

cc. Sts. very short, so that the plant is practically acaulescent, the fls. solitary on scapes.

d. Scapes very short, usually not exceeding 4 in. but sometimes twice that height.

18. pyrenäicum, Kern. Low and cespitose perennial, nearly stemless: lvs. green, all radical and petiolate, appressed pilose or serotinous (sometimes nearly glabrous), pinnately parted, the segms. ovate, ovate-lanceolate, entire, or seldom pinnatifid: scapes 1 or several, usually 2-4 in. high in the wild but sometimes twice that height, the bud ovoid, pilose, nodding: fl. yellow to orange; petals round-obovate, more or less erose, nearly 1 in. or less long: caps. oblong or obovate, strongly ribbed. Pyrenees, Alp, Apennines.

19. alpínum, Linn. ALPINE POPPY. Low and cespitose, perennial, nearly stemless: lvs. glaucous, all radical and petiolate, glabrous or nearly so, 2-3-pinnately parted, the ultimate segms. linear or linear-lanceolate:

20. nudicaulis, Linn. ICELAND POPPY. Fig. 2754. Mostly a yellow-flowered perennial, more robust than the two preceding, cespitose, nearly stemless: lvs. all radical and petiolate, somewhat glaucous, glabrous or hairy, pinnatifid, the segms. oblong and entire or lobed: scapes single or several, usually 1 ft. high, the bud ovate or nearly globose, pilose, usually nodding; fls. 1-2 in. diam., sweet-scented; petals obovate and siminate, white with yellow base or yellow with greenish base, the 2 inner ones smaller: caps. oblong or obovate-glo-
bose, hispid or rarely glabrous. Arctic regions. E. and W. hemispheres.—The species runs into very many botanical forms. In America a form or similar species is found as far south as S. Colo. Gn. 26:390; 21, p. 342; 28, p. 58; 42, p. 584; 79, p. 42. G. 6:321; 7:68. V. 13:297. B.M. 1633; 3035, and R.H. 1890:60 (P. croceum). F. S. 10:1017 (as var. croceum). The following varieties are in the trade: album, auranti- acum, coccineum, croceum, striatum, and sulphureum. Double forms in the various colors are advertised. Older names which are likely to appear are vars. litetum, punicicum, and ribro-aurantiacum. B. M. 2344. The name "nudicaule" refers to the lack of lvs. on the scape, which distinguishes this and the alpine poppy from the common corn poppy of Eu. P. greenlandicum, Hort., is possibly a catalogue name for P. nudicaule. The Iceland poppy is a favorite for spring bloom. It is a hardy perennial, but blooms the first year from seed. It has neat evergreen foliage on the ground. The colors have been much varied in the cult. sorts, so that the gardener has choices in pure white, bright yellows, orange, and orange-scarlet. If the seed-pods are continuously removed, the plant will bloom throughout most of the summer. The fls. are very useful for cutting.

P. strobilochi, Hort.—P. Schinziana, below.—P. heterophy- lum, Greene=Meconopsis heterophylla.—P. Hesperis, Hort. (a botanically annual, and described as a particled by good of medium height with deep scarlet lbs. on slender graceful sts. Offered abroad.—P. Monkbi, Hort. Spontaneous hybrid between P. glauca and P. Rhoeas.—P. rubra-bracteata in a garden hybrid, which distinguishes this and the alpine poppy from P. Schinzianum, Fedde. Probably a garden hybrid between P. rupifragrum and a species allied to P. lateritium, and which has been cult. as P. Heldreichii: fls. brick-red; petals sub orbicular-ovate, to 1 1/4 in. long; csa. ochryroid-ovate.

Wilhelm Miller. L. H. B.†

PAPAYA (Fig. 2755). The papaya (Carica Papaya) is a well-known edible fruit which has spread from its original home in America throughout the tropical world, and is a favorite fruit in many regions. In Hawaii it is said to rank next to the banana in popularity; in nearly all parts of tropical America it is one of the commonest fruits, while early in the seventeenth century it became known in the Orient and is now grown in India, Ceylon, the Malay Archipelago, and many other regions, as well as in tropical Africa and Australia. The name papaya is considered a corruption of the Carib ababai, which in one form or another has been carried around the world; papaia, papeya and papia are some of the various adaptations which are in use. The English name papaw (or pawpaw) is probably derived from the same source, and is widely used; in the United States it has the disadvantage of confusing this fruit with Asimina triloba, which is well known in the central and southeastern states under the same name. The Portuguese name, current in Brazil, is mamão (the tree mamouco), a word probably referring to the mamiform apex of the fruit; in the French colonies it is called papaye (the plant papayer); in German colonies papaja and papajaum, or melonenbaum. Several other names are used in tropical America, notably fruta de bumbula in Cuba, lechosa in Porto Rico, melon zapote in parts of Mexico, and tree melon in English-speaking countries.

The papaya—a giant herbaceous plant rather than a true—grows to a height of 25 or 30 feet, and is often likened to a palm in general appearance, though there is, of course, no botanical relationship. The trunk is commonly unbranched, bearing toward its apex large soft deeply-lobed leaves sometimes 2 feet across, upon stiff hollow petioles 2 feet or more in length. The wood is fleshy, the bark smooth, grayish brown, marked by prominent leaf-scar.s.

The plant is normally dioecious, and produces its flowers in the uppermost leaf-axils, the staminate ones sessile on pendent racemes 3 feet or more in length, the pistillate ones subsessile and usually solitary or in few-flowered corymb. The staminate flowers are funnel-shaped, about an inch long, white, the corolla five-lobed, with ten stamens in the throat; the pistillate flowers are considerably larger, with five fleshy petals connate toward the base, a large cylindrical or globose superior ovary, and five fleshy fan-shaped stigmas.

Beside the typical dioecious form in which male and female flowers are confined to separate plants, it is not unusual to find various other distributions of the sexes; these have been studied in Hawaii by Higgins and Holt, who describe (Hawaii Agricultural Experiment Station, Bulletin No. 32) a number of different forms, such as the occurrence of stamine flowers with more or less rudimentary stigmas and ovaries which sometimes give rise to small fruits; a hermaphrodite form, which regularly produces perfect flowers and good fruits; and various other combinations of stamine, pistillate and hermaphrodite flowers on the same and different plants. It will thus be seen that the distribution of the sexes in the papaya is very irregular; it has been reported by some authorities, indeed, that severe pruning or injury to the tree sometimes results in a change of sex, but this has been observed only on stamine trees of the dioecious type.

Aside from these variations in the distribution of the
which was first separated by Peckholt, greatly resem­
bles animal pepsin in its digestive action, and in recent
years has become an article of commerce. Aside from
its value as a remedy in dyspepsia and kindred ail­
ments, it has very recently been utilized for the clar­
ication of beer. Its digestive action has long been
recognized in the tropics, as evidenced by the common
practice of the natives, who rub the juice over meat to
make it tender.

The papaya succeeds best in regions with a warm climate
and rich loamy but well-drained soil. In south Florida it ap­
ppears to prefer the richer ham­mock soils to those of pine­
lands, but may be very success­
fully grown on the latter with proper fertiliz­
ing. On the Florida Keys, the plant has be­
come thoroughly naturalized, and
springs up wherever a clearing is made, the seeds being scattered by
birds and other agencies. It withstands but little frost, although it is occasionally possible to fruit it

toward the northern part of the state when a mild
winter allows it to reach its second summer without
injury. In California, the papaya has never been
very successful, probably because the nights are
too cool to mature the fruit perfectly. It has been
noticed in the tropics that fruit ripened in cool weather
is poor and somewhat squash-like in flavor. The best
locations in southern California are the protected foot­
hill regions, where the ground is sloping and the soil
well drained, and where the heat during the summer
months is more intense than on the seacoast. An old

PAPAYA
Two pests have become sufficiently troublesome in south Florida to require attention, one of which, the papaya-fruit fly (Toxotrypana curviscava), threatened at one time to become serious (Cf. Journ. Agr. Research, ii. 447-453, Knab & Yothers). This insect occurs in several parts of tropical America; the female inserts her eggs into the immature papaya by means of a long ovipositor, and the larvae first feed in the central seed mass, but later work into the flesh of the fruit, frequently rendering it unfit for human consumption. The only means of control which have been suggested are the destruction of wild plants and infested fruits, and the production of varieties of the papaya with very thick flesh, so that the female will be unable to reach the seed cavity with her ovipositor; the young larvae are unable to live in the flesh. A fungous disease, known as papaya-leaf spot (Puccinia caricae) frequently attacks the foliage during the winter season, forming small black masses on the undersides of the leaves. It is not very destructive, and easily controlled by spraying with bordeaux mixture. F. W. Popenoe.

PAPÉDA (Malayan name). Rutaceae, tribe Citreae. Under this name Hasskarl in 1842 created a new genus to include a form closely related to if not identical with Citrus Hystrix, DC. A number of species of Citrus closely related to C. Hystrix have been reported from the Indo-Malayan and western Polynesian regions. As these species are for the most part only imperfectly described, it is doubtful whether they are valid species or forms may constitute a subgenus under Citrus, distinguished by having very large broad-winged petioles sometimes equaling or even exceeding in area the lamina, small fss. with free stamens, rough frs. with sour and acid pulp composed of very short pulp vesicles, containing oil in the center. Citrus (Papeda) Hystrix, DC., probably includes Papeda Rumphil. Hasskarl. The forms of this subgenus are sometimes used in the Philippines as stocks on which to graft the common cult. species of Citrus. The frs. are not edible but are used by the natives of the Malayan and Polynesian islands in lieu of soap for washing the hair.

WALTER T. SWINGLE.

PAPER PLANT: Cyperus Papyrus and Papyrus antiquorum.

PAPHINIA (Paphos, city of Cyprus, sacred to Venus). Orchidaceae. A rare and pretty genus of orchids, having a number of species of Citrus philippinense, and its hybrids, and the selepienium group. The plants should never be allowed to become dry, as they are making active growth most of the time. Light spraying should be frequent in bright weather, and an application of very weak liquid manure occasional. The foliage is formed in great assistance in keeping the plants healthy. Ventilation regulated according to external conditions is essential at all times to maintain atmospheric action.

During the winter months the thermometer should register from 55° to 60° F. by night, and about 65° F. by day, with sun heat a few degrees higher doing no harm. On the approach of spring the temperature should be slighted, and the plants for summer heat, and accordingly decreased on the approach of fall. A light shading will be necessary at all times, to prevent excessive heat and sunburn, with heavier shading toward midsummer by the addition of bamboo shades, these to be removed in autumn, and dispensed with during the winter.

The greater part of the species grow best in pots, in a compost composed of two parts peat-fiber, one part turfy loam, one part chopped living sphagnum, one third of the pot room being devoted to clean drainage. The compost should be pressed in rather firmly around the roots, finishing off about ¼ inch below the rim of the pot. A sharp lookout should be kept for thrip, and clean pots, with frequent sponging of the foliage, is essential to the good health of the plants. P. insignis and kindred species should have one part chopped sod added to the above mixture (see note on culture in Veitch's "Orchid Manual" 2:34). P. villosum and P. Ezul sometimes suffer under pot culture from fungi, which attack the base of the plant in sultry summer weather. Basket culture will obviate this, as it allows a better circulation of air through the compost. P. Lowes, P. Parahiti, P. philippinense and allied species, together with Selene petiolarum could not be truly chrysidiad and probably should be grown in baskets. By this method the roots are better preserved and less liable to decay during the winter season.

The concolor section requires a warm moist location with free access to the air. The species should be grown in rather small pots, with at least half the space devoted to drainage of broken charcoal or other free material. The potting compost should consist of equal parts chopped sod, peat-fiber and living sphagnum. Lime stone is often recommended as essential in the culture of this section, but, the conditions being equal, it gives no beneficial results (Orchid Review 4:45; Veitch's Manual 2:19, 20).
LXXXIV. A plantation of papaya in the Hawaiian Islands.
The deciduous tropical species require similar treatment to the evergreen kinds. They have a long dormant period during which they should be rested in a temperature of 50° F, with sufficient water to keep the compost moist until growth starts, when they must be returned to their proper department and enjoy a liberal supply of water until after the flowering season, when they must be ripened off and the water supply gradually withheld.

The hardy species (true cypripedias) do better planted out in the open ground or in rockeries, where they should be so situated as to have good drainage and shade. The soil must be free and porous and consist of three parts chopped turf and equal parts of peat and sphagnum. They require a liberal supply of water and frequent syringing over the foliage while growing, but the supply should be gradually reduced after the flowering period until only enough water is given to keep the soil moist. During the winter the plants should be protected with leaves or pine boughs.

Cypripedium reginae and C. pubescens grow well under pot culture. A 7- to 10-inch pot will hold eight or a dozen crowns, which should be planted 2 inches below the surface. Two inches of drainage are sufficient. The pots should be filled with soil (firmly pressed in) to ¼ inch below the rim. After a thorough watering they should be stored in a coldframe and protected with leaves and boughs. About the middle of February they may be removed to a coolhouse, where they should remain for a week, and then be placed in the cool end of the cypripedium house, where they should be watered sparingly until growth-action starts. These plants make strong growth under this treatment, and the flowers are a decided improvement over those produced sparingly until growth-action starts. These plants

The hardy species (true cypripedias) do better planted out in the open ground or in rockeries, where they should be watered until growth-action starts. These plants...

4. niveum, Pfitz. (Cypripédium niveum, Reichb. f.) Lvs. up to 6 in. long and 1 1⁄2 in. broad, dull dark green above, spotted gray-green; lvs. underside, glossy: scape equaling or longer than lvs., 1- or 2-ft.; fls. white; sepal and petals ciliate; dorsal sepal orbicular, concave, reddish purple on the back. purple-dotted in front toward the base; petals or nearly orbicular, a little deflexed; lip shorter than sepal and petals. Spring. Loevai and Tambilan Isls. B. M. 5822. G.C. 19:17. J.H. III. 45:559. Var. album, Pfitz. Fls. pure white. Var. punctatum, Pfitz. Base of petals densely violet-dotted. Var. reticulatum, Pfitz. Petals purple-reticulated at the apex, the nerves purple-spotted. Other minor varieties are: punctatissimum, Requière, roseum.

SECTION II.

A. Sepals with simple nerves, no cross-nerves.

b. Length of petals flat, ciliate

c. Length of petals twisted, the margins with hair-bearing warts.

D. Staminodium pointed in front.

e. Point a long back

f. Point short

G. Staminodium notched in front...

H. philippinense, Pfitz. (Cypripedium philippinense, Reichb. f. C. laevigatum, Batem.) Lvs. oblong-ligulate, late, up to 1 ft. long, glossy; scape up to 1 1⁄2 ft. tall, 3-5-ft.; fls. 3 in. largest diam.; dorsal sepal broadly ovate, acute, whitish, striped purple-brown; petals linear, twisted, 3-6 in. long, ciliate, with small hair-bearing basal warts, yellowish at base, passing into dull purple, the apex pale green; lip buff-yellow, lined faintly with brown. April and May. Philippines. B.M. 5508. G.C. 1855:914. F. M. 298. B. H. 1857:6. F.S. 17:1760, 1761. G.C. 3:309. Var. platyphanenum, Desb. Petals a little longer and twice broader than in type. Var. Conantianum, Pfitz. (Cypripedium Conantianum, Lind. C. roebelianum var. Conantianum, Pucci). Lateral sepal not united as in type. Var. Sanderianum, Pfitz. (Cypripedium Sanderianum, Reichb. f. C. laevigatum, Lind.) Lvs. up to 1 ft. long; scape barely as long as lvs., black-purple, pubescent, several-fl.; fls. about 4 in. largest diam.; dorsal sepal broadly lanceolate, concave, acute, ciliate, pale yellowish green with broad brown line, pubescent on back; petals linear, twisted, 1 1⁄2 ft. long or more, ciliate at the broader base, pale yellow margined with brown-purple at base, above this spotted with brown-purple, the remainder, the greater part, dull purple barred or spotted here and there with pale

10. Störei, Pfitz. (Cyripédium Störei, Hook.). Lvs. up to 1½ ft. long; scape up to 2 ft. tall, greenish purple, pubescent, 3–6-fl.d.; fls. about 4 in. greatest diam.; dorsal sepal cordate, acuminate, white, with usually 2 or 3 dark crimson streaks; petals 5–6 in. long, linear, twisted, spuriously ciliate at base, the lower two-thirds pale tawny yellow, crimson-spotted, the remainder crimson; lip dull rose, veined and reticulated with crimson, the narrow infolded lobes whitish; stamino­

SECTION III.

A. Scape several-fl.d.

B. Fls. all appearing at same time: lvs. nearly erect.

C. Petals with hairy warres, narrow, pendent, much twisted.

D. Dorsal sepal cordate, with a tooth in the sinus; apex of petals 4 times broader than lower half.

E. Margins of staminodium flat; petals flat or but slightly undulate on margins.

F. Petals dilated; staminodium cordate.

G. Ovary white—villos; petals much diluted, the upper part almost orbicular.

H. Staminodium nearly rhomboid.

I. Dorsal sepal obtuse.

J. Dorsal sepal acuminate.

K. Petals, the upper mar­

tiges of petals with warts.

L. Lip equaling or shorter than the petals, directly descending.

M. Claw of the lip less than half as long as the sac.

N. Claw of the lip half as long as the sac.

O. Bottom margin of petals with few spots.

P. Upper margin of petals only with warts.

Q. Lower sepal elliptic–ovate, obtuse; lobes of lip with small warts.

R. Lower sepal narrowly ovate, acute; lobes of lip with large warts.

S. Upper and lower margins of petals with warts.

T. LJawrenceae.

U. Staminodium not umbonate.

V. Lvs. pale beneath, shorter than scape.

W. Sepals not reticuluted.

X. Petals, the upper mar­

gin with warts; stamino­
dium nearly rhomboid.

Y. Petals without warts.

Z. Volunteanum.

aa. Fls. appearing in succession: lvs. recurved.

bb. Fls. appearing at same time: lvs. nearly erect.

cc. Petals without warts, dilated at apex, deciduose.

dd. Dorsal staminodium with a tooth in the sinus; apex of petals 4 times broader than lower half.

ee. Lvs. green, more or less netted.

ff. Pouch long and narrow.

gg. Petals manifestly dilated above.

hh. Staminodium lunate.

ii. Staminodium not lunate.

jj. Petals ciliate on both surface spotless or with few spots.

kk. Petals, the upper mar­
gin with warts.

ll. Staminodium nearly rhomboid.

mm. Claws of the lip half as long as the sac.

nn. Claws of the lip less than half as long as the sac.

oo. Bottom margin of petals with few spots.

pp. Upper margin of petals only with warts.

qq. Lower sepal elliptic–ovate, obtuse; lobes of lip with small warts.

rr. Lower sepal narrowly ovate, acute; lobes of lip with large warts.

ss. Upper and lower margins of petals with warts.

tt. Lawrenceae.

uu. Staminodium not umbonate.

vv. Lvs. pale beneath, shorter than scape.

ww. Sepals not reticuluted.

xx. Petals, the upper mar­
gin with warts; staminodium nearly rhomboid.

yy. Petals without warts.

zz. Volunteanum.

aaa. Fls. appearing in succession: lvs. recurved.

bbb. Fls. appearing at same time: lvs. nearly erect.

ccc. Petals without warts, dilated at apex, deciduose.

ddc. Dorsal staminodium with a tooth in the sinus; apex of petals 4 times broader than lower half.

eee. Lvs. green, more or less netted.

fff. Pouch long and narrow.

ggg. Petals manifestly dilated above.

hhh. Staminodium lunate.

iii. Staminodium not lunate.

jjj. Petals ciliate on both surface spotless or with few spots.

kkk. Petals, the upper mar­
gin with warts.

lll. Staminodium nearly rhomboid.

mmm. Claws of the lip half as long as the sac.

nnn. Claws of the lip less than half as long as the sac.

ooo. Bottom margin of petals with few spots.

ppp. Upper margin of petals only with warts.

qqq. Lower sepal elliptic–ovate, obtuse; lobes of lip with small warts.

rrr. Lower sepal narrowly ovate, acute; lobes of lip with large warts.

sss. Upper and lower margins of petals with warts.

ttt. Lawrenceae.

12. Löwii, Pfitz. (Cypridipedium Löwii, Lindl.). Lvs. ligulate, up to 15 in. long; scape much exceeding lvs., nodding, 3-6-fl.; fls. 3-4 in. diam.; dorsal sepal oval; acute, yellowish green, veined with purplish brown at base, pubescent at the back; petals spatulate, twisted, about 3 in. long, deflexed, the basal part yellow, black-spotted, the upper part violet-purple; lip brown, paler beneath; staminodium oblongate, the border with purple hairs, a small erect hairy horn at the base. April and May. Borneo. F.S. 4: 437. A.F. 11: 1349. R.H. 1857, p. 402; 1858, p. 322; 1885, p. 473. Var. cruciforme, Hall. (Cypridipedium cruciforme, Zoll. & Morr.). More slender, with narrower paler lvs. which are often obscurely marbled. W. Java.

13. Haynaldianum, Pfitz. (Cypridipedium Haynaldianum, Reichb. f.). Lvs. up to 16 in. long and 2 in. broad; scape much exceeding lvs., long-hairy, 4-6-fl.; fls. 4 in. greatest diam.; dorsal sepal oval, obtuse, whitish, tinted with green above, the lower half with revolute margins pale yellowish green, with large brown spots; petals spatulate-linear, 3-4 in. long, twisted and recurved above, ciliate, yellowish green below with large brown spots, the upper half pale dull purple; lip pale, yellow, ciliate; staminodium oblong, 2-lobed in front. Jan.-May. Philippine Isls. B.M. 6296.

14. Victoria-Mariae, Rolfe (Cypridipedium Victoriae-Mariae, Rolfe). Lvs. broadly linear-oblong, paler beneath; scape several-fl.; much exceeding lvs., brown, pubescent; fls. about 4 in. greatest diam.; dorsal sepal nearly orbicular, concave, the margin reflexed, white-ciliate; petals about 1½ in. long, spreading, linear-lanceolate, twisted, white-ciliate, green, red-margined; lip about as long as petals, purple, green-margined; staminodium rhomboid-ovate. Sumatra. B.M. 7573.

15. Chamberlainsianum, Pfitz. (Cypridipedium Chamberlainsianum, O'Brian). Lvs. up to 1 ft. long and 1½ in. wide, narrowly white-margined: scape much exceeding lvs., brownish green, densely pilose, nodding; fls. about 4 in. greatest diam.; dorsal sepal almost orbicular, emarginate, the basal margin reflexed, white-ciliate, green, suffused with brown at base, the curved nerves brown; petals about 1½ in. long, linear, spreading, white-ciliate, green, marked with small purple spots in lines along the nerves; lip about as long as sepal, pale green, with many violet dots. Sumatra. B.M. 7575. R.I.I. 1892, pp. 104, 105. G.C. F 5: 413. Gn. 61, p. 411. J. & W. 5, p. 9. R.B. 26: 258.


17. Hirsutissimum, Pfitz. (Cypridipedium hirsutissimum, Lindl.). Lvs. narrowly strap-shaped, up to 6 in. long and 3½ in. wide, indistinctly marbled: scape shorter than the lvs., black-purple, hirsute, 1-fl.; fls. 4-5 in. greatest diam.; dorsal sepal nearly orbicular, the base and central part marked with blackish purple, often confluent dots, the remainder green; petals about 3 in. long, broadly spatulate, spreading, somewhat twisted, the margin undulate, the base marked with deep purple on a green ground and suffused with many black hairs, the upper bright violet-purple; lip dull green, purple-stained and with minute blackish warts; staminodium almost square, with 3 protuberances and 2 white eyes. March-May. Assam. B.M. 4990. J.H. III. 3: 553. R.H. 1859, pp. 182, 183. I.H. 4, p. 67 (note). F.S. 14: 1430.

18. Villosum, Pfitz. (Cypridipedium villosum, Lindl.). Lvs. up to 18 in. long and 1½ in. broad, grass-green, with the lower surface paler and purple-spotted toward the base: scape nearly as long as lvs., 1-fl., hairy; fls. 5-6 in. greatest diam., glossy, the sepal and petals ciliate; dorsal sepal broadly oval, green, the base and center marked with brown-purple, the margin with a narrow white band, the base marked revolute; petals about 3 in. long, strongly dilated above, yellow-brown, undulate, purple-hairy at the base, the midvein brown-purple; lip brownish yellow, the broad infolded lobes tawny yellow; staminodium tawny yellow, oblong-obovate. Jan.-Feb. Borneo. A.F. 4: 120. F. 6: 555. Gn. 65, p. 435. Var. Böällii, Veitch (Cypridipedium Böällii, Reichb. f. P. Böällii, Pfitz.). Dorsal sepal narrower at base, the central part marked with numerous, often confluent, black spots, the marginal band broader. Moulmein. I.H. 26: 345. G.W. S 5, p. 545. Gng. 15: 506. Other varieties are: var. albo-marginatum, Pfitz., the white margin of dorsal sepal broader; var. atratum, Pfitz. (also known as var. Böällii atratum), has the dorsal sepal strongly marked with black spots and the white border broad, the petals yellow-brown above, spotted below, and yellow-marginated (R.I. 1: 8); var. aureum, Pfitz., dorsal sepal lemon-yellow, strongly black-margined, the petals above red-lined; var. gigantium, Pfitz., in color much like var. aureum, the petals and dorsal sepals larger; var. Gortoni, Pfitz., dorsal sepal with a narrow purple band, bright emerald, the petals pale rose-purple narrowly band; var. Lindennii, Pfitz., fls. larger and more brilliant; var. Measuresiànum, Pfitz., in color resembling var. atratum, the dorsal sepal yellowish green with a purple base, the lip pale cream; var. Moënsii, Pfitz., dorsal sepal black for two-thirds its height, then olive-green bordered with pale cream, the petals reticulated, the stamodium large, the protuberance amethyst.

19. Insigne, Pfitz. (Cypridipedium insignis, Wall.). Lvs. linear, up to 1 ft. long and 3½ in. broad, pale green: scape usually shorter than lvs., 1-2-fl., densely purple-pubescent; fls. 4-5 in. greatest diam.; glossy; dorsal sepal broadly oval, with margins somewhat revolute, the base and central portion apple-green, marked with numerous brown-purple spots along the green veins, the upper part white; petals linear-oblong, spreading, undulate, pale yellow-green veined brown-purple; lip yellowish green, brown-shaded; staminodium nearly quadrate, pubescent, the center marked with brown-purple, the margin with a narrow yellow band, the basal margins revolute; petals almost orbicular, emarginate, the basal margin reflexed, the petals above red-lined; lip large, violet, staminodium rhomboid-ovate. Sumatra. B.M. 6296.

20. Greyi, Pfitz. (Greyi, B.M. 8084. Lvs. narrowly strap-shaped, up to 1 ft. long and ½ in. broad, grass-green.

20. exúl, Pfitz. (Cypripedium exúl, O’Brien). Lvs. up to 8 in. long and nearly 1 in. broad, narrowly strap-shaped, lightly matted, very narrowly white-margined; several longer than lvs., green, purple-spotted, about 3 in. greatest diam.; dorsal sepal broadly ovate, obtuse, reticulate-veined, yellowish green with a white margin, brown-spotted; petals longer than the sepals, oblong, a little dilated toward the apex, ciliate, yellow sparsely spotted and lined with brown; lip marked like petals. Siam. C.O. pl. 13. B.M. 7510.

21. Charlesworthii, Pfitz. (Cypripedium Charlesworthii, Rolfe). Lvs. spotted, up to 10 in. long and 1 in. broad: scape 1-fl., about as long as lvs., purple-spotted, pubescent; fls. about 3 in. greatest diam.; dorsal sepal broadly ovate, large, about 2½ in. long, obtuse, nearly flat, white, mottled and suffused with pale carmine or purple-rose; petals horizontally spreading, a little shorter than sepal, obtuse, long-hairy at base on inner surface, spotted with brown; petals yellowish green, slightly reticulated with brown, striped or reticulated with brown. Autumn. Bengal. B.M. 7416. R.B. 20:241. Gt. 56:1559. A.F. 13:430. J.H. III. 45:469. O.R. 1:335. L.I0:443. A.G. 25:561.—Variable. The following varieties are known: Var. conchifórum, Pfitz. Dorsal sepal concave. Var. Crázshawa, Pfitz. (Cypripedium Crázshawa, O’Brien) Has the fleshy lvs. glaucous beneath, the fls. larger. Var. Desmetianum, Pfitz. Dorsal sepal with the rose-reined white center surrounded by a band of rose-magenta, and with a white border. Var. Duvisiríánnum, Pfitz. Dorsal sepal orbicular, nearly 3 in. diam., pure white at the base, the radiating nerves of a rose, the mahogany petals tessellated with the above, the staminodium white with a chrome-yellow umbo. Var. magníficum, Pfitz. Fls. very large and brilliantly colored. Var. margínatum, Pfitz. Dorsal sepal is white with the base and border rose. Var. unicolor, Pfitz. Lip the same color as sepals and petals.

22. Drúryi, Pfitz. (Cypripedium Drúryi, Bedd.). Lvs. ligulate, up to 8 in. long and ½ in. wide, lightly matted: scape longer than lvs., purple-hairy, 1-fl.; fls. about 3 in. greatest diam.; dorsal sepal about 1½ in. long, rhombic-ovate, obtuse, nearly flat, glandular-black-hairy on the back, white-ciliate, yellowish green or citron-color, marked black-purple in center; petals
longer than sepals, narrowly elliptic, obtuse, somewhat falcate, pubescent on back, the face manifestly hairy at base, golden yellow, purple-lined down middle and brown-dotted at the base; lip about as long as petals, yellow, mucronate, truncate at apex, a node (Tracyanae, A.F. 8:555. F.M. 1890:428. L.H. O. 1014, p. 130).

23. Spicierianum, Pfitz. (Cypripedium Spicierianum, Reichb. f.). Lvs. up to 1 ft. long, and 2 in. broad, broadly linear-lanceolate, pale beneath; scape about as long as lvs., glabrous, black-purple, 1-fld.; fls. about 3 in. greatest diam.; dorsal sepal ovate, transversely sepaled when spread out, about 1½ in. long, deeply sulcate, the margins strongly reflexed, giving the sepal the appearance of a spathe, white, a crimson-purple band down the center, and a large green basal blotch spreded with red; petals a little longer than sepals, spreading, deflexed, somewhat falcate, oblong, strongly undulate at margin, pilose at base on inner surface, green, dotted and suffused with brown; lip longer than sepal, the claw green, the pouch violet, pale-green-margined. Oct.—Dec. Assam. B.M. 6490. L.H. 30:473. Gn. 48, p. 304. A.G. 11:159. A.F. 3:226. Gn. 1:242. F.E. 9:329. G.W. 14, p. 73. J.H. III. 44:27.—Quite variable. Among others, are the following varieties: Var. albicorne, Pfitz.—Dorsal sepal and petals of medium color of the dorsal sepal. Var. grandiflorum, Hort. Fls. larger than usual. Var. leodecans, Pfitz. Dorsal sepal for upper three-fourths pure white, with tender green at base, the petals green at the very undulate margins, with the margin brownish green, the lip bronzy green. Var. magnificum, Pfitz. Lower sepal pure white. Var. Mercatellianum, Pfitz. Fls. yellowish white marked with purple, green absent. Var. nanum, Pfitz. Dorsal sepal without green band. Var. nigrescens, Pfitz. Fls. smaller, lip blackish brown. Var. rubescens, Pfitz. Dorsal sepal pure white on back, strongly tinged with violet-red on face and marked down the center with a purple band, the petals bronzy green, marked with brown dots. 


25. Appletoniæum, Rolfe (Cypripedium Appletoniæum, Gower. C. Bullenianum Appletoniæum, Rolfe). Lvs. ligulate, indistinctly tessellated; scape much exceeding lvs., slender, velutinous, 1-fld.; fls. about 4 greatest diam.; dorsal sepal ovate, shortly acuminate, the margin at apex involute, the basal margin revolute, yellowish green, brown-striated; petals half longer than sepal, horizontally spreading, somewhat rhombic-dilated above, glabrous, the margins at base undulate, the upper margin usually with a few warts, the lower part green, purple-dotted, the upper part rose; lip green, marked with purple. Siam. O.R. 4:177. C.O. 22. Var. Poynüianum, Pfitz. (Cypripedium Poynüianum, O'Brien). Petals pale green, the apex like lip, whitish, tip sparsely spotted. Spec. Per. 12:1244. 

26. Bulleenianum, Pfitz. (Cypripedium Bulleenianum, Reichb. f. C. Hookera Bulleenianum, Veitch). Lvs. up to 8 in. long, about 1 in. wide, tessellated; scape much exceeding lvs., 1-fld., hirsute; fls. about 3½ in. greatest diam.; dorsal sepal ovate, acuminate, the margin reflexed, about 1¼ in. long, olive-green, shaded with brown; petals deflexed, dilated from a narrowly oblong base, obtuse at apex, ciliate, the upper margin with hairless violet-brown warts, olive-green at base, rose-violet above; lip green, marked with greenish brown, longer than sepals but shorter than petals, the inflexed lobes with warts. March and April. Borneo. Var. anoplitænum, Reichb. Fls. yellowish green, suffused with violet; lip red-brown, bordered with green. 

27. Volonteanum, Pfitz. (Cypripedium Volonteanum, Sand. C. Hookera Volonteanum, Rolfe. C. Hookera Volonteanum, Kerch. Fig. 2758. Lvs. up to 8 in. long, 2 in. broad, obscurely tessellated above, paler beneath; scape much exceeding lvs., 1-fld., pale brown with white hairs; fls. about 4 in. greatest diam.; dorsal sepal ovate, long-acuminete, the margin reflexed, yellowish green; petals nearly twice as long as sepals, deflexed, the narrow base undulate, spatulate and somewhat falcate, long-acuminate at apex, minutely toothed, at the base long-ciliate and barbed, green rose at apex, upper margin with black spots; lip pale green, suffused rose. June, July. Borneo. Var. giganteum, Pfitz. A robust form. Var. Lœwei, Pfitz. Darker.

28. Hookera, Pfitz. (Cypripedium Hookerae, Reichb. f. C. barbatum Hookerae, Hort.). Lvs. up to 6 in. long, 1½ in. wide, tessellated; scape about as long as petals, exceeding lvs., 1-fld., purple, pubescent; fls. about 3 in. greatest diam.; dorsal sepal ovate, acuminate, pubescent on back, ciliate, yellowish white, marked centrally with green; petals depressed, spatulate, ciliate, the undulate basal part green with blackish spots, the margin purple, the apex purple; lip pale green, suffused with rose, the infolded lobes yellowish brown, purple-spotted. May and June. Borneo. B.M. 5362. F.S. 15:1565.—The following varieties are known: caerulens, luteum, majus, Measurestianum, and superbium.

29. venstum, Pfitz. (Cypripedium venstum, Wall.). Lvs. up to 6 in. long and 1½ in. wide, above dark green blotted with white, broad-ovate, yellowish green, the pouch violet, pale-green-margined. Oct.—Nov. Borneo. B.M. 2129. B. R. 785. Var. Measurestianum, Pfitz. Fls. white and green, without the brown or red tinge. Var. pardinum, Pfitz. (Cypripedium pardinum, Reichb. f. P. pardinum, Pfitz.). Warts extending over whole upper surface of the petals which are yellow, suffused with copper-color, inflexed lobes of lip with large conic warts. F.M. 51. Var. spectabile, Pfitz. Scape shorter than in the type, the petals strongly colored with mahogany at the apex, the middle area brownish, irregularly black-spotted, the lip large, bronzy green, reticulated with clear green.

30. tænum, Pfitz. (Cypripedium tænum, Reichb. f.). Lvs. up to 8 in. long and 2 in. wide, tessellated, usually beneath toward the base with purple: scape longer than lvs., 1-fld., reddish brown, shortly pilose; fls. 4—5 in. greatest diam., shining; dorsal sepal broadly ovate, acute, ciliate, green-veined, or the alternate veins sometimes purplish; petals somewhat spatulate, pale green, sometimes stained with dull purple, green-veined, marked with a few black spots.
lip dull green, tinged crimson and brown, the infolded lobes broad, warty. Autumn. Mountains of Sumatra. C.O. Cypripedium 6. The following varieties are known: *purpureum*; *superbiens*, with the dorsal sepal white at the extremity marked with clear brown; and *supurbum*.

31. *Mastersiánium*, Pfitz. (*Cypripedium Mastersiánium*, Reichb. f.). Lvs. up to 10 in. long and 2 in. broad, broadly ovate, somewhat reticulate; scape longer than lvs., brown-purple-long-hirsute; fls. 3–4 in. greatest diam.; dorsal sepal nearly orbicular, ciliolate, bright green, the border yellowish white, green-veined; petals horizontal; lip broadly ovate, obtuse, brownish red, the base pale purple, with numerous blackish purple small warts on the upper margin and midvein; lip pale reddish brown, the infolded lobes spotted dull purple on a greenish brown ground. Spring. Ambonina. G.C. III. 15: 593; 25: 274.

32. *virens*, Pfitz. (*Cypripedium virens*, Reichb. f. *C. javinicum virens*, Veitch. *P. javinicum virens*, Kerch.). Lvs. up to 6 in. long and 2 in. wide, obscurely tessellated above; scape somewhat exceeding lvs., brown, shortly pilose; fls. 3–4 in. greatest diam.; dorsal sepal ovate, acute, ciliate, the margin reflexed at base, about 1 1/2 in. long, pale green, streaked darker green; petals divaricately spreading, longer than dorsal sepal, ovaried at base with scattered small, black warts, the apex pale purple; lip about as long as sepal, green suffused with rose, the infolded lobes with numerous contiguous small warts. N. Borneo.

33. *javanicum*, Pfitz. (*Cypripedium javanicum*, Reinw.). Lvs. up to 7 in. long and 2 in. wide, distinctly tessellated beneath; scape longer than lvs., pubescent, 1-fl.; fls. 3–4 in. greatest diam.; dorsal sepal nearly orbicular, long-acuminate, ciliolate, margin reflexed below, pale green, streaked darker green; petals horizontal; lip broadly ovate, obtuse, brownish red, the base pale green, the inner surface with brown small warts; lip green, the infolded lobes minutely warty. Java. F.S. 7: 703. Var. majus, Du Buyss. Fls. larger and greener.


36. *cérúsis*, Pfitz. (*Cypripedium Cérúsis*, Reichb. f.). Lvs. up to 8 in. long, tessellated above; scape longer than lvs., 1-fl., pubescent; fls. 3–4 diam., the segments ciliate; dorsal sepal broadly ovate, acuminate; green, white-margined, the numerous green veins purple toward the base; petals ligulate, deflexed, the tips recurved, the margin with black hairs and warts, pale purple, white along the midvein, uniformly purple-green; lip manifest, helmet-shaped, dull brownish purple, the infolded narrow purple lobes with darker warts. May–June. Sumatra. A.F. 6: 557. G. R. 1: 41.

37. *cilíolare*, Pfitz. (*Cypripedium cilíolare*, Reichb. f.). Lvs. obtuse, oblong-elliptic, 6–8 in. long, tessellated; scape longer than lvs., 1-fl., hirsute, black-brown; fls. 4 in. greatest diam.; dorsal sepal broadly ovate, acuminate, ciliate, white, purple at the base, green-veined, and the veins sometimes purple; petals deflexed, recurved, ciliate with long black hairs, green toward base with numerous blackish warts, pale purple at apex; lip manifest, helmet-shaped, dull brownish purple, the pale yellowish infolded lobes with purple spots. April–July. Malaya Archipelago and Philippines. I.H. 31: 530. G.C. III. 21: 348. Var. Miteúúnum, Pfitz. Dorsal sepal nearly triangular, reddish crimson at base and strongly black-nerved, the border white, lightly tinted rose; petals crimson at base, dotted with blackish brown. L. 3: 146. Other varieties are: *Elmiórum, grandiflorum, magníficium, máximum, splendens,* and *splendidum*.


40. *purpurátum*, Pfitz. (*Cypripédiúm purpurátum*, Lindl. *P. purpurátum*, Hance.). Lvs. up to 5 in. long and 1 1/4 in. wide, distinctly tessellated, paler beneath; scape longer than lvs., 1-fl., purple, hirsute; fls. 3–3 1/2 in. greatest diam.; dorsal sepal nearly orbicular, acute, ciliate, the base revolute, white with a greenish central stain, purple-veined, ciliate; petals spreading, undulate, narrowly elliptic, somewhat falcate, ciliate with mixed longer and shorter hairs, purplish crimson, with purple or green veins, numerous small blackish warts at base; lip brownish purple, deeper veined and reticulated, the infolded purple lobes with numerous warts. Autumn. Hong-Kong. B.M. 4901. F.S. 11: 1158. C.O. C. Cypripédiuim 12. Var. Kimbélíánum and Seegéri are known.
Paphiopedilum

Pfts. Dorsal sepal round, lightly acuminate, white, strongly veined with shining green, the border here and there spotted with reddish purple; petals white at base, green-lined, and almost entirely black-spotted; lip reticulated. Other varieties known are: bifórum, gigantum, grandisflorum, Mantini, Morrenianum, multicolor, nigrum, purpuratum, and tigrinum.

40. barbatum, Pfts. (Cypripedium barbatum, Lindl. C. purpuratum, Wight.) Lvs. acute, up to 6 in. long, tessellated: scape longer than lvs., black-purple, pubescent, 1- or rarely 2-fld.; fls. 2½-3 in. greatest diam.; dorsal sepal nearly orbicular, pointed, folded at the mid-vein, white, more or less purple-stained, green at base, veins prominent, deep purple, the central green at base; petals spreading, somewhat deflexed, oblong-linear, ciliate, the upper margin with small blackish warts; the base brownish green, the apex purple; lip helmet-shaped, deep brownish purple, paler below, the infolded lobes deep-spotted. June, July. Malay Peninsula. B. M. 4234. B. R. 27, p. 53 (decem.). F. S. 3:190. B. H. 33:7. V. O. 4:12. Var. bifórum, Pfts. Scape 2-fld. Var. cerúlescens, Pfts. Dorsal sepal white and green in about equal proportions, the nerves dark green and crimson; petals olive-green, whitish rose at the apex with a few black dots; lip maroon. Var. Cróssii, Pfts. (Cypripedum Cróssii, Hort. C. barbatum var. Warnerianum, Warn.). Dorsal sepal large, nearly round, the upper half pure white, the center green, striped deep maroon and tinted rose-purple between the nerves; petals strongly reflexed, rose-violet toward the apex which terminates with a white spot; lip clear maroon. B. H. 15:227. Var. grandisflorum, Pfts. Dorsal sepal very large, the apex pure white, lined and veined with rose-purple at base; petals olive-green above, black-spotted, rose-magenta below toward the apex; lip large, deep purple-maroon. Var. Hendersonii, Pfts. Dorsal sepal has a broad white border, the center shaded with violet, and the base lined with tender green; petals undulate, reflexed, the upper surface olive-green, the lower surface light rose heavily shaded green, the extremity with a white point; lip deep maroon. Var. illístre, Pfts. Dorsal sepal round, acuminate, white, green-lined at base, banded with blackish purple, and broadly purple-bordered; petals brownish green above, rose-salmon, below; lip very large, blackish brown. Var. május, Pfts. Resembles var. grandisflorum, but is more robust and has larger fls. of richer color. Var. nánum, Pfts. Dorsal sepal small, only about 1½ in. long, petals so small that what falcate, about 1½ in. long, with 2-4 warts. Var. nigritum, Pfts. (Cypripedium nigritum, Reichb. f.). Dorsal sepal oblong, acute; petals narrower. Perhaps a natural hybrid. Borneo. Var. nigrum, Pfts. Dorsal sepal very large, oval, strongly lined with deep crimson and shaded violet-purple, the center greenish white, the border brownish white; petals brownish black, lip blackish brown. A.F. 36:1184. G. R. 20:34. Var. O'Brienii, Pfts. Dorsal sepal small, less than 1 in. long; petals falcate, with 6-8 warts. Var. orbum, Pfts. (Cypripedium orbum, Reichb. f.). Fls. paler than in the type. Var. porphyreum, Pfts. Dorsal sepal very broad, round, reticulated, deep violet on a white ground, the border pure white; petals olive-green above, rose-violet below; lip very large, blackish brown. Var. pulcherrimum, Pfts. Perhaps a natural hybrid between P. Hookerae and P. barbatum. Var. superbíum, Pfts. Dorsal sepal orbicular, very flat, striped with very deep crimson and black-veined; petals redish wine-color above, and olive-brown below with a central black band. Var. Wärneri, Pfts. Dorsal sepal very broad, nearly orbicular, white, strongly lined with dark green, stained with red-magenta, with a broad white border; petals shining dark green above; lip deep maroon. Other varieties known are: gigantum, orblído, málacum, pámólum, purpuratum, rubrum, etc.

green veins short. Vari. stenosemum, Pitz. Dorsal sepal much narrower than in type, elliptic. Other varieties known are: auricula, gigantum, grande, Lindenui, marmoratum, nigrum, pictum, Pitcheriilium, purpureascens, roseum, superbum, virens.


many spreading spikelets; wings of rachilla lanceolate, yellow, falling early, with the glumes; stamens 3, the andria joined by a crzted connective: but or fr. ellip.

soild, 3-cornered, gray. Var. antquorum, Clarke (P. antquorum, Willd. P. mossambicen, Pull. Cyprium Pappus, Linn., in part), has spikelets more or less deciduous above the 2 lower or empty glumes, the wings of the rachilla obtuse and tardily falling, the connective not crzted. This variety occurs in Trop. and N. Afr. and in Palestine.

The papyrus is popular about large tanks or aquaria in greenhouses, and is often bedded out about ponds in summer. Far, South it may stand in the open. It is much used in California for adornment of lawns, doing well even with a moderate supply of water. The fluffy heads make attractive house decoration. The papyri of the ancient Egyptians were made of strips taken from the culm or stem, from base to apex, between the cortex and the core, being laid side by side and beaten and pressed together to form a continuous surface. It is no wonder, then, that plant pathology is primarily concerned, and path-

oblong.—Anthericum Liliaago, Linn., has 12-20 lvs.; scape 6-15 in. high; raceme (sometimes panicked) 10-20-fl.; bracts linear; perianth 6-9 lines long; style 5-6 lines long; ovary and caps. globose. Some of the above characters may not hold for cult. plants.

Lillastrum, Bertol. (Anthericum Lillastrum, Linn. Cactesi Lillastrum, Andr.), has 6-8 lvs.; scape 12-24 in. high; raceme 2-10-fl.; bracts lanceolate; perianth 15-21 lines long; style 15-18 lines long; ovary and caps. globose.

Var. majkr, Hort., is much larger and a better form than the type, growing 2-3 ft. high and bearing more and larger lfs. On 6. 12 (as Anthericum Lillastrum var.) has lfs. 2 in. long and 2½ in. across. Var. gigantum, Hort., is probably the same. P. Lillastrum and its varieties are plants of secondary importance in the hardy border; they are of simple cult.; prop. by division, by seeds sown as soon as ripe.

While Miller.
L. H. B.

PARASITE FLOWER: Streelisia Reginae.

PARASITE. A parasitic plant or animal is one that fastens itself upon another living thing, penetrating the tissues of the host or organism attacked, thus usually deriving some (if not all) of its nutrition therefrom. Parasitic plants are numerous, but the larger part of them are to be found among the fungi and the bacteria. These two classes of organisms are the chief causes of plant diseases,—such as rusts, smuts, mildews, and blights. It is with such parasites as these that plant pathology is primarily concerned, and path-

2763. Paramigna monophylla. (X½)

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PARASITE

Ologists estimate that in the United States alone the annual losses to crops from parasitic fungi and bacteria amount to not less than $600,000,000. Parasitic fungi commonly grow within the tissues of the host plant, reaching the surface only when forming certain types of spores, or propagative bodies. Parasites invariably cause some disturbance of the normal development of the tissues. Notwithstanding this fact, it can be said that there are beneficial parasites which, such as the bacteria producing the nodules, or tubercles, on the roots of legumes; and these nodules are important because of the fixation therein of atmospheric nitrogen, which ultimately becomes a source of nitrogen supply for the legume host.

There are also parasites among flowering plants. Of these, two principal classes may be noted: (1) those green in color, or chlorophyll-containing, such as the mistletoes and the bastard toad-flax; and (2) those practically devoid of chlorophyll, such as the dodder and the broomrape. The members of the first class are commonly supposed to be active photosynthetically, that is, they are able to manufacture their own carbon-nutrients from carbon dioxide and water, while members of the second class must receive all or nearly all similar foods through the host plant. Plants living upon dead organic substance are termed saprophytes; they are all gradations between parasites and saprophytes, especially among the fungi. Some are parasitic during their more active vegetative growth, and then continue their development saprophytically. Again, there are many fungi which, while generally parasitic, may be grown in the laboratory upon a variety of culture media, or cooked plant products. Finally, there are those which ordinarily live saprophytically in the soil, but under certain conditions are able to induce disease epidemics.

B. M. DUGGAR

PARATROPIA (Greek, turned away, probably with reference to the twining habit). Araúceae. Twining trees or shrubs similar to Aralia, with compound lvs.: infl. paniculate or racemose. The genus is now included in Schefflera by most authorities. P. Stellatiflora, Barb.-Rodr. The plant intro. into Calif. under this name grows up to 24 ft. high; evergreen; if. palmately 6-foliate; lfts. leathery, oblong, short deltoid acuminate; petioles articulate at the petiole.

PARDANTHUS: Bolanawanda

PARIETARIA (from parietarius, belonging to walls, referring to its habitat). Urticaceae. Annual or perennial herbs widely scattered in the temperate zones, scarce in the tropics. Fls. polygamous, eynose or glomerate at the axile; perianth of the hermaphrodite and male fls. deeply 4-lobed, rarely 3-lobed; lobes valvate; of the female fl. distinctily tubulose at the base, lobes shorter; stamens 4, rarely 3; ovary free within the perianth; stigma penicillate, short or linear: achene included in the persistent perianth. Ten or more species. P. arborescens, Ait., an erect shrub, with lvs. perfectly white underneath, has been offered in trade lists. This belongs in the genus Gesnouinia, differing from Parietaria in bearing small fls. with the involucre subtending 3-fld. glomerate-panicked branches: fls. monocious, the central pistillate, with the achene included in the tube of the involucre. Gesnouinia contains 2 species belonging to the Canary Islands.

PARIUS (the berry of the plant is compared to the apple of discord, while the four leaves surrounding it are likened to Paris and the three envious goddesses, Juno, Minerva, and Venus. Others think the name is derived from par, equal, referring to the moment in number between leaves and floral parts, and this is probably the correct derivation) Liliaceae. Herb-PARIS. LOVE-APPLE. Hardy small herbs.

PARKINSONIA

Differes from Trillium in having its floral parts in 4's instead of 3's. There are about 6 species altogether, and in some of them the floral parts are in higher numbers than four. They resemble trilliums in being small hardly rhizomatous plants, but in the entire range of country, species, and season they are more herdaceous and subshrublike, while the inner ones are much narrower and less showy, being mere strips of petal, or even entirely absent.

quadrifolia, Linn. Herb-PARIS. TRUE-LOVE. FOUR-LEAVED GRASS. Height 9-12 in.: lvs. all cauline, netted-veined (exceptional among monocotyledons); peduncle rising 1-2 in. above lvs.: perianth-segms. yellowish green, the 4 inner ones rather more yellow; berry bluish black. The dominant European type, scattered over Eu. and Siberia from the Arctic Circle to the Medit., in woods and shady places, but usually local. Gn. 31, p. 165.—Fls. in spring or early summer. Rarely the lvs. and floral parts are in 5's.

W. M. MILLER

PARTHUM: Hibiscus eulatus and H. tomentosus.

PARK: Landscape Gardening, page 1801.

PARK (named after Mungo Park, born in 1771). Leguminosae. Tall unarmed trees: lvs. even bipinnate; lfts. very numerous, small: fls. in dense, long-peduncled, obvolute heads; calyx tubular, shortly 5-lobed; corolla tubular, somewhat cleft: stamens 10; ovary stalked: pod large, flat, strap-shaped, coriaceous.—About 10 species, tropics of both hemispheres. P. timoriana, Merr. CUPANG. A very large tree, up to 115 ft. high, with vase-shaped, wide-spreading crown: lvs. feralike, with very small lfts.: lfs. small, white and yellow, in dense pear-shaped panicles; pods pendulous, flattened, black, in long, long, Timor and Philippines. Intro. in U. S. by Dept. of Agric. and offered for distribution.

PARKINSONIÀ (John Parkinson, 1567-1629, London apothecary, author of the delightful "Paradisus Terrestris" and "Theatrum Botanicum"). Leguminosae. Tropical trees or shrubs, with a thin smooth bark and armed with simple or three-forked spines. Leaves alternate or fasciilied, bipinnate, with 1-4 pairs of pinnae; the common petiole short, often obsolete or spineous; stipules minute etc.: lfts. yellow or whish, on slender pedicels in short, loose axillary or terminal racemes; calyx 5-parted, produced at base and jointed upon the pedicel; petals 5, clawed, the upper one within and broader than the rest, somewhat cordate, the claw pubescent and neetarterous on the inner side; stamens 10, free, the upper one gibbous outside; ovary several-ovuled, shortly stipitate; pod compressed, leathery, 2-valved, linear to linear-oblong, more or less twisted, tapering at both ends; seeds compressed, albuminous, with a crusty brown testa.—Five species. The dominant type, both in the wild and in cult., is P. aculeata, the Jerusalem thorn, which is probably a native of Amer., but is naturalized or cult. in all tropical countries. One species is S. African, one is S. American, and the remainder belong to the region between Texas and S. Calif. P. aculeata is a thorny evergreen tree with feathery drooping branches and handsome yellow fls.; it is excellent for gardening in the driest places and can endure some cold. It has been cult. in European conservatories, being usually raised from imported seeds, but it is of difficult cult. P. Torreyana, though generally destitute of lvs., is known in S. Mex. as "poa verde," from the bright green color of the branches. It stands drought even better than P. aculeata. These plants belong to the same tribe with such fine northern trees as Gleditsia.
and Gymnocladus and such southern kinds as Cæsali-
pinia, Poinciana, and Colvillea. They are little known horticulturally.

aculeată, Linn. Jerusalem Thorn. Small glabrous
tree, up to 10 ft. tall, the slender zigzag branches often
prolific: lvs. 8-16 in. long, with spiny petioles ½-1 in.
long; lfts. numerous, very small, distant, linear to
linear-oblongate, ½-4 in. long, inequilateral, on slen-
der petioles; rachis winged, ½-1½ ft. long; racemes
slender, axillary, 3-6 in. long; ls. fragrant, pendulous;
calyx glabrous, tube very short, lobes oblong, reflexed,
exceeding the tube; petals yellow, ½-½ in. long, blades
suborbicular or oval, longer than the claws; stamens
and ovary pubescent: pods narrow, 2-4 in. long, con-
stricted between the seeds; seeds oblong. Probably

AA. Lfts. few; rachis terete.
Torreyana, Wats. Small tree, 18-25 ft. tall, with
light green, smooth bark: young branches and lvs.
sparingly pubescent: lts. 2 or 3 pairs, oblong, obtuse,
narrowed toward the scarcely oblique base, glaucous,
about ½ in. long; racemes terete or with rather long
pedicels, jointed near the middle; petals bright yellow, a prominent gland on
the upper one: pod acute, more or less constricted
between the very thick ventral suture. Valley of the
Colorado, and eastward through W. Texas.—Usually
naked in the S.W. as the lvs. are early deciduous.

P. L. Ricker.
PARMENTIERA (named after Ant. Aug. Parmen-
Shrub or small shrub with spirally placed lvs.
in 3's: lvs. from the old wood on rather long peduncles,
almost regular; calyx spath-like, splitting up one
side; corolla campanulate-tunnelform, little crooked,
limb sub-2-labiate, posterior 2-parted, anterior 3-parted,
lobes all broadly spreading; stamens 4, scarcely
exserted; ovary sessile, 2-loculate, many-seeded;
fr. elongate-cylindrical or oblong: lvs. alternate or
subopposite, 3-folate or some simple, common petiole
often broad. Species 2, from Mex. and Panama, P.
carifera, Seem., from Panama, called "palao de velas," or
candle-tree, up to 10 ft. tall, the slender zigzag branches often
is desirable for hanging-baskets, pots

PARONYCHIA (old Greek name used by Dioscorides,
meaning whitlow-wort, or a cure for whitlow, a disease
of the fingers or toes). Carpophyllææ; by some sep-

A. Petals not clawed.
b. Rudimentary stamens 9-20 at the base of each petal.
c. Scape-lf. more or less clasping.
palustris, Linn. Grass of Parnassus. Rootstock
short and erect: lvs. ovate, usually coriaceous at the base;
sepal-llf. ovate or cordate, at or below the middle of st.: ls. ½-1 in. across; rudimentary stamens 9-15 scales
at the base of each petal. Eu., Asia, N. Amer., south
cc. Scape-lf. not clasping.
californica, Greene (P. palustris var. californica,
Gray). Height 1-2 ft.: lvs. ovate or ovate-oblong,
cuneate at base, 1-2 in. long; sepal-lf. very small, and
borne above the middle: lts. ½ in. across; rudimentary
stamens about 20 at the base of each petal. Calif.

b. Rudimentary stamens usually 3 at the base of each petal.

PARKINSONIA 2475

PARONYCHIA

A. Petals not clawed.
b. Rudimentary stamens usually 3 at the base of each petal.
asarifolia, Vent. Rootstock erect, short and thick:
height 10-16 in.: lvs. orbicular, kidney-shaped to
the base, often 2-3 in. wide; sepal-lf. clasping, borne
about the middle: petals entire. Wet places in high

b. Rudimentary stamens 5-9 at the base of each petal.

fimbriata, König. Rootstock ascending, short:
height 1 ft. or less: lvs. kidney-shaped to cordate-ovate;
sepal-lf. cordate, more or less clasping, at or above
the middle: petals fringed below the middle. Colo. to Calif.
and north in Alberta and to Alaska.

p. nudicaulis. Wall. The largest and coarsest of all the species,
and lacks the delicate beauty and white petals of P. palustris. lvs.
Elliptic-ovate; sepal-lf. borne below the middle: petals shorter than
in the other kinds as compared with calyx-lfts. rudimentary filaments

Wilhelm Miller.
L. H. B.†

PAROCHETUS (Greek, besido, and oceanic, naval). Légumínosæ. A half-hardy perennial trailer, with
foliage like the shamrock, but with each of the 3 lfts.
marked at the base with a handsome brown crescent;
the pea-shaped lts. have a cobalt-blue standard and
purple wings. It is desirable for hanging-baskets, pots
and rockeries, and is said to boom the year round.
Parochoetus is a genus of one species. It is allied to the
clovers, sweet clover, medic, and rest-harrow, and
differs from them in having a more acute keel, a 2-
valved pod, and the lfts. not stalked. It is a native of
Trop. Asia and E. Afr., ascending the Himalayas from
4,000-13,000 ft. If seeds could be secured from the
greatest altitude the plants might be hardy in the N.
This plant was formerly offered by A. Blane, of Phila-
delphia, under the name of shamrock-pea, or blue'
oxalis. It has recently been distributed by the U. S.
Dept. of Agric. in an effort to give this attractive plant
a place in American horticulture.

communis, Hamilt. SHAMROCK-PEA. Blue Oxalis.
Height 2-3 in.: rhizome thread-like, wide-creeping;
petiole 2 in. long; lfts. obovate, emarginate, glabrous
or slightly pubescent: peduncles 1-2-fid.; lts. ½-½ in.
across, axillary; pod straight, glabrous, linear, 2½-4 in.
PARONYCRIA

Paronycria. Annual and perennial little herbs, without showy flowers, adaptable to rock-gardens and borders. Plant tufted, low, with minute clustered flowers and silvery stipules; erect or diffuse, often dichotomously branching: lvs. opposite, broad or narrow, entire, the margins flat or very rarely recurved; stipules small, minute, without petals, axillary or rarely in terminal cymes, usually hidden among the stipules; sepals 5, awned; stamens 5; staminodia 5 (sometimes wanting), bristle-like or reduced to teeth; style 2-lobed: fr. an urticating indurate follicle.—P. argentea is said to be much used for carpet-bedding abroad. P. argentata furnishes the Algerian tea. Allied to Herniaria, which see for generic differences. The species described below are perennials. They are of simple cult.; prop. by seed and division.

a. Lvs. narrow, linear or awl-shaped.

Paronycria, Nutt. (Angydia argyrocoma, Michx.). Erect or ascending perennial, 3-8 in. high, making broad tufts or mats, clothed with silvery appressed scale-like hairs: lvs. linear; stipules silvery white, scori-ous, usually shorter than the lvs.: fls. in forking cymes; bracts large, silvery, membranous; staminodia minute. Rocky places. Maine and N. H. to Ga. and Tenn.—Also called silver chickweed, silverhead, and silver whitlow-wort. The northern form is sometimes not usually found in the home-gardens in this country.

Parsley furnishes the Algerian tea. Allied to Herniaria, which see for generic differences. The species described below are perennials. They are of simple cult.; prop. by seed and division.

2764. Curl-leafed parsley. 3 in. high, with a raceme of many fls., the petals nearly ½ in. long and bright purple: lvs. spatulate or oblanceolate, entire, densely tomentose. N. Calif., north to the Lower Columbia River. L. H. B.† PARSLEY

Parsley, L. H. B.† PARSLEY (Petroselinum hortense, which see). Fig. 2764. A leaf vegetable, used for garnishing and flavoring. While indispensable in the market-garden, parsley is not usually found in the home-gardens in this country.

Parsley is a spreading shrub or small trees with medium-sized orbicular to obovate-oblanceolate leaves, small flowers in dense heads appearing before the leaves, and with fruit similar to those of the witch-hazel. The Persian species is hardly so far north as Massachusetts. Its chief beauty consists in the brilliant autumnal tints of the foliage, which changes to golden yellow, orange, and scarlet and remains a long time on the branches. The early appearing flowers with the purple pendulous stamens, are also attractive. The Himalayan species is more tender and its foliage turns only to pale yellow, but the flowers are somewhat more showy from their rather large white bracts. The parrotias grow in any well-drained soil and like a sheltered position. The wood is very close-grained, hard and strong, and therefore P. persica bears the name, "ironwood." The tough pliable branches of the Himalayan species are extensively used for basket-work and are also twisted into thick ropes used for the construction of twig-bridges over the great rivers of its native country. Propagation is by seeds and layers and also by greenwood cuttings under glass.

Parrotia, C. A. Mey. Shrub or small tree, to 15 ft., with spreading branches: lvs. oval to obovate-oblong, obtuse, narrowly and crenately dentate above the middle, dark green above, pubescent beneath when young, 3-4 in. long: bracts of fl.-heads covered with dark brown tomentum; stamens 5-7, pendulous, with linear-oblong, purplish anthers: fr. with recurved beaks. N. Persia. B.M. 5744.

Parrotia, L. H. B.† PARROT'S BILL: Clinanthus. PARROT'S STEALTH: Myriophyllum. PARTRA (Curt. W. E. Parry, Arctic explorer). Cruciiferae. Four or 5 N. American and a few Asiatic low perennial herbs, with thick caudices, saclike peduncles, narrow lvs. and mostly racemose rose-colored or purplish showy fls.; sepals obovate and erect, the lateral ones gibbose at base; petals broad, clawed: fr.舟 broad and flat, mostly ellipsoid, with heads many-fl.-d., with spreading white bracts sprinkled with a purplish scurf on the back; stamens about 15, erect, with yellow, oval-oblong anthers. Himalayas. B.M. 7501. ALFRED REHDER.
The addition of a bit of parsley foliage, finely-chopped, heightens the flavor of soups, fish, and the like. The principal use of this vegetable, however, is for garnishing meats and fish and other dishes, and for this purpose it seems to be the vegetable *par excellence*, equally desirable in the home as on the hotel table.

The average home-gardener thinks much of quick results. The drawback to parsnip-growing, in his estimation, is the length of time the crop requires for its development. When seed is sown, in early spring, the harvest seems a long way off. To offset this disadvantage, however, parsnips become available as green material when other things fresh from the garden are very scarce or entirely absent, that is, in open spells in winter, and in the very early days of spring. A crop of good straight roots may not be so easily produced as a crop of smooth carrots, but when once grown it does not burden one with much responsibility in regard to storage or keeping, which is an important point in its favor. The roots may be left in the ground where they grew or stored in the cellar,冬季 there is no frost. Seed is easily grown. Plant the roots in spring in any good soil, and gather the seed-heads in summer when most of the seeds in them are mature. Dry them on sheets, and then thresh or strip.

The varieties of parsnip are few in number. For shallow, stony or otherwise unfavorable soils the best varieties are the Round or Early Short Round; for better soils the Half-Long, Student, or Hollow Crown; and for deep clean soils the Long Smooth. T. GREINER.

**PARSONSIA** (after John Parsons, a Scotch naturalist). *Apocynaceae.* Twining shrubs with opposite lvs.: calyx 5-parted, glandular or naked, or with 5 scales; corolla 5-lobed, glandular or naked, or with scales, tube short; lobes overlapping to the right; stamens inserted in the tube; filaments often twisted, anthers connivent over and adhering to the stigma, cells spurred and empty below; disk of 5 lobes or scales; ovary 2-celled, cells spurred and empty below; ovary 2-celled, cells many-ovuled.—About 20 species in Trop. Asia, Austral, and New Zeal. The genus as here defined is that of Robert Brown; some recent authors have revived the older genus of the same name of Patrick Browne, making it supplant the usual species of Cuphea (p. 913). *P. Padissimii,* R. T. Baker, is reported as under cult. It is a woody climber with glabrous sts., attaining a height of about 15 ft., and with stalked ovate-lanceolate lvs. This species produces tubers the size of beet-root, which are used as food by colonists as well as natives of New S. Wales. R. H. 1901:322 (note).

**PARTHÉNIUM** (ancient name transferred to this plant). *Compositae.* About a dozen perennial or annual, mostly canescent or pubescent, rather coarse herbs or shrubs of the western hemisphere, only rarely taken to gardens and apparently not domesticated. The heads are only inconspicuously rayed and not specially showy, the ray-florlets about 5. *P. integrifolium,* Linn., the American Feverfew, or Prairie Dock, has been noted as a.A ornamental hardy herbaceous perennial, but the plant is desirable only for foliage effects; and the lfls. are not attractive. It is pictured in B.B. 3:411 and described in American manuals; it grows on dry soils from Minn. to Ga.; stout, to 4 ft., from a robust rootstock; lvs. ovate or ovate-oblong; heads many in a dense corymbose, the rays whitish. The so-called "guayule rubber" of Mex., *P. argentatum,* Gray, the difficulty of growing which has caused much discussion, is reported as being under cult. in Mexico City by M. Calvino. It is unknown in horticulture.

**PARTHENOCLISSUS** (Greek, parthenos, virgin, and kisseros, ivy; translation of its French name). Syn. *Quisitaria, Prisera.* Woody vines planted chiefly for their handsome foliage.
Deciduous or rarely evergreen shrubs climbing by means of tendrils with adhesive tips, rarely these tips not developed: bark with lenticels; pith white; lvs. alternate, digitate or 3-lobed, long-petioled: fls. in peduncled compound cymes opposite to the lvs., often crowded at the end of the branches and forming panicles, perfect, rarely polygamous, calyx minutely, petals 5, rarely 4, spreading; stamens 3 or 4; style short and thick; a distinct disk wanting; ovary 2-celled, each cell with 2 ovules: fr. a 1-4-seeded berry.—About 10 species in N. Amer., Mex., E. Asia, and Himalayas. Formerly usually classed with Ampelopsis, which see for the differentiating characters between the allied genera.

These are high-climbing vines with handsome three- to seven-foliolate or three-lobed leaves assuming beautiful tints in autumn and with small greenish flowers in cymes or panicles followed by bluish black or black berries. They are particularly valuable as they cling firmly to walls and trees by means of adhesive tips of the tendrils without any other support. P. quinquefolia, P. viaceae, and P. tricuspidata are hardy North, while the other species are more or less tender; P. henryana may be grown in the greenhouse for its beautiful foliage. In humid and good soil all species grow vigorously and soon climb into trees and form a dense, close covering like P. radicans. When grown in the full sun the lvs. lose finally the white markings and the purple coloring of the lvs. is more beautiful when grown in the greenhouse or outdoors in a partly shaded place; in full sun the lvs. lose finally the white markings and the purple color.

A. Lvs. 5-foliolate.

b. Young branchlets terete; lvs. green.

viaceae, Hitch. (P. quinquefolia, Graebn. Ampelopsis quinquefolia var. viaceae, Knerr. A. dumetorum, Hort. P. dumetorum, Rehd. P. laciniata, Small.) Usually low and rambling over bushes, occasionally climbing high into trees, glabrous or pubescent with 3-5 twining branches only exceptionally ending in adhesive: disks; the young growth green: lfts. oval or elliptic to oblong, acuminate, usually cuneate at the base, dark green and lustrous above, lighter green and usually lustrous below, coarsely serrate with usually 2 or 3 seeds. June, July, Aug.; fr. in Sept., Oct. New England to Fla. and Mex., west to Ohio, Ill., and Mo. Em. 2:535. S.T.S. 1:88. Var. murorum, Rehd. (P. quinquefolia var. latifolia, Rehd. P. radicans, Hort. Ampelopsis muralis, Hort. A. radicans, Schelle.) Tendrils with shorter and more numerous, usually 8-12 branches: lfts. generally broader, the outer ones usually broadly ovate and rounded at the base. This is a more southern form and somewhat tender. Var. minor, Rehd., is similar to the preceding variety, but lfts. smaller and broader, ovate to orbicular-ovate, rounded at the base, on slender stalks about ½ in. long. Var. hirsuta, Planch. (P. hirsuta, Small. Ampelopsis hirsuta, Don. A. Graebneri, Bolle pubescens, Schelle.) A. quinquefolia var. radicans, Hort. A. radicans, Hort.). Young branchlets and lvs. soft-pubescent, at least beneath, usually bright red while young, otherwise like the type. Ct. 48:1452. Var. Saint-Paulii, Rehd. (P. Saint-Paulii, Graebn. Ampelopsis Saint-Paulii, Hort.). Young branchlets and lvs. beneath pubescent: lfts. oblong-ovate, cuneate at the base, short-stalked or nearly sessile, sharply serrate with usually spreading teeth: panicles elongated: tendrils with 3-12 branches: aerial rootlets often present. Iowa and Ill. to Mo. and Texas. R.H. 1907, p. 567. Var. Engelmannii, Rehd. (P. Engelmannii, Graebn. Ampelopsis Engelmannii, Hort.), does not differ much from the typical form except in its generally smaller foliage.—The species is a very valuable climber of vigorous growth with the foliage changing to bright scarlet in fall; the varieties hirsuta, Saint-Paulii, and murorum, are particularly adapted for covering walls; they cling firmly and form a dense, close covering like P. tricuspidata, but grow more quickly and more straight upward than that species.

bb. Young branchlets quadrangular; lvs. usually with white markings above and purplish below.

henryana, Diels & Gilg (Vitis henryana, Hemsl. Ampelopsis henryana, Hort.). Climbing to 20 ft. or more: tendrils with 5-7 slender branches with adhesive tips: lfts. 5, stalked, elliptic-ovate to cuneate-ovobate, acuminate, toothed usually only above the middle, glabrous or hairy on the midrib beneath, 1½-2½ in. long, bright scarlet when unfolding, changing finally to dull reddish green, with silvery markings along the veins above, purple or purplish beneath: fls. in narrow panicles, 3-6 in. long; fr. dark blue, usually 3-seeded. Cent. China. G.C. III. 37:309; 38:334. Gm. 69, p. 341. M.D.G. 1908:239. R.H. 1907, p. 211. R.H.B. 22:213.—This is a very handsome but tender species; the coloring of the lvs. is more beautiful when grown in the greenhouse or outdoors in a partly shaded place; in the full sun the lvs. lose finally the white markings and the purple color.

aa. Lvs. partly 3-lobed and partly 3-foliolate.

shining and glabrous on both sides; puberulous on the veins beneath; cymes mostly 2-flowered; short slender axillary or terminal, narrow and somewhat elongated: fr. bluish black, bloomy. June, July; fr. in Sept. Oct.

A. G. 15:194. B.H. 27:244. R.H. 1877, p. 176. Gm. 1:373; 4:253. R.B. 1877:11. Var. Veitchii, Rehd. (P. Veitchii, Graebn. Vitis Veitchii, Hort. Ampelopsis Veitchii, Hort.). Lvs. smaller, crenately serrate, purplish while young; frs. with only 1-3 coarse teeth on each side, the lateral ones inside without teeth. Apparently only a juvenile form which may pass later into the type. Var. purpurea, Hort. (Ampelopsis Veitchii var. purpurea or atrupurpurea, Hort.). Lvs. dark purple, not changing to green. Var. Lowii, Rehd. (Ampelopsis Lowii, Hort. Vitis Lowii var. Lowii, Hort.). Lvs. small, 3½-4 in. long, mostly entire or 3-foliolate, often broader than long, incisedly dentate or almost palmately lobed with very unequal teeth, apple-green, purplish when older, red and smoke well, and turns to a brilliant orange and scarlet in fall. Probably the favorite of all hardy vines in cities. The varieties Veitchii and Lowii are much smaller and slenderer and are very effective as basket plants (M.D.G. 1892:9).

P. heptaphylla, Small (P. texana, Rehd. A. quinquefolia var. heptaphylla, Bailey. A. heptaphylla, Buekii.). High-climbing; tendrils with 2-4 branches without disks; lvs. usually 7, oblong-obovate, cuneate at the base, crenately serrate, 1½-2½ in. long; cymes dichotomous, opposite; T. 5-7 (150).—P. Himalayana, Planch. (Ampelopsis Himalayana, Royle). Allied to P. tricuspidata; lvs. 3-ovate to oblong, palmate nerve-like at the base, crenately serrate, 2-5 in. long; cymes about as long as the lvs. Himalayan. Var. rubrifolia, Gagnep. (Vitis rubrifolia, Léveillé & Vaniot). Lvs. smaller and broader, purplish while young; cymes smaller. W. China.—P. Veitchii, Hort. Lvs. smaller, crenately serrate, bright yellowish green on both sides, 2-4 in. long, cymes about as long as the lvs. Himalayan. Var. rubrifolia, Gagnep. (Vitis rubrifolia, Léveillé & Vaniot). Lvs. smaller and broader, purplish while young; cymes smaller. W. China.—P. Veitchii, Hort. Lvs. smaller, crenately serrate, bright yellowish green on both sides, 2-4 in. long, crenately serrate toward the apex or entire, glabrous at length, 1½-2½ in. long; fr. in short spikes; cup ovate, inclosing the acorn. S. Ore. to Calif. S. I. F. 1:3.1. ALFRED REHDER.

P. Paspalum (Greek, paspalos, an ancient name for millet). Gramineae. Spikelets 1-flowered, plano-convex, mostly rounded, subsessile and overlapping in 2 rows on one side of a narrow or winged axis forming slender racemes. About 100 species in the warmer parts of both hemispheres, but more abundant in Amer. forming an important part of the pampas and campos of S. Amer. P. dilatatum, Poir., of Argentina, a coarse species 3-5 ft. high, is sparingly cult. as a forage grass in the Gulf states and has become naturalized throughout the S. P. compressum, Nees, Carpet-Grass, a native, 6 in. to 2 ft. high, with creeping sts. and rather broad lvs. makes a good lawn grass in the Gulf region; it is less difficult to eradicate than Bermuda-grass. P. dilatatum, Linn. Etc. (Greek,上学, the home of the swan). Paspalum vaginatum, Tickn. The ovary is a slender, rather large, somewhat cylindrical, base by the shallow cup coated with linearly spreading scales. S. Ore. to Calif. S. I. F. 1:3.1. ALFRED REHDER.
PASSERINA (Latin, sparrow, from the supposed resemblance of the seed to the head of a sparrow; or possibly after one of the Passerina, two Italian botanists). Thymelaeaceae. Heath-like shrubs sparsely used in horticulture: lvs. small, decussately opposite: fls. hermaphrodite, in axillary, branched spikes; perianth-tube ovate, with 4 spreading lobes often about as long as the tube; stamens 8; ovary subsemis, glabrous, 1-celled.—About 5 species from S. Afr. P. filiformis, Linn. Branches puberulent: lvs. acroce-linear, 3-corrneced, rather acute: spikes terminal, many-fl.; fls. rose; calyx-lobes oval or oblong. S. Afr.

PASSIFLORA (L. passion flower). Including Disemma and Tacsonia. Passifloraceae. Passion-Flower. Highly interesting herbs, shrubs, or trees, most of the cultivated kinds climbing by means of tendrils, with flowers of odd structure; some of them produce edible fruits.

Mostly vines, but some species erect: lvs. alternate, rarely opposite, the pedicel usually gland-bearing, the blade entire,digitately lobed or parted, stipules sometimes present: tendrils (sometimes wanting) lateral, simple: fls. solitary or racemose, mostly axillary, on articulated and often 3-bracted peduncles, mostly hermaphrodite, with colors in yellow, green, blue and red, often large and showy; calyx: with short tube (also with long tube when Tacsonia is included), the lobes or petals 4 or 5 and narrow, often colored inside, bearing on the throat a simple double or triple showy fringe or crown; petals 4 or 5 (sometimes wanting, or 3), attached on the calyx-throat; stamens 4 or 5, the filaments joined into a tube in which is the gynophore or stalk of the ovary, the anthers linear-oblong and versatile; the style including the ovary oblong or nearly globular, with 3 styles and 3 many-ovuled parietal placenta: fr. large or small, berry-like, many-seeded, oblong or globular; seeds flat, mostly ovate, with a fleshy aril.—Species probably 250-300. By some, the genus Tacsonia is separated from Passiflora, but it is here combined; it differs in having an elongated rather than very short calyx-tube or hypanthium; An­chian species. See Tacsonia.

With the exception of a few Malayans, Chinese and Australian species, the true passifloras are natives of tropical America, some of them in the sub-tropical and warm temperate parts. Many of them are cultivated as curiosities, and some of them for the beauty of their flowers and for their festooning foliage. The fruit is of many kinds, in most cases not edible. The ovary is supported on a long stalk and is either free or united with the tube formed by the fusion of the bases of the filaments. The structure of the fruit is well shown in Fig. 2768; the remains of the floral envelopes have broken from the attachment on the torus and are now detached. A dozen passifloras occur in the United States, and one of them, P. vitifolia, grows naturally as far north as southern Pennsylvania and Illinois. From Virginia south, the Maypop, P. incarnata, is a very common plant in fields and waste places. Both these species are herbaceous perennials.

In cultivation, the passifloras have been considerably hybridized, and they are also confused with Tacsonia. In 1871 Masters enumerated 184 species (Trans. Linn. Soc. 27), but many species have been discovered since that time. Most of the passion-flowers are yellow or green in color of envelopes, but there are fine reds in P. racemosa, P. Raddeana, P. caerulea, P. alata, P. vitifolia, and others. The species known to gardeners are few, although many kinds are or have been in cultivation by fanciers and in collections. They usually require much racket room in greenhouses. According to G. W. Oliver, P. carnea and Constance Elliott are both hardy at Washington. Not many of the tender species and hybrids are grown to any great extent in this country. P. alata and P. quadrangularis are desirable climbers for a roosy warm greenhouse. P. quadrangularis var. marantea seems to flower quite as freely as the green-leaved one. Passifloras are propagated from cuttings of the half-ripened growth, with bottom heat. P. racemosa and P. Loudonii are a little difficult to root from cuttings; the growths would be as ripe as possible for this purpose. Keep the under surface of the leaves flat on the sand while rooting. The native P. incarnata grows very freely at Washington, becoming more or less of a weed and hard to eradicate.

The peculiar charms of these plants lies in the odd flowers, the parts of which were fancied by the early Spanish and Italian travelers to represent the implements of the crucifixion (whence both the technical and popular names). Legend and superstition have attached to these plants from the first. The ten colored parts of the floral envelope were thought to represent the ten apostles present at the crucifixion, Peter and Judas being absent. Inside the corolla is a showy crown or corona of colored filaments or fringes, taken to repre­sent the crown of thorns, or by some thought to be emblematic of the halo. The stamens are five, to some suggestive of the five wounds, by others thought to be emblematic of the hammers which were used to drive the three nails, the latter being represented by the three styles with capitulate stigmas. The long axillary coiling tendrils represent the cords or the scourges. The digitate leaves suggest the hands of the persecutors. The following sketch of the passion-flower legend is from Folkard's "Plant Lore, Legends and Lyrics," and the illustration (Fig. 2769) is also produced from that book:

The passion-flower (Passiflora caerulea) is a wild flower of the South American forests, and it is said that the Spaniards, when they first saw the lovely bloom of this plant, as it hung in rich festoons from the branches of the forest trees, regarded the magnificent blossom as a token that the Indians should be converted to Chris­tianity, as they saw in its several parts the emblems of the passion of our Lord. In the year 1610, Jacomo Bosio, the author of an exhaustive treatise on the Cross of Calvary, was busily engaged on this work when there arrived in Rome an Augustinian friar, named Emmanuel de Villagas, a Mexican by birth. He brought with him, and showed to Bosio, the drawing of a flower so "stupendously marvelous," that he hesitated making any mention of it in his book. However, drawings and descriptions were sent to him by inhabitants of New Spain, and certain Mexican Jesuits, sojourning at Rome, confirmed all the astonishing reports of this floral marvel; moreover, some Dominicans at Bologna engraved and published a drawing of it, accompanied by poems and descriptive essays. Bosio therefore conceived it to be his duty to present the Flos Passionis to the world as the most wondrous example of the Cross triply enfolded with its thorns or field. The flower represents all, he tells us, not so directly the Cross of our Lord, as the past mysteries of the Passion. It is a native of the Indies, of Peru, and of New Spain, where the Spaniards call it 'the Flower of the Five Wounds,' and it had dearly been given by the great Creator that it might, in due time, assist in
Passifloras as gardener’s ornamental plants.

(J. J. M. Farrell.)

These plants constitute a large family or group of evergreen climbers. They will show to best advantage when they can be planted out permanently in a warm conservatory and where they can have comparatively large space to climb. They may also be grown in pots when the conditions do not permit other methods of handling.

Passifloras may be propagated either by cuttings or seeds. They may be rooted from young growth taken any time from the middle of January until April. These cuttings are placed in a warm propagating-bed, and kept shaded and moist, and in a short time they will root; they are also inserted in small pots in a mixture of loam, peat, and sand, in equal parts, and plunged in the propagating-bed. When rooted, the cuttings are potted off, using a compost of four parts leaf-mold two parts, well-rotted cow-manure one part, and which should contain enough sand to keep it porous. Keep shaded until they become well established, when they may be given a place well up to the glass in full sun. The passifloras are also readily raised from seed sown in spring, and the plants potted off as soon as big enough.

The plants will stand a night temperature of 65° to 70°; this can be increased until it reaches 80° to 85° for a day temperature with sun. Give ventilation daily, taking into account the state of the weather; while they like plenty of heat, they will not do well in a stagnant atmosphere; therefore, give air on all favorable occasions. Every morning in bright weather, give them a good syringing, as this is a great aid in keeping them in vigor and supplying the desired atmospheric moisture, but this does not mean a very humid atmosphere. By pinching, the plants are made to produce several growths. These plants can be shifted until they are in 10- or 12-inch pots. The growth may be trained on pillars or along rafters of the conservatory.

When planted out in about 8 or 10 inches of soil, passifloras will cover a very large space, but sometimes to such an extent as to obscure the whole glass. The best place is on a back wall in some house where they may ramble at will. Keep well syringed until they show flower, when syringing should be discontinued until they are through blooming. After the plants have covered the position allotted to them, all that is required is the regulation of the young growth, so as to keep them from becoming entangled. In winter they may be cut back and the exhausted soil replaced by good rich compost. They will not need a high temperature, doing well in 55° to 60° at night. When they start off into growth again, keep raising the temperature until it has reached the figures already stated. They may now be given manure water regularly and throughout the growing season. Keep down thrip, red-spider, and mealy-bug by syringing and sponging.

The edible-fruited passifloras. (F. W. Popenoe.)

The principal species of Passiflora that are cultivated for their fruits in tropical and subtropical regions are P. quadrangularis, the granadilla, granadilla real of Costa Rica, barbadine of the French colonies, pasionaria of Cuba, maneejá melão of Brazil; P. edulis, also called granadilla, as well as passion-fruit; and P. laurifolia, the water-lemon of the British West Indies, pompom-lime of the French colonies. While P. quadrangularis is a common garden plant in tropical America, it is not so extensively grown in any region as is P. edulis in Australia. In the United States these species can be grown only in the warmest regions; in California P. edulis is the only one that is successfully cultivated in the open, the other two species being much more susceptible to frost; in south Florida all three can be grown, although the tropical species are sometimes injured by frost.
The true granadilla (Passiflora quadrangularis) is a strong rapid-growing climber, frequently planted for ornament in tropical regions and allowed to cover arbors and pergolas. Its brownish yellow oval fruits are sometimes 8 inches in length, and within the thin brittle pericarp is a large number of small flattened seeds surrounded by gelatinous pulp and subacid juice. When green, they are sometimes boiled and used as a vegetable; when ripe, the acidulous pulp is very refreshing, and is used to prepare cooling drinks, or is eaten with a spoon directly from the fruit.

The passion-fruit (P. edulis) is considerably smaller than the granadilla, rarely larger than a hen’s egg, and dull purple when ripe. Its pulp is slightly more acid than that of the granadilla, but of very pleasant flavor, and highly esteemed in Queensland and New South Wales, where the plant is cultivated commercially. It is used for flavoring sherbets, for confectionery, for iced cakes, for “trifles”—a dish composed of sponge cake, fruits, cream, and white of egg—for jams, and for other table purposes. The pulp is also eaten directly from the fruit, after adding a little sugar, or is used to prepare a refreshing drink, by heating it up in a glass of ice-water and adding a pinch of bicarbonate of soda. The plants are grown on trellises about 6 feet high; at the top of the trellis is nailed a crosspiece 18 inches long, from the ends of which are run two wires, the long branches being allowed to hang down over these to the ground. The rows are placed 15 feet apart, with the vines 15 feet apart in the row. The young plants must be protected in regions subject to frost; they begin bearing the second year, sometimes producing a few fruits the first season, and continue in profitable production four to six years, when they must be renewed. By proper pruning, two crops a year can be secured, in the same manner as grapes. The young shoots are cut from fairly well-matured shoots, and should be placed in flats of light soil. They do not germinate very quickly, but the young plants are easily raised, and may be set out in the open ground when six months to a year old. Cuttings should be taken from fairly well-matured shoots, and should be about 6 inches in length. They are easily rooted in sand, no bottom heat being required. Cuttings of P. edulis will often fruit in pots at the age of one to two years, and form very interesting greenhouse plants. While this species usually fruits prolifically, P. quadrangularis sometimes requires hand-pollination when grown outside its native habitat.

2770. Granadilla—Passiflora quadrangularis. (X ¼–½)
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reddish purple band along each of the 3 midribs; fls. yellowish, fragrant, small. Brazil. L.H. 13:544.
G.Z. 12:96.—Interesting for its ornamental foliage.

cc. Lvs. broader than long.

5. ibetes, Linn. Wild Yellow Passion-Flower. Hawaiian. Fruits about 10 ft. tall or long, glabrous or very nearly so: lvs. broader than long, shallowly and bluntly 3-lobed; corollae, ovate at base, the petiole glandular; fls. solitary or in pairs, about ½ in. across, greenish yellow; fr. a globular berry about ½ in. diam., smooth, purple at maturity. Fruits. south and west, in thickets and more or less damp places. B.R. 79.—It has been offered by dealers in native plants.

6. maculifolia, Mast. Notable for its spotted or variegated foliage: branches slender and wiry, puberulous; lvs. short-stalked, roundish corollae, 3-nerved, with 3 shallow lobes at the truncate apex, green and yellow-blotched above, purplish and glandular beneath: fls. in pairs, cream-colored, nearly 1 in. across, the peduncles with 3 remote minute bracts; calyx cup-shaped, with acuminate recurved lobes; petals shorter than calyx-lobes or sepals; crown plicated and with hatched-shaped processes. Venezuela. G.C. III. 32:suppl. Nov. 8.

AA. Corona not crinkled or folded on the edge, plain or nearly so.

b. Bracts grown together.

7. ligularis, Juss. (P. Loewii, Heer). Woody below, tall, branchy: lvs. large, cordate, ovate-cordate, acuminate, neither lobed nor toothed; fls. solitary, the petals and sepals greenish, the corolla white, with zones of red-purple: fr. as grown in S. Calif. described as oval, larger and more oblong than that of P. edulis, with a hard shell and buff-brown in color. Trop. Amer. B.M. 2967.—Young foliage has metallic hues.

bb. Bracts free.

c. Tube of fl. evident and cylindrical, swollen at the base.


9. Raddianna, DC. (P. kermesina, Link & Otto). Rather slender climber, glabrous: lvs. shallow-cordate, 3-lobed and sparingly dentate, purplish beneath; fls. solitary, with very narrow distinct sepals and petals of a bright crimson-red, which are wide-spreading at first but finally turning almost straight back; crown black-purple, upright, with smaller whitish filaments inside. Summer and fall. Brazil. B.M. 3503. B.R. 1635. G. 1:453. F.W. 1874; 161.—An old and well-known species; said to prop. from cuttings of old well-formed wood. P. Lodonii, Hort., is considered to be a hybrid of this and P. racemosa. Summer and fall.

10. Watsonianna, Mast. Sts. wiry, purplish, with leathery dentate stipules; lvs. shallow-cordate, rather broader than long, 3-lobed to the middle, with a few teeth: peduncles 1-fl.; fls. about 3 in. across, the sepals linear and shaded with violet; petals also very narrow, liliaceous; crown of many rows of filaments, violet with bars white below the middle, the inner and shorter set cordate at base, mucronate, entire, the petiole with 2 or 3 pairs of glands: stipules large: fl. large (3–5 in. across) and interesting, fragrant, with ovate sepals and petals (the former within and the latter reddish), the crown composed of 5 series of white-and-purple parti-colored filaments, of which the outermost exceed the floral envelopes: fr. oblong, 5–9 in. long, yellowish green, pulpy and edible. Trop. Amer. B.R. 14. R.H. 1898, p. 599. Gn. 51, p. 313; 59, pp. 1, 7. G. 33:161.—Widely grown in the tropics, and variable, both as a vine and for its edible frs. Frequent in collections of economic plants in the N. It is a good climber for covering a greenhouse roof. Best results are secured if the temperature does not fall below 50°. The fr. ripens in summer. The fls. usually need to be hand-pollinated if fr. is wanted on house-grown plants. Var. variegata, Hort. (P. variegata, Hort. P. aucubifolia, Hort.), has foliage blotched with yellow.

11. aata, Dry. St. winged: lvs. glabrous, oval to ovate, somewhat coriaceous at base, the margin often undulate but otherwise entire, the petiole with 2 pairs of glands: fl. 3–4 in. across, very fragrant, the interior of the sepals and petals carmine; corona nearly or quite as long as the envelopes, the numerous filaments parti-colored with red, purple, and white: fr. yellow, ovoid-rounded, about 5 in. long, very fragrant and one of the most edible, S. Amer. B.M. 66. G.C. III. 15:19; 22:449–51; 43:187. R.B. 20, p. 104 (see R.H. 1902, pp. 287–9, for taxonomic discussion).—An excellent old species, ripening its fr. in midsummer. It is a variable species, and is perhaps one of a polymorphic group including the granadilla. P. pharnicea, Tod. P. plambea, Desf., P. affinis, Roem., P. latifolia, DC., P. mauritiana, Thouars, and P. mascarenica, Presl., are all considered to be forms of this species. P. Lawsonianna, Hort., not Mast., is a hybrid of P. aata and P. racemosa: lvs. oblong-obovate, somewhat peltate, entire: fls. 3–4 in. across, brownish inside, the corona with filaments in several series.

12. Decaisneana, Hort., is perhaps a hybrid of P. quadrangularis and P. oliae: fls. bright carmine inside, about 4 in. across; corona as long as or longer than the
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envelopes, the more or less tortuous filaments banded with deep blue and white: lvs. bearing about 6 glands. R.H. 1855:281; 1902:288 (as P. Decaisneana and P. quadrangularis var. Decaisneana, where a botanical and historical discussion by André may be found). F.S. 8:848.

dd. Sts. and branches terete, or at least not winged.


vv. Blossoms white, greenish, purplish, or variously tinted, but not red.

g. Rays of corona (or the outer ones) about as long as the floral envelopes: If.-margins strongly serrate (except sometimes in No. 20).

18. incarnata, Linn. WILD PASSION-FLOWER. MAY-POP. Fig. 2768. Tall-climbing strong perennial vine, glabrous or nearly so, becoming 20-30 ft. long; lvs. 3-lobed to about half their depth, glabrous: lvs. oval to oval-oblong, thickish, entire, with a short sharp point; petiole with 2 glands at apex: fl. about 2½ in. across, white, with red spots or blotches; corona or white filaments in 3 series, violet with white bands: fr. globose-oblong, thickly purple-dotted when ripe, the rind hard. Brazil. B.M. 1899. R.H. 1857, p. 224; 1883, p. 489. G. 50:414; 62, p. 299. G.C. III. 23:101. A.G. 13:120.—Runs into several forms. The fr. is fragrant and edible, but there is little pulp, and the seeds occupying most of the interior. Readily grown from seeds. Naturalized in tropical countries.

20. prunifolia, Mast. Climbing, the sts. terete, glabrous: lvs. broad in outline, 3-lobed beyond the middle, the lateral lobes diverging, the margins remotely glandular-toothed, glaucous beneath: stipules very large and almost like, cordate, 2 in. long; fls. 3 in. across, pale or pearly violet, the corona of numerous filaments, the outermost of which are nearly as long as the petals and are deep violet at the base, yellowish in the middle and curly at the top. British Guiana. G.C. III. 22:303 (desc.).—First described in 1897.

gg. Rays distinctly shorter than envelopes: If.-margins nearly or quite entire.


22. adenhophylla, Mast. By some thought to be probably identical with P. alba: lvs. glabrous, cordate at base, 3-lobed nearly to middle, glandular in the sinus, the lobes oblong and apex but perfoliate with sessile glands: fls. white, the peduncle equaling or exceeding the petiole; sepals bearing a subulate appendage near apex on the back; petals shorter than sepals and narrower. Mex.

23. violacea, Vell. Tall, glabrous, with drooping branches: lvs. straight at base and somewhat peltate, with 3 long, narrow lobes, of which the side ones stand at nearly right angles to the central one, the margins
entire or with a few teeth in the bottom of the sinus, the under surface slightly glaucous; fl. about 3 in. across, the petals and sepals lilac-pink inside (sepals ending in a long spur), the numerous filaments of the corona are sometimes again lobed: fl. 3-4 in. across, slightly fragrant, greenish white, the sepals tipped with a short point, the rays of the corona in 2 series, blue at the tip, white in the middle and purple at the base, the styles light purple. Brazil. B.M. 28. Gn. 31: 421; 34, p. 114; 46, p. 369. G. 3: 611. J.H. III. 47: 57.—The commonest of passion-flowers in American greenhouses, and now represented by several named forms and hybrids. It can be grown in the open in the S. and in Calif. as far north as San Francisco. Var. grandiflora, Hort, is only a somewhat larger-fl.d. form. Constance Elliott (P. coccinea var. alba), is a white-fl. fragrant form. G.C. III. 43: 186. Gn. 31: 420. There are hybrids with P. Radcliana, P. racemosa, P. alata, and others. P. coccinea grows readily from seeds.

II. TACSONIA, the hypanthium or calyx-tube long (\(\frac{\text{length}}{\text{diameter}}\) long and usually much more).

a. Fls. orange or rosy orange.

25. Párrite, Bailey (Tacsonia Párrite, Mast.). Lvs. deeply 3-lobed, glabrous above, pilose beneath, lobes narrow and entire; stipules entire, subulate-acuminate:

fl. with a long and slender tube, glabrous, swollen at the base; sepals winged and with points, rose-orange; petals oblong and flat, shorter than the sepals, orange; corona double, the outer row of tooth-like projections. Colombia. G.C. II. 17: 225. I.H. 35: 41.—Named for Senor Parra (“better known as Parrita”), through whom it was intro.

AA. Fls. scarlet or rose-colored.

b. Bracts beneath the fl. not united.

c. Lvs. simple or not lobed.

26. insignis, Hook. (Tacsonia insignis, Mast.). Pilose: lvs. ovate-lanceolate, subcordate, dentate, rugose or blistered above and red-downy beneath, the stipules dissected: fl. about 6 in. across, violet, rose or crimson; tube cylindrical, swollen at the base, downy; sepals about twice longer than the tube, lance-oblong, spurred at the end; petals similar in shape, obtuse; corona of one series of short threads, blue and white. Probably Peruvian. G.C. 1873: 1118. F.S. 20: 2083, 2084. B.M. 6069.

d. Foliage glabrous at maturity.

27. Van Volxemii, Triana & Planch. (Tacsonia Van Volxemii, Hook.). Fig. 2773. Sts. slender and slightly pubescent: lvs. cordate-ovate in outline, deeply 3-lobed, the lobes long-lanceolate-acuminate, serrate: fls. 5-7 in. across, bright red with short green calyx-tube that has a swollen base, the acute calyx-lobes green externally; corona an inconspicuous toothed rim. Colombia. B.M. 5571. G.C. 1866: 171. G.Z. 9: 144.—Less showy than some others, but a well-known species.

28. Jämesoni, Bailey (Tacsonia Jämesoni, Mast.). Lvs. suborbicular, 3-lobed, glabrous: fl. large, bright rose or coral-red, with a cylindrical tube 4 in. long; fr. said to be green at maturity, oval. Peru.

dd. Foliage downy beneath at maturity.

29. exoniensis, Hort. (hybrid of P. Van Volxemii and P. mollissima). Fig. 2774. Lvs. downy, cordate, ovate-oblong, divided nearly to base into 3 lanceolate, serrate segms.: fls. 4½-5 in. across; sepals brick-red outside, brilliant rose-pink within; throat violet; tube white inside, 2½ in. long. Resembles P. Van Volxemii in having peduncles as long as lvs., linear stipules, free downy bracts, filamentous corona near base of tube


\textit{P. alata-carrilo} (P. Pfordri, Hort.) is a hybrid from seed of \textit{P. alata} by pollen of \textit{P. carrilo}. Lvs. much like those of \textit{P. alata}, 3-lobed: fls. fragrant, beautiful; sepals white; petals pink; corona of 3 series, the outer filaments being white at tip, blue-purple in the middle, the sepals at the base. R.H. 1897. Brazil. \textit{P. alba-algra}, Hort. Said to be a hybrid of \textit{P. alata} and \textit{P. Raddiana}: lvs. 3-4 in. across, rose-pink, the oblong sepals not equaling the green scarcely saccate tube; corona a short multiple rim or disk. Andes. It is reported that the \textit{P. mollissima} that has been grown in Calif. is a hybrid of \textit{P. mollissima}.

22. \textit{mollissima}, Bailey (\textit{Taccsonia mollissima}, H.B.K.). Pubescent: lvs. cordate-ovate in outline, very pubescent beneath, the lobes extending nearly to the base of the blade and ovate-lanceolate in shape and saccate, the stipules lanciate: fl. about 3 in. across, rose-color, the green tube exceeding the sepals and swollen at the base; corona a short rim. Andes. B.M. 4187. B.R. 32:11.

2775. \textit{Passiflora manicata}. (X about 1/4)
PASSIFLORA

H. B. B.

stamens usually 4; style nearly entire at apex: sterile locules of the fr. nearly as large or larger than the fertile ones. About 15. Herbs corymbosous, minutely pubescent: lvs. nearly semi-circular or almost lanceolate, shallowing 3-lobed, the middle lobe much smaller, variegated on both sides; stipules purple: fls. 10 pairs, yellow, about 1½ in. across; sepals ovate-oblong, obtuse, nearly ½ in. long; petals similar: corolla 4 rows, yellow, the filaments of the outer row with veins yellow. S. Amer. B. M. 8401—P. quadranguliflora, Hook. Fls. solitary, 4-5 in. diam., rose-colored with a darker shade in the center: 6 petals and an outer ring of dark red filaments; inner filaments tubular and paler; sepals and petals more or less purple, acuminate-pointed. Habit unknown. G. 28:575.—P. serratifolia, Linn. Lvs. ovate-lanceolate, acute, serrate, pubescent beneath; petals 4-5 dentate, purple; corona pale purple and bluish. Mex. B. M. 631 H. 2. p. 771. —P. suberosa, Linn. Glabrescent, with corky bark: lvs. roundish or ovate, 3-lobed; the loaves to oblong to lanceolate, the petals 2-glandular above the middle; fls. greenish yellow, without petals; corona short; berry obovate, small. 'V. Indies, Venezuela, etc.
B. M. 4062. B. R.

PAULLINIA

PAULLINIA (probably after Simon Paulli, 1608–1680, professor of anatomy, surgery, and botany at Copenhagen). Sapindaceae. One species is a greenhouse climber, which may also be grown as an upright fern-like pot-plant.

Twining shrubs: lvs. alternate, stipulate, compound, 1-3-ternate or pinnate, or decomposed; petals often winged; fls. usually dentate, dotted or minutely lined; racemes axillary, usually with 2 tendrils; peduncles red, pale, small; sepals 5, the 2 upper larger, connate; petals 4, but there is a fifth abortive one, two of the petals smaller and bearing a scale below the apex; stamens 8; ovary 3-lobed, bearing a 3-parted style. Trop. Amer.

thallinifera, Julius. Lvs. 4-10 in. long, triangular in outline, 3-ternately-pinnate; pinnae in 6-8 pairs; pinnae 4-8 pairs, 4-5 lines long: fls. inconspicuous, pinkish

thallinifera, Julius. Lvs. 4-10 in. long, triangular in outline, 3-ternately-pinnate; pinnae in 6-8 pairs; pinnae 4-8 pairs, 4-5 lines long: fls. inconspicuous, pinkish
are formed the previous year are not killed by frost, of the leaves. In temperate climates it is sometimes used as an avenue tree.

Deciduous, rarely half-evergreen; lvs. opposite, long-petioled, entire or sometimes 3-lobed or coarsely toothed, without stipules; fls. in terminal panicles; calyx campanulate, 5-lobed; corolla with long slightly curved tube, and spreading oblique 5-lobed limb; stamens 4: fr. a 2-celled caps., loculicidally dehiscent, with numerous small winged seeds.—About 8 species in China; in Japan only cult.

The paulownias are medium-sized or fairly large trees with stout spreading branches, large long-petioled leaves similar to those of catalpa, and violet or nearly white large flowers resembling those of the foxglove or gloxinia in shape, appearing in terminal panicles before or with the leaves and followed by ovoid pods remaining on the tree and conspicuous during the winter. *P. tomentosa* is fairly hardy in sheltered positions as far north as Massachusetts, but the flower-buds are usually killed in winter, and it does not flower regularly north of New York City; plants raised from seed collected in Korea have proved hardier at the Arnold Arboretum than the commonly cultivated Japanese plant, also the var. *lanata* from Central China seems to be somewhat hardier. As an ornamental foliage plant it may be grown as far north as Montreal, where it is killed to the ground every winter, but throws up from the root vigorous shoots attaining 10 to 14 feet, with leaves over 1 foot and occasionally even 2 feet long. If used as a foliage plant and cut back to the ground every spring, the young shoots should be removed, except one or very few on each plant; during the first years of this treatment they will grow more vigorous every year, but afterward they will decrease in size, weakened by the continuous cutting back; they should then be replaced by strong young plants. Where the flower-buds which are formed the previous year are not killed by frost, the paulownia is one of the most conspicuous flowering trees in spring, and in summer the foliage, although it is of somewhat dull color, attracts attention by the size of the leaves. In temperate climates it is sometimes used as an avenue tree. It thrives best in a light deep loam, and in a sheltered position. The other species are still little known in cultivation and are probably tender; they are great favorites with the Chinese and much planted in central and southern China. Propagation is by seeds sown in spring or by root-cuttings, and by greenwood cuttings under glass; it may be grown also from leaf-cuttings; the young unfolding leaves when about 1 inch long are cut off close to the stems and inserted in sand under a hand-glass in the propagating-house.

*P. tomentosa* in southern California reaches a height of 40 feet in twenty-five years, with a spread nearly as great. When in full leaf it makes a dense shade. It starts to bloom before the leaves come and all is over before the tree is in full leaf. For this reason it is not a favorite. The jacaranda is a prettier blue, more floriferous, lasts three times as long, the blooms continuing until the tree is in full leaf. It is out of leaf not more than half as long as is paulownia and in mild winters holds much of its foliage throughout, being properly an evergreen. It makes as dense shade as the paulownia, has a prettier leaf and is more desirable in every way. The growth of the two trees is about the same at the end of a quarter century. The habit of the paulownia in retaining dry seed-pods on dead limbs 3 or 4 feet long is very unpleasing, and necessitates a thorough cleaning each year to the tip end of the uppermost branch—often a hard task to accomplish. (Ernest Braunton.)

*P. imperialis*, Sieb. & Zucc. Fig. 2776. Tree, to 40 ft., with stout spreading branches forming a round or ovate head; lvs. large, long-petioled, broadly cordate-ovate, entire or sometimes 3-lobed, acuminate, pubescent above, tomentose beneath, 5–8 in. long or on vigorous shoots even larger; peduncles 1–2 in. long; fls. fragrant, pale violet, 1½–2 in. long; pedicels and calyx densely rusty tomentose; calyx lobes short, rounded; caps. woolly, brilliantly organized, pointed, 1 in. or somewhat longer. April, May. Cent. China, cult. in Japan. S.Z. 1:10. B.M. 40:11. P.M. 10:7. Gn. 44, p. 73; 54, p. 476; 60, p. 150. G.C. H. 48:277; 51:430; 431. S.I.F. 1:85. H. U. 4, p. 102. R.H. 1907, p. 378. G. 35:769. Mn. 7, p. 171. —It is sometimes escaped from cult. in the southern states. Var. *pallida*, Schneid. (P. imperialis var. *pallida*, Dode). Fls. pale or whitish violet; lvs. dull green above. Var. *lanata*, Schneid. (P. *imperialis* var. *lanata*, Dode). Lvs. more densely yellowish tomentose beneath; calyx more tomentose with longer acutish lobes. Cent. China. P. *Dudokii*, Dode. Tree, to 60 ft.; lvs. oblong-ovate, open sinus at the base, tomentose below, to 1 ft. long; fls. about 2½ in. long, pale lavender-purple, not spotted, calyx with acute tomentose lobes and glabrous or glabrescent tube; corolla rather gradually narrowed toward the base. Cent. and S. W. China.—P. *Fortunei*, Franch. Tree, to 60 ft.; branches usually pilose. Lvs. pubescent or glandular above, slightly pubescent beneath, entire or with few coarse teeth; fls. lavender or white, 2½ in. long; calyx tomentose outside with triangular acutish lobes. W. China.—P. *Fortunei*, Hemsl. Tree. to 20 ft. Lvs. sub-coriaceous, densely tomentose below, ovate or ovate-oblong, to 1½ in. long; fls. to 4 in. long, white, spotted purple inside; calyx 1 in. long, glabrous outside except the acutish lobes; corolla rather gradually narrowed toward the base. S. E. China.—P. *Silvestres*, Pampanini & Bonat. Small tree; lvs. densely brown-wholly, narrow, deeply cordate, 6–8 in. long, densely tomentose beneath; calyx somewhat obtusish lobes. Cent. China.—P. *thevetioides*, Rehd. Tree, to 20 ft.; branches and petals usually pilose. Lvs. ovate, usually truncate at the base, sparingly pubescent, often irregularly and remotely toothed, 6–8 in. long; fls. with the lvs., lavender, 1½ in. long, in spike-like racemes forming terminal panicles about 1 ft. long; calyx tomentose, about 1½ in. long. Cent. and S. E. China.

ALFRED REHDER.

PAVETTA (Malabar name of *P. indica*). Ruibeces. Tropical shrubs and small trees closely allied to the brilliant ixoras but less showy, not often seen but deserving of attention; flowers white or greenish, leaves opposite or ternate, simple, sometimes parted, stipules present and joined at base; fls. in mostly terminal bracted corymbs; calyx top-shaped or bell-shaped, the limb mostly with 4 or 5 persistent or deciduous lobes; corolla usually salver-shaped, with a
PAVONIA 2489


(ii) Calyx-teeth short-triangular, shorter than the tube, or sometimes practically wanting.

Indica, Linn. A variable small tree or bush, common in India, extending to China and Austral.: glabrous, pubescent or tomentose: lvs. from elliptic to obovate or oblanceolate or even orbicular, at the apex from obtuse to caudate: fls. slender-stalked, white, fragrant, the corolla-tube 1½–2½ in. long; infl. corymb-like, terminal and sessile. B.R. 198, which is var. polyantha, Hook. f., with density crowned pubescent fls. The species has many synonyms.

I. H. B.

PAVIA: Aesculus.

PAVONIA (J. Pavon, joint author of Ruiz and Pavon's "Flora Peruana et Chilenisa"; died 1844). Malvaceae. Herbs or shrubs, one or two of which are sometimes grown under glass as pot subjects, for the showy bloom.

Tropical plants, tomentose, hispid or glabrescent: lvs. often angled or lobed: fls. of various colors, peduncled or crowded at the tips of the branches: bractlets 5 to many, distinct or more or less connate and resembling a calyx, usually not colored: calyx 5-cut or 5-toothed; petals spreading or convolute-connivent; staminal column truncate below the apex or 5-dentate; ovary 5-loculed, 1-ovuled: ripe carpels surrounding the axis and separating from it, rounded or truncate at top, sometimes winged, indehiscent or imperfectly dehiscing, prickly or awned.-Species about 100, Cent. Amer. to Argentina; also in Trap. Afr. and Asia, to Austral.

Pavonia multiflora, St. Hil. (P. Wioti, Morr. Goethea multiflora, Nichols.). Robust, with a stout usually simple st.: lvs. alternate, 6–10 in. long, narrowly oblong- or obovate-lanceolate, long-acuminate, serrate or dentilcate: fls. in a short terminal corymb; bractlets beneath the fl. numerous, narrow-linear, whorled, red-hairy, curving, in length about equal to the corolla-tube, purple corolla (which is 1½–2½ in. long); calyx-segments much shorter than the bractlets; column of stamens 2½ in. long and prominently exserted. Brazil. B.M. 6398. P.M. 1877:276.—What is known as P. intermedia by gardeners is apparently not P. intermedia, St. Hil.; it is said to be derived from P. multiflora. There are forms of P. intermedia, Hort., known as var. röseae, var. floribunda, and var. kermei. This group of plants is readily grown from cuttings taken in spring or early summer, and good blooming plants in 5-inch pots may be had by winter. They grow naturally to about one st., and should not be pinched back. They make attractive pot subjects with the terminal clusters of fls. marked by the long-protruding staminal column with hanging bluish anthers, the narrow rolled corolla and the slender conspicuous bracts.

spinifex, Wild. Shrub, to 20 ft., from S. Amer., the st. slender, branches few and virgate: lvs. ovate, coriaceous, sometimes angled, pubescent on both surfaces: fls. large, yellow, not fragrant, the corolla open; petals obovate; calyx-lbs lanceolate: bracteoles 5 or more, linear, hairy on margin: caps. with 3 spines. B.K. 339.

præmorsa, Cav. Shrub with rodlike branches, from S. Afr.: lvs. broad-ovate or fan-shaped, truncate, obtusely dentate, canescent beneath, with petiole and

cylindrical or funnel-shaped commonly slender tube, the throat mostly bearded or pubescent, the limb prevailingly 5-parted (rarely 4-parted) into oval or oblong contorted lobes; stamens 4 or sometimes 5, affixed at the mouth of the corolla; style conspicuously exserted, the stigma entire or 2-toothed: fr. a pea-shaped somewhat flabby 5-pyrenous bean below the apex or 5-dentate, prickly or awned.-Species about 100, Cent. Amer. to Argentina; also in Trap. Afr. and Asia, to Austral.
setaceous stipules: fls. bright yellow and dark-centered, single on axillary pedicels exceeding the lvs., with 12-14 linear involucral bracts: fr. of downy carpels.—This and P. spinifex are reported in Calif.

P. Makoyana, Morr. (Goethea Makoyana, Hook.). Lvs. elliptic, short-stalked, with large stipules: fls. in terminal clusters, subtended by large caduceate-crusfoe crimson bractlets. Brazil. B.M. 6427. G.Z. 22:160.—P. semperflorens, Garcke (Goethea semperflorens, Nees & Marth.). Tall; lvs. elliptic, serrate; fls. usually terminal, purple, with brown bractlets. Brazil. L. H. B.

2777. Garden pea, American Wonder. The illustration shows an entire plant, cut off at the surface of the ground. (X 1/4)

PEA. As known to horticulturists, the pea is the seeds and plant of *Pisum sativum* and its many forms, one of the Leguminose, grown for its edible seeds and sometimes for the edible pods. (Figs. 2777-2783.)

The garden pea is native to Europe, but has been cultivated from before the Christian era for the rich seeds. The field or stock pea differs little from the garden pea except in its violet rather than white flowers and its small gray seeds. There are many varieties and several well-marked races of garden peas. Whilst peas are grown mostly for their seeds, there is a race in which the thick soft green pods, with the inclosed seeds, are eaten. The common or shelling peas may be separated into two classes on the character of the seed itself,—those with smooth seeds and those with wrinkled seeds. The latter are the richer, but they are more likely to decay in wet cold ground, and therefore are not so well adapted to very early planting. Peas may also be classified as climbing, half-dwarf or showing a tendency to climb and doing best when support is provided, and dwarf or those not requiring support. Again, the varieties may be classified as to season,—early, second-early, and late. Vilmorin’s classification (Les Plantes Potagères) is as follows:

A. The pea round (smooth).
   b. Plant climbing.
   c. Seed white.
   d. Seed green.
   e. Plant half-dwarf.
   f. Seed white.
   g. Seed green.
   h. Plant dwarf.
   i. Seed white.
   j. Seed green.
   AA. The pea wrinkled (divisions as above).

2778. Garden pea, Champion of England (X 1/4)

Left to themselves, the varieties of peas soon lose their characteristics through variation. They are much influenced by soil and other local conditions. Therefore, many of the varieties are only minor strains of some leading type, and are not distinct enough to be recognized by printed descriptions.

Garden or green peas.

Peas are one of the earliest garden vegetables to reach edible maturity. The date at which a mess of green peas could be gathered used to be regarded as an indication of a man’s horticultural ability. In modern times, green peas grown far away to the South come to northern markets while the ground is still frozen and are eagerly purchased only to result in disappointment and a longing for the old-time quality. Such disappointment is inevitable, for even with refrigerator cars, express trains, and modern skilful handling, green peas grown hundreds of miles away cannot come to our tables for many hours, often not for days, after they have been gathered, and with an inevitable loss of the freshness, which is essential for satisfactory quality.

Peas do well in cool moist weather and will germinate and make a slow but healthy and vigorous growth in lower temperatures than most garden vegetables. The young plants will even endure some frost with little injury, but the blossoms and young pods will be injured or killed by a frost which did not seem materially to check the growth of the plant. For this reason it is generally most satisfactory to delay planting until there is little probability of a frost after the plants come into bloom.

The cultural requirements are simple, but a thorough preparation of the soil before planting is desirable, and the use of green and fresh manure should be avoided. The best depth of planting varies with the season and character of the soil, and early plantings on clay land should be covered only 1 to 2 inches deep, while later plantings on sandy land do best in drills 6 or 8 inches deep to be gradually filled as the seedlings grow. Generally anything more than surface tillage will do a growing pea crop more harm than good; but any crust injured or killed by a frost which did not seem materially to check the growth of the plant. For this reason it is generally most satisfactory to delay planting until there is little probability of a frost after the plants come into bloom.

Of the better garden sorts, from fifty to one hundred good seeds are in an ounce, and a half-pint should plant 50 to 80 feet of row and furnish a sufficiency of pods for a small family for the week or ten days in which they would be in prime condition. For a continued supply one must depend upon repeated plantings. Most of the best garden varieties can be well grown without trellising, but the sorts growing over 2 feet high will do better if supported. Nothing better for this purpose is known than brush from the woods, but this is not always available and a good substitute is the wire pea trellis offered by most dealers in horticultural supplies, or a, home-made one made by strings stretched 2 to 4 inches apart on alternate sides.
LXXXV. Good pods of the garden pea, variety Peter Pan.
of supporting stakes. The ingenuity of the home-gardener will devise good forms of trellising.

It is evident that green peas occupy too much ground to be a practical crop for a small lot or small town garden, and generally the town dweller can most satisfactorily supply fresh peas from a nearby market-garden; and the great superiority of freshly gathered local-grown peas over those which have to be shipped in make this one of the best of crops for a gardener with permanent customers. The best cultural methods for field plantings do not differ materially from those given for the garden. No planting is so likely to give a satisfactory yield both as to quantity and quality as on an old clover sod on a well-drained clay loam, which should be well plowed in the fall or early winter and the surface worked into a good tilth as early as practicable in the spring.

Planting can be best done with a seed-drill so arranged that the rows are 12 to 36 inches apart, according to the variety, with occasional rows left blank for convenience in gathering.

2779. Garden pea, Nott Excelsior. (X 1/2)

Picking should be done after sundown or in early morning before nine o’clock and care be taken not to bulk the pods, as they are liable to heat and spoil.

Peas for canning.

There is no modern industry in which there has been greater improvement within the past ten or more years, both as to methods and the quality of the product, than in the canning of vegetables. This is especially noticeable in canned peas. First there has been a great benefit as to the variety and quality of the stock used. For canning, particularly when modern methods of harvesting and processing are used, it is important not only that the green peas be sweet and palatable, but that the largest possible proportion of the pods shall be in prime edible condition at the same time, and canners are influenced by these qualities in selecting varieties for their plantings, and in the cultural methods for the development of each planting is closely watched by an expert, who directs that it be cut and delivered at the factory on the day when he judges it will be in the best condition, the time for individual crops being sometimes modified by the capacity of the farmer to deliver and the factory to handle it. Not infrequently certain crops are left to ripen and be harvested as grain because of such conditions.

In hot and sunny weather, the vines are cut either after five in the afternoon or before nine in the morning, hauled to the factory and from the wagon go direct to a specially constructed threshing-machine, or "viner," which separates the peas and delivers them on a moving inclined belt, which throws out any bits of vines or pods. They are then washed and graded, and go to the processer. So promptly is this work done that it is known of peas being in the cans and being cooked before the wagon on which they were brought from the field could start for home. Usually peas put up by a well-managed cannery come to the table in more palatable condition than so-called fresh peas which were gathered ten to twenty-four hours before and shipped from 10 to several hundred miles to market.

Canners who are particular as to the labeling of their output often separate it into different grades, determined by the variety and size of peas and labeled somewhat as follows:

Varieties and seed.

Few vegetables have developed greater varietal differences affecting their horticultural or culinary value than garden peas. As to vines, there are sorts from 6 inches to 6 feet in height and which very rarely form more than a single stem, while others are so branched that they often are wider than tall; some mature their crop very early and all at once, others not until the vines are fully grown or continuing through a long season; pods which are so broad and long that the inclosed peas never fill them, others in which the growing peas very often split the pod open; peas which are green, yellow or white, smooth and hard; others which are wrinkled, distorted and comparatively soft, even when fully mature. Very conspicuous variations of little practical importance are sometimes correlated with invisible qualities which are of great importance.

When grown for seed, peas of the garden varieties yield a comparatively small fold of increase, seldom over 10 or 12 and often only 3 or 4, so that it is better than with most vegetables always to secure full supplies of certain sorts, and seedsmen’s stocks are constantly changing, not only as to character but name. The following are now very popular varieties: Extra-early smooth-seeded—Alaska or Prolific. Extra-early; early wrinkled-seeded—Thomas Laxton, Grand, Surprise; dwarf Excelsior, either the Notts or the Suttons; midseason—Advance, Admiral, Senator; late—Champion of England, Strategem. However, one should confer with the seedsmen...
as to the most available stock best suited for the particular needs.

Sugar or edible-podded peas.

These are a class little known in this country, but are largely grown in Europe. They are characterized by large more or less fleshy and often distorted pods, which are cooked when in the same stage of maturity and in the same way as string beans. Varieties have been developed in which the pods are as white, tender, and wax-like as those of the best varieties of wax-podded beans.

Field peas.

There are a number of kinds of field peas in which the vines are very vigorous, hardy, and productive and the peas generally small, hard, and becoming tough, dry, and unpalatable as they ripen. In one variety of this class known as French Cammer, the very young and small peas are sweet and tender, and in this stage are put up by French canners under the name of petit pois. The larger-seeded Marrowfat peas were formerly commonly used by canners, and large quantities are still packed. If this is done while the peas are sufficiently young and tender they make a fairly good product.

Split peas.

Large quantities of field peas, mostly of the smaller-seeded kinds, are used for split peas, the preparation of which consists in cleaning and grading, kiln-drying, splitting, and screening out the hulls and chips from the full half peas. This is all done by special machines, mostly of American invention. The annual consumption of split peas in the United States is about 60,000 barrels, of which, before the European war, 75 per cent came from abroad.

W. W. TRACY.

PEACH. The tree and fruit of Prunus Persica (or Persica vulgaris), widely cultivated in the United States and parts of Canada for home use and market.

In the northern prairie states and on the plains, and in the colder parts of the mountain regions of the West, the peach is little grown or is even altogether absent; yet the range of adaptability is constantly extending as the local conditions and requirements become better known. There is less dependence on

"fruit-belts" than formerly, in which some special favor of climate or location was supposed to exist. Some parts of New England are well adapted to commercial peach-culture. Parts of Canada bordering the Great Lakes, and regions in Nova Scotia, are prominent peach districts. Varieties of special adaptability to climate and useful also for particular purposes have arisen in recent years; and the requirements of the peach are now better understood than formerly. The range of its cultivation will probably be considerably broadened in years to come.

The discussion of the peach is here comprised in four articles:

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Protecting peach trees in cold climates (W. Padock) ;........................................................................... 2504

The culture of the peach.

The marked feature in the development of the peach industry in the United States since about 1900 has been the extension of the areas of commercial peach-production because of the introduction of hardier varieties such as Carman, the discovery of materials and methods that make certain the control of peach-scab and brown-rot, and the organization of fast-freight and refrigerator-car service that permits of successful long-distance shipment of this perishable fruit.

The necessity of spraying to control the scale also focused the attention of the growers upon all other factors of peach-production except marketing, which for the time presented few difficulties because of the great reduction in the number of bearing trees and the ability of the local markets to absorb much of the crop produced.

Peach-scab and brown-rot caused serious damage to the crop annually in central and southern peach districts until the self-boiled lime-sulfur summer spray was proved to be a successful remedy.

The development of large commercial areas at long distances from market has resulted in better grading and packing. The Georgia six-basket carrier has become the popular shipping package from southern New Jersey to Georgia, Alabama, and Texas. (Fig. 2707.)

Innumerable changes and improvements in the growing and handling of the crop have occurred within the last ten years.

The United States Census reports show many interesting facts in connection with the extent and development of the peach industry. A few trees are found in every state in the Union. According to the Census of 1910 only three states, Wyoming, North Dakota, and Montana, have less than 5,000 trees. Five other states, Minnesota, South Dakota, Wisconsin, Maine, and Vermont, have less than 10,000 trees. The most significant fact, however, is that twenty-six states reported a total of more than 1,000,000 bearing trees each, which definitely shows the extended area over which this crop is produced to some commercial degree. The Census for 1910 shows Georgia to lead in the total number of bearing trees with 80,609,119; Texas is second with 9,737,527; and California is third with 7,829,011 trees.

On the basis of total number of trees, however, Texas leads with 12,696,640; California is second with 12,238,573, and Georgia is third with 12,140,486.
The Census reports also indicate the general trend of the industry in no uncertain way. In 1890, five states led prominently in the total number of bearing trees, as follows: Maryland, 6,113,287; Kansas, 4,876,311; Delaware, 4,521,623; Texas, 4,486,901; and New Jersey, 4,413,588. The greatest peach district in the country at that time was comprised by the states of Maryland, Delaware, and New Jersey, with a total of more than 15,000,000 trees.

The three leading states in 1900 were, Michigan with 8,104,415 trees, Georgia with 7,068,639 trees, and California with 7,472,835 trees. The states of Maryland, Delaware, and New Jersey, which geographically comprise one district, reported a total of a little more than 9,000,000 trees, the San José scale and other factors having reduced the total about 6,000,000 trees. Yet as a peach district, this still held its place as having the greatest total number of trees.

The Census of 1910, however, shows that this number was greatly reduced during the period from 1899 to 1909, having less than 4,000,000 bearing trees.

The central or Mississippi Valley district extends from Texas across Oklahoma, Missouri, and Kansas to Iowa, Missouri and Indiana, practically connecting with the Great Lakes area. The Pacific Coast Belt includes California, and areas in Nevada, Utah, Colorado, Oregon, and Washington. There are many areas in these so-called "peach-belts" that are not favorable to peach-production, but they indicate the general grouping of the industry.

Varieties and types.

All of the common forms of the peach belong to the species Prunus Persica, but are sometimes grouped under the name Amygdalus Persica. The flat or Peen-to peach is P. platycarpa. The United States Department of Agriculture, through its Bureau of Foreign Plant and Seed Introduction, has secured a form of peach from China known as A. Davidiana which is used there as a stock for certain cherries. It is said to be very hardy and may prove of value in breeding work, or as a stock for the peach. Its fruit is not attractive enough for use as it is now developed. Several other forms

The Census of 1910 is of particular value in showing the recent trend of the industry, because the number of trees in bearing and those not in bearing were tabulated separately.

The western states, Idaho, Oregon, Utah, and Washington are increasing their plantings. The young trees not in bearing in Massachusetts, Michigan, and New Jersey were greatly in excess of those producing fruit in 1909. West Virginia has also been planting peaches extensively in recent years.

The extensive planting of peaches in the eastern and Middle Atlantic states, following the earlier destruction by yellows, was only just beginning in 1909, when the last Census was taken. Since that time, millions of trees have been planted and have come into bearing. As a result, the marketing factor became the most important peach problem in 1916. Southern districts can no longer expect the prices of former years in the great eastern markets, the Middle West is growing quantities of peaches and so also are the states along the Great Lakes. The problem at the beginning of 1916 is where and how can the crops from these trees be marketed profitably.

In any broad discussion of the peach regions of North America, the Ontario district of Canada should not be overlooked. Situated south of the western end of Lake Ontario, climatic conditions are so modified that such yellow-fleshed varieties of peaches as St. John, Fitzgerald, Elberta, and Niagara can be grown successfully in large quantities.

The northern limits of peach-production extend from the southeastern shore of Lake Ontario along the southern shore of Lake Erie and the eastern shore of Lake Michigan as far north as the Grand Traverse on the 44th parallel. This area is often termed the "Great Lakes Belt." Beginning in southwestern and central Massachusetts, another commercial peach area extends across Connecticut, Long Island, the Hudson River Valley, New Jersey, eastern Pennsylvania, Delaware, and Maryland. The Coastal Plain areas in New Jersey, Delaware, and along the eastern shore of Maryland are favorable to peach-production, and the fruit is grown to within a few miles of the seaboard. Further south, the Coastal Plains area is unfavorable to successful commercial production and the industry is transferred to the Piedmont area across Virginia, North Carolina, and southward to the Gulf districts in Alabama and Texas. Florida has too warm a climate to suit the common standard varieties of peach and has developed a special type from the South China race.

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or types have been collected in China by Frank N. Meyer, of the Department of Agriculture, and sent to the United States for propagation and study. See the article Prunus.

The common types of peaches have been grouped into certain races. Onderdonk (Rept. Commr. Agric.,

1887) and also Price have placed North American peaches in five groups: (1) The Peen-to or flat peach race, comprising the variety known as Peen-to (Fig. 2781), and also the Angel, and Waddell; (2) the South China race, with long-contracted fruit with deep suture near the base, represented by the Honey (Fig. 2785); (3) the Spanish or Indian race, with very late yellow firm often streaked fruit, represented by various southern varieties, as the Cabler (Fig. 2786), Columbia, Galveston, Lulu, Texas, and Victoria; (4) the North China race, with large mostly cling or semi-cling fruit and very large flat leaves, represented by the Greensboro, Waddell, and Carman; (5) the Persian race, including the common varieties of the mid-country and the North, as Crawford (Fig. 2787), Mountain Rose, and the like. The so-called North China and Persian types of peaches are now very much mixed in commercial varieties.

We have been content to say that Elberta (Fig. 2788) is of the North China type, when it is plainly mixed with the Persian, and when studied carefully its characters resemble the Persian type even more than they do the North China. Two types of peach blos-toms are commonly recognized (as shown in Fig. 2790), yet there are three distinct types, the large bloom, typical of Greensboro and Waddell and the North China type, the medium bloom of such varieties as Elberta and Belle, and the small bloom of Early and Late Crawford, and others. The botanical significance of these types is not well understood.

A double-flowered peach (Fig. 2789) is sometimes cultivated as an ornamental, as well as a purple-leaved form. A form of the cultivated peach growing wild near Pekin, large-flowered, is shown in Fig. 2791.

Propagation.

The peach is universally propagated by means of the pits or seeds. A few are sometimes secured by budding upon plum or even cherry stocks, but this dwarfs the tree and makes it susceptible to various stock troubles.

So-called natural seedling pits or seeds gathered in Tennessee and North Carolina are said to be the best for propagation work. Such seeds are considered to be more viable and to produce harder stock than pits from cultivated varieties. Considerable quantities of so-called "seedling" seeds have undoubtedly been secured from canning factories and represent commercial varieties, although one can readily detect the difference between them. It has not been definitely shown that wild seedling pits will produce a stock that is any more hardy than that which might be secured from the pits of some of our harder cultivated varie-
ties. Seeds or pits for propagation are treated in two ways. Where severe freezing weather occurs they are commonly planted in the autumn in nursery rows from 4 to 6 feet apart. The pits are scattered a few inches apart in the rows and covered to a depth of about 2 inches. In less severe climates, the pits are stratified very shallow in autumn, are dug up in the spring and the kernels separated from the soil and shells, and planted in nursery rows. By this method, any pit or seed which is not cracked open by the action of the frost may be broken by the use of a hammer. Pits not affected by the frost usually fail to grow the first season, but may do so the second year.

The pits should be planted in good soil and be given careful cultivation so that the seedlings will be at least 24 to 30 inches high by the latter part of August of the first season, and in condition for budding. The buds are inserted the latter part of August or early in September, and simply become united with the seedling stock without making any growth. Early the following spring the seedlings are cut back just above the inserted buds, and all shoots developing from buds of the stock itself are kept rubbed off. In this way the desired bud develops into a vigorous well-branched shoot or tree which should be from 3 to 6 feet high at the close of the season's growth, and is ready for sale that fall or the following spring. So-called "June buds" are secured by budding vigorous seedlings in June and selling the resulting trees in the fall or the spring following. Such trees are smaller and are seldom equal to one-year-old trees except possibly for planting in the South. In Fig. 2792, at the left, is a well-branched one-year-old nursery tree; at the right a slender tree of the same age and height, and in the center a June bud.

The question as to whether trees should be propagated north of the region in which they are grown is a common one. Evidence has shown that it makes little difference as to the latitude in which the trees are raised if they are well grown and are free from injurious insects and diseases. It is generally best, however, to purchase trees as near at hand as good ones may be secured.

The ideal climate for the peach is one in which the winter extremes do not go much lower than zero at any time, and no warm periods of many days' duration occur in winter. The absence of late spring frosts and presence of bright sun during the ripening period are also important essentials. Extremes of either warmth or cold in winter are almost equally detrimental.
Soil.

The peach will succeed upon a wide range of soil types, but prefers a sandy loam. It will also develop exceptionally well upon gravelly or stony loams, if deep and well drained. Heavy poorly drained soils should be avoided. It also thrives on sands.

Site and elevation.

The type of peach-growing business one expects to engage in has much to do with the kind of location and site that should be chosen.

A successful local market business may be established even upon disconnected areas and at some disadvantage. But extensive peach plantings for supplying the wholesale markets should be planted upon uniformly favorable areas near good shipping-points and where plenty of labor is available. Locations should be sought where peaches can be grown and placed on the market cheaply because of large annual yields and low cost of production and marketing.

The elevation above sea-level at which peaches are planted in any region is a most important matter. It is not sufficient that the orchard be on land that is higher than its immediate surroundings. In some localities an elevation of 150 to 200 feet is sufficient to secure good yields, while in others one must seek altitudes of 500 to 900 feet, or even more, for successful crops. The site of the orchard should also be readily accessible, so that fertilizers, spray materials, and packages can be delivered cheaply and so that the crop may be picked, packed, and shipped economically. Uneven land broken up by gullies or wet areas is to be avoided, as well as hilly areas that are difficult to reach by team and expensive to manage.

The particular exposure is not important in a relatively flat country. In hilly or mountainous sections, it may become so. Severely exposed situations should be avoided, as well as warm pocketed areas. Some protection from severe prevailing winds is most desirable and does not increase the danger of too early blooming if good air-drainage prevails.

Establishing the orchard.

A well-defined plan should be drawn up before planting is begun. The peach is a relatively short-lived tree, and packing-houses and permanent buildings should be located in connection with road-ways and plantings so as to result in the most economical procedure of the work.

The selection of varieties must be made previous to the planting of the orchard. Specific recommendations for each district cannot be given in a brief article, but some general statements as to the variety question follow. Yellow-fleshed peaches are preferred by most markets. Such varieties as Mountain Rose, Reeves, Stump, Oldmixon, and the Crawfords are falling behind in popularity except in a few localities. Better varieties are needed commercially. Carman and Belle (of Georgia) are rapidly gaining in commercial importance. New varieties, such as the J. H. Hale, are demanding recognition. Elberta is still the most popular single variety. It is the most widely successful commercial variety of any of our tree-fruits. In making a choice of commercial varieties for any section, a few hardy sorts that are known to do well in the locality are the safest to plant. One should also have enough trees of each variety for economical growing and marketing.

Vigorous one-year-old trees that will caliper 5/8 to 3/4 inch and are from 3 to 5 feet in height, as illustrated at the left in Fig. 2792, are an ideal size to plant. They should be free from yellows or little-peach or rosette, root-gall, scale, peach-borers, or other injurious peach enemies.

Fall planting is successful with well-ripened trees in localities in which the winter weather is not severe and where soils are sandy and well drained. In northern districts, fall planting is less likely to be successful. In spring planting, the land should be prepared and the trees set as early as soil conditions permit.

The trees should be set about 20 feet apart each way under average conditions. In some localities 18 feet is sufficient distance, while in others 25 feet is not too much.

Vegetable crops, such as peas, beans, tomatoes, and potatoes, may be grown between the rows of young peach trees for the first and second seasons, after which the practice is of doubtful economy.

Tillage.

The apple is sometimes grown successfully under the sod-mulch system, but attempts to manage the peach in the same way have commonly resulted in failure. The soil of the orchard should be plowed or disked into
Fertilizing.

Potash, and 400 pounds acid phosphate will not be needed in many cases. In districts where the winters are severe, however, nitrogenous fertilizers must be applied sparingly.

Pruning.

Two distinct types of pruning are practised with the peach. One is to allow the tree to form its own particu-
and the pinching back of the tips of any branches that tend to develop in an irregular manner. The removal of shoots should be done before they are more than an inch or two in length. The pinching back of irregular shoots should be accomplished in June or early July before they are more than 18 or 20 inches in length. The removal of much growth and foliage in the summer may cause a severe check to the tree.

The annual dormant-season pruning beginning with the second year should be somewhat as follows: The main branches will develop numerous side branches and the strongest and best placed of these should be retained. A well-formed tree is not only agreeable to look upon, but furthermore the maximum production of good fruit is secured only when the greatest possible amount of vigorous fruit-bearing surface is properly exposed to light. The annual cutting back of the leading branches to the first good side branch will result in well-spread vigorous trees. The cutting of a branch to an "outside bud," however, does not change the direction of growth of that branch to anywhere near the same degree. The cutting back of the branches causes a thickening of the top, and some thinning out of shoots and branches is necessary, otherwise the fruit will lack color.

A central leader is avoided in the pruning of peach trees, and any shoots which tend to shut out the light from the center of the tree should be kept pruned back and not allowed to become more than fruiting twigs. The general form of the tree should be about complete at the close of the third or fourth summer after planting, and the annual pruning will largely consist of the removal of any broken branches and the cutting back of the annual growth on each branch about one-third or one-half, according to the variety and the amount or length of growth. Pruning is often the most economical method of thinning, and this point should not be overlooked.

After peach trees have fruited for several years, they commonly require a severe cutting back to reduce the size of the top and to secure more vigorous wood. Such a cutting back should be practised whenever the fruit-buds are destroyed in winter. All branches may be cut back into wood-growth formed the two or three previous seasons. It is never advisable to saw the main branches back to mere stubs a foot or more in length except upon young trees that are to be topworked.

Thinning the fruit.

Thinning is now a regular feature of good orchard-management. Small fruit sells for low prices at all times and in seasons of heavy crop-production can hardly be disposed of at any price. When trees are allowed to mature as much fruit as will set in a favorable season, much breakage of branches is the usual result. The small green fruits should be thinned as soon as the so-called "drop" or the natural thinning occurs. Sometimes this fails to take place and then the fruit should be thinned as soon as it is about the size of a shelled hickory-nut. Thinning the necessary number of packages should be purchased, the packing-house put in order, and arrangements made for the needed number of teams, trucks, pickers, packers, and other labor.

When the fruit is ready to pick, the work should be organized with one man in constant charge in the orchard. He should direct the pickers and see that each one picks all the fruit that is mature enough at any one time and yet does not take off that which is too green. An efficient picking-crew is necessary in order to secure good results at the packing-house.

White-fleshed peaches change from a light green to a cream-white ground- or under-color as they mature. So-called yellow-fleshed varieties change from a yellowish green to various shades of yellow or orange as they ripen. Pickers should be instructed to determine the maturity of a fruit by its color, and be corrected if they attempt to test it by pressure with the fingers. Good pickers will harvest from sixty to one hundred sixteen-quart baskets a day from well-pruned trees.

The fruit is not uncommonly picked directly into the package in which it is sold, but this practice is rapidly passing in favor of a distinct picking-basket. The most common type in use is a round flat-bottomed wooden stave basket of sixteen quarts capacity. A low-wheeled wagon is best adapted for hauling the fruit from the orchard to the packing-house.

Packing the fruit for market.

Some sort of a packing-house is necessary when any considerable amount of fruit is handled. A shelter against rain is imperative to prevent the warping of wooden packages. Rapid work in packing can best be organized in a building with a wooden or cement floor and where stencils and tools can be kept in order. A long and relatively narrow packing-house with large doors upon either side is likely to prove the most economical for the handling of the fruit.

Packages, tables, and box- or crate-presses should be arranged in a way to promote rapid and efficient work. No distinct grades of peaches, unfortunately, have become recognized in any broad way. Persons employed as pickers should be chosen for their honesty and interest in the business as well as for their ability in filling the packages.
The common commercial packages now in use are the sixteen-quart Jersey or Delaware basket and its modifications, the Georgia six-basket carrier, the Michigan bushel and half-bushel, the Climax basket (Fig. 2904) and the western or California box.

Packages often arrive on the market in bad condition because they have not been sufficiently well-filled at the orchard. The fruit must be packed tightly enough so that it cannot move in the package during transit.

Simple mechanical graders have been used for some time in some of the peach regions, but the new types of graders are still in the experimental stage. See Packages, page 2426, for description of types of fruit-graders.

Markets.

All the large cities in the United States and Canada, in addition to the local towns, consume large quantities of peaches. A grower who is situated near a large local market can allow his fruit to become well-ripened and haul it by wagon or truck without requiring other transportation facilities. Much of the crop must go to market by rail, however, and if in transit more than a few hours, some refrigeration is necessary. Refrigerator cars are employed for this. The large so-called “Fruit-Growers Express” or “Dispatch Cars” will hold live and one-half tons of ice and are capable of carrying 448 Georgia carriers in four tiers, or 558 crates in five tiers.

All crates, boxes, or baskets should be so arranged when placed in refrigerator cars as to allow of a free circulation of air.

Precooling of peaches previous to shipment is practised to some extent, but is not yet common. One who engages in peach-production upon a large scale cannot depend upon local markets to take his entire crop. The fruit must be packed tightly enough so that it cannot move in the package during transit.

Insects.

The most serious insect enemies of the peach are the borer, San Jose scale, and curculio. A few years ago the scale was considered the most troublesome of the three, but the borer is now the most difficult to control. The mature insect is wasp-like in appearance, the male shining steel-blue in color with an orange-yellow band about the abdomen, while the female is of a deeper and duller color. The eggs are laid on the trunk near the ground from August to October. The “grubs” hatch and work their way under the bark and there feed upon the inner bark for about twelve months, when a case is formed of the “sawdust” and other materials, in which the pupa stage is passed. One or two borer larvae may completely girdle a nursery tree, while several may accomplish similar damage on a young tree in the orchard. In any case the infested tree is greatly weakened. The presence of borers is easily detected by the mass of gum and “chewings” at the base of the tree.

A great variety of materials has been tested as coatings to prevent the entrance of borers, but none has proved to be entirely successful. The expansion of the bark because of growth causes numerous cracks in the coating of most materials that are applied and the borers gain entrance. A soft grade of asphaltum applied to the trunk as late as September and feeds as September or possibly October. The “grubs” hatch and work their way under the bark and there feed upon the inner bark for about twelve months, when a case is formed of the “sawdust” and other materials, in which the pupa stage is passed. One or two borer larvae may completely girdle a nursery tree, while several may accomplish similar damage on a young tree in the orchard. In any case the infested tree is greatly weakened. The presence of borers is easily detected by the mass of gum and “chewings” at the base of the tree.

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growth commonly prevents any serious check to the trees.

Various beetles and grasshoppers may cause some damage at times by feeding upon the peach, such injuries being most common in orchards in which grass or weeds are allowed to grow freely.

Diseases.

The peach is subject to the attacks of a considerable number of diseases. The most difficult to combat are yellows, little-peach, and rosette. The causes of these diseases are still unknown. Some suggest the presence of a fungus, others an organism too small to be detected by the ordinary microscope, and there is also the possibility of enzymes.

The advanced stages of yellows are indicated by a premature ripening of the fruit from a few days to at least two weeks in advance of the normal season. Such fruit is commonly red-spotted and blotched in its coloring and may be insipid or bitter in flavor. Affected trees may also develop sickly wiry twig-growths on the trunks and branches.

Little-peach is indicated by a characteristic drooping of the foliage and by the fact that the fruit is smaller and matures later than the fruit on healthy trees.

Rosette occurs only in southern districts and is readily distinguished by the tufts of leaf-development. This disease is fatal within twelve months in many instances.

It is not known whether these diseases are entirely distinet or not, but they have been so regarded. Yellows and little-peach attack all varieties in about the same proportion. Infection does not appear to take place through the soil, flowers, or seed. These diseases can readily be transmitted to healthy trees or stocks, however, by budding. Buds taken from the apparently healthy parts of diseased trees have invariably reproduced the diseases.

The recognition of early stages of yellows and little-peach have shown that these diseases are too frequently distributed in nursery stock. It is now known that a tree may be infected with either of these diseases for three or four years without showing any prominent symptoms. When good growing conditions are provided, the true state of affairs may be masked for a time, but a check to growth will result in the prompt appearance of the advanced stages of disease.

Many cases of so-called "cures" of yellows have been announced, but all have been without sound basis. Too often trees affected with borers, winter injury and other troubles are considered to be affected with yellows. Diseased trees should be destructed as soon as detected.

When such trees are left in an orchard, the disease spreads to surrounding trees until all are affected. If all diseased trees were destroyed annually in any district and no diseased nursery trees were introduced, the annual loss could readily be kept as low as 1 per cent, without much doubt. Yellows and little-peach attacks Japanese plums as well as peaches, and this should not be overlooked in control work.

Peach leaf-curl, brown-rot, peach-scab and mildew are fungous diseases of the peach which cause much damage annually. The leaf-curl attacks the foliage in early spring just as the leaf-buds open, and the leaves become curled, thickened, and distorted. The tips of shoots may also become affected and the disease is occasionally seen upon the fruit in a fan-shaped discolored area. These affected leaves finally turn brown and fall from the trees in early summer. In severe attacks, the trees are almost completely defoliated, greatly reducing their vigor and causing them to lose most of the fruit which may have set. This disease is readily controlled by spraying with lime-sulfur directed for the scale, before the leaf-buds begin to make growth. After the leaf-buds begin to expand, however, the spraying may not prove effective. Recent experiments have shown that without much doubt. Yellows and little-peach attacks Japanese plums as well as peaches, and this should not be overlooked in control work.

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with self-boiled lime-sulfur will commonly hold it in check.

Spraying.

The peach is subject to the attacks of numerous disease and insect enemies, and thorough spraying is required for success in most cases. The peach foliage is very sensitive to caustic sprays, however, and great damage may be done by ignorance. Copper sprays, such as bordeaux, are dangerous to use on peach foliage in humid climates. San José scale and leaf-curl can be controlled by a winter spraying of lime-sulfur. Peach-scap and brown-rot can be held in check by several sprayings of the self-boiled lime-sulfur summer spray.

When San José scale, leaf-curl, peach-scap, brown-rot and curculio appear to any considerable extent, the following spraying schedule is suggested:
1. For scale and leaf-curl, apply concentrated lime-sulfur diluted to a specific gravity of 1.03 to 1.04 before the leaf-buds start to make growth in early spring.
2. Just after the petals fall, apply self-boiled lime-sulfur of an 8-8-50 formula and arsenate of lead at the rate of three pounds of paste, or one and one-half pounds of powdered lead to each fifty gallons of spray.
3. Repeat this when the calyces are shedding from the fruits or when the latter are about the size of peas.
4. Apply self-boiled lime-sulfur without the addition of arsenate of lead three weeks after the third spraying.
5. Apply self-boiled lime-sulfur again three weeks later to all varieties ripening later than Carman.
6. In wet seasons-and especially for varieties as late as Fox, Salway, or Bilyeu, an additional spraying may prove profitable.

No spraying should be done within less than three weeks of the ripening stage, or the fruit may have a white-washed appearance.

Where the plum-curculio causes little or no damage, the second spraying may be omitted, and where peach-scap and brown-rot are uncommon, the fourth, fifth, and sixth sprayings may be omitted.

Winter injuries.

There are several forms of winter injury, including bud-killing, twig-killing, collar injury and bark-splitting. Bud-killing takes place when the temperature is too severe in winter. The pistils and stamens are killed in their rudimentary state, giving the center of the bud a brown or black appearance when a cross-section is made. Poorly formed buds often die even when the winter temperatures are not particularly severe. Alternate warm and cold periods may also result in bud-killing. Varieties such as Reeves, Early Crawford, and Mount Rose suffer more from bud-killing than Greensboro, Carman, or Crosby. Vigorous trees that ripen their wood-growth early are best able to withstand low temperatures successfully. Trees that make a relatively late growth are, however, more successful in resisting the effects of a variable winter. Twig-killing is a more severe form of injury than bud-killing, and following such injury the trees should be well cut back before growth begins.

Collar injury is caused by the action of the weather upon the bark of the trunk just at or below the surface of the ground. In mild cases, the inner bark becomes yellow in color and very spongy. The tree is checked in growth and the fruit forced to an unusually large size. The lenticels or dots are large and the flavor of the fruit is often astringent, due to a large proportion of tannin. In more severe cases of injury, the trees suddenly die in midsummer with the shriveled fruit clinging to the twigs. Bark-beetles often attack trees checked by the winter injury and the portion of the tree is often entirely attributed to their attacks: The Elberta appears to be more susceptible to this form of winter injury than such varieties as Greensboro or Carman. The soil should be firmly mounded up for about a foot against the trunks of peach trees just before freezing weather each fall to prevent such winter injury.

The bark on the trunks of old peach trees may occasionally crack open as a result of winter weather. The most that can be done is to cut away the bark that has separated from the sap-wood and to paint the latter to prevent decay.

Peach trees not infrequently suffer injury to the sap-wood of the branches and twigs, and the trees may fail to grow vigorously the following spring. Such trees should be given liberal fertilizing and be kept well cultivated to promote a good growth. M. A. Blake.

Peach-culture in the South.

Peaches have been abundant in the southern states since the very earliest settlement, the so-called Spanish varieties being first distributed by the early settlers in Florida, and to this day, all through the South Atlantic States, the old "Spanish Blood" or "Tinsley" peach, is spoken of as one of the choice fruits of the earth. From time to time all the improved varieties were scattered through the South by the more progressive horticulturists and nurserymen and these and their seedlings were abundant on nearly every plantation. The South being strictly an agricultural country, there was little chance for commercial peach-culture until along between 1870 and 1875, when the introduction of a number of new extra-early varieties of the Alexander type, seedlings of Hale and Rivers, gave such bright showy peaches the latter part of May and early June that attempts were made to market them at a profit in our northern cities.

A lack of quick through railway-express service caused them to be three and four days on the way, and usually to be delivered in poor condition. peach-culture lots, arriving in fair to good condition and selling at $12 to $20 a bushel, convinced a few of the shippers that the extra-early peaches of the South were appreciated at the North, and persistent efforts were continued to get them to market in sound condition. Every conceivable style of shipping package was used,—paper-wrapped fruit placed between layers of cotton, excelsior, paper, and the like, and sent by express or steamer,—and all brought about the same returns, "Arrived in bad order." Only occasional lots paid a profit. Finally, heavy refrigerator boxes that would hold about six bushels of fruit in packages, and a sufficient quantity of ice, with strong castor wheels under them so they could
be trundled in and out of freight cars, were utilized to bring peaches north by Savannah and Charleston steamers; and by re-icing on the steamers, much of the early fruit came through in good order and sold at such satisfactory prices as to encourage the sending of the large midsummer peaches to market in the same way, and the early and moderate fruit in the fall, and the all of the leading branches for the first two or three years, back at time of planting, and a general shortening-in a foot from the ground. As a rule, the close cutting of the branches over 18 inches up, and often 8 inches to the former direction of the rows. Three years of this usually builds up a perfect orchard without the aid of any further experimenting with seedlings and varieties.

The perfection of the refrigerator car for fruit transportation, improved machinery for the cheap manufacture of ice, the consolidation of various small railway lines into great through routes of transportation, and a full appreciation by their managers of the importance of a successful peach industry, and last but not least, the originating of the Elberta peach by Mr. Rumph, are the final factors in rapidly developing the great commercial peach industry in Georgia, and its smaller counterparts in South Carolina, Alabama, Mississippi, and the more recent rush of overplanting in Texas, Arkansas, Oklahoma, and southern Missouri.

The year 1889 saw the first large peach crop successfully harvested and marketed. Profits were large, and being reported in the press many times greater than the time from October to March, opening furrows for the year. One variety, have a season of less than two weeks in many orchards. Fort Valley and Marshallville, the peach country of the South, where extended lists of varieties are grown, covering a season of fully two months; while the southwestern states, planting almost entirely of one variety, have a season of less than two weeks, can any profit be assured.

All land is plowed deep, and sometimes subsoiled before planting. Young orchards are given frequent and thorough tillage up to midseason, when two or three rows of cowpeas are drilled in at least 4 feet away from the rows of trees; these and the trees are cultivated frequently, until the peas have taken almost full possession of the ground, and it is time for both the land and trees to have a rest from cultivation. In the fall when peas are ripe, enough are gathered for next year's seed, after which hogs or mules may be turned in to pasture for a time. The stubble furnishes a fine winter cover, and is turned down at first plowing in February or March, when summer culture begins, and at proper time the orchard is again seeded to cowpeas, across the former direction of the rows. Three years of this usually builds up a perfect orchard without the aid of any other fertilizers, except possibly a very little about the trees at time of planting to give them a start.

Low-headed trees are the rule, the trunks seldom branching over 18 inches up, and often 8 inches to a foot from the ground. As a rule, the close cuttings-back at time of planting, and a general shortening-in of the leading branches for the first two or three years, is about all the pruning given, even in the best orchards. A good plan is to shorten-in every year much of the untrained branches, and by this means to bring peaches north by Savannah and Charleston steamers, opening furrows for the trees and cross-checking the rows 18 to 22 feet apart, later plowing this land and planting it in cotton, continuing it for three and often four years. Two to four hundred pounds of low-grade fertilizer is applied in drilling for the cotton and usually about the future given; trees are allowed to grow at will, their culture being incidental to the cotton crop. In such orchards very little if any pruning was ever attempted. After the trees become so large as to drive out the cotton, one plowing is given in winter, then anything from fairly good culture to none at all the remainder

of each season. Such a system resulted in many "scrub orchards," that were not very profitable after six or seven years.

In the recent and more highly developed peach orcharding of this section of the South, better preparation is given the land at the start, dynamiting of the holes for planting being largely practiced. There is a more careful selection of trees, far more liberal fertilizing, planting at greater distances, seldom less than 20 by 20 feet, better culture, less and less of intercropping, except of cowpeas and other cover-crops, and somewhat more of systematic pruning, though as yet this art is not fully enough practised to show best results. Many of the land-booming orchards, planted between 1890 and 1900, proved financial failures and are either no longer in existence or else have been absorbed into other and better propositions. There are less and less of the cotton farmer orchardists and more peach specialists, as time and experience have shown the business to be unprofitable, except under best business conditions.

The writer's plantations, which ten years ago aggregated some 265,000 trees, have now been reduced to less than 100,000 trees, as only by planting at greater distances and giving a less number of trees better care and attention were, any profit be assured.

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that force themselves on all the main stems when the top is properly headed back. These little side branches have given several full crops of fruit, without when there has been failure.

Soil and climate favor the very brightest of color on all peaches in the South; qualities of the soil and the long, hot summer sun give a richness of color superior to any other section of America, though the same varieties are not so juicy or luscious as when grown farther North.

The orchards in connection with cotton plantations run all the way from 10 to 100 acres in extent, while the "straight-out peach farm" seldom has as few as 50 acres in fruit, more of them having from 100 to 200 acres, while orchards all the way from 300 to nearly 1,000 acres in extent are no uncommon sight. The Georgia peach industry turns out 5,000 to 7,000 carloads of peaches in seven or eight weeks of a busy picking season, even though the 18,000,000 trees estimated to have been in that state ten years ago have now been reduced to less than 8,000,000.

Growth usually ceases early in August, and the trees shed their leaves the last of September, a month or six weeks before any frosts occur. Should the fall be warm and wet, some fruit buds will be forced into bloom, while the greater number will remain dormant until late January or early February, when spring growth commences. The season of full bloom is usually about the first week in March, though it varies all the way from February 15 to March 25, and no matter whether early or late, the entire blooming season of most varieties covers a period of nearly three weeks. While spring frosts are the greatest menace to southern peach culture, this long blooming period often gives a chance for a setting of fruit between the various frosts, or after the last one, from some belated buds. Even with these varying chances of escaping between frosts, about one year in three destroys the peach crop in some one or more of the great centers of peach-production in the South.

Two other serious troubles hamper the southern peach cultivator—curculio and monilia or brown-rot. Curculios are very abundant; beginning early in April, they keep up their destructive work until the end of the blooming season. In recent years in the summer spraying for monilia, the addition of arsenate of lead to the spray is finding its way, while the greater number will remain dormant until late January or early February, when spring growth commences. This resembles the usual growth of full bloom is usually about the first week in March, though it varies all the way from February 15 to March 25, and no matter whether early or late, the entire blooming season of most varieties covers a period of nearly three weeks. While spring frosts are the greatest menace to southern peach culture, this long blooming period often gives a chance for a setting of fruit between the various frosts, or after the last one, from some belated buds. Even with these varying chances of escaping between frosts, about one year in three destroys the peach crop in some one or more of the great centers of peach-production in the South.

Peach-growing in California.

The peach is a fruit of wide commercial importance in California. The great peach-growing sections are principally in the San Joaquin and Sacramento valleys, but orchards are found and are profitable not only in the mountains up to an altitude of 3,000 feet, but also in the coastal sections. The most important districts are the first named. For size, flavor, color, and shipping qualities, the peaches grown in this state have a national reputation.

The tree thrives not only on the sandy, loamy soils which are adapted to irrigation and are well drained, but also on the heavier red and black soils, which are more or less mixed with gravel and are found both in the foothill and coastal regions of California. On account of the arid climate, there being no rainfall from May until October, it goes without saying that to produce high-class peaches for either shipping, canning, or drying, irrigation is very essential. The theory that was formerly advanced that irrigated fruit would not keep, has not been borne out in practice, and to attempt to grow peaches without irrigation, particularly in the great valleys, would now be considered the height of folly.

No systematic plan has been followed in fertilising orchards, although growers are realizing that to grow good fruit and to maintain an orchard up to the very highest standard, the application of fertilizers is essential. Considerable interest is now taken in cover-crops, and a number of experiments have been made with Canada field peas, fenugreek, and vetch. To grow a cover-crop successfully, it is necessary to have water in the fall, and as water from the canals is not obtainable, it must be secured by pumping. Barnyard manure, when it is to be had, is given the preference by growers. This is becoming very scarce, however, and eventually commercial fertilizers will come into general use.

Peach trees are transplanted in California when they are one year old from the bud, except in years when stock is scarce and trees sell at high prices, when many growers purchase June buds, which transplant readily, providing care is taken to allow them to mature fully in the nursery before digging.

Nothing will bring a peach tree to a premature end more quickly than not to prune. Trees when transplanted to the orchard should be pruned both root and top. The root-pruning should be the shortening-in of all the roots at least one-third and the removal of all bruised and lacerated roots.

After the trees are set, they should have the top cut off to within 20 inches of the ground, even if the tree be 6 feet or more in height. In most cases, the failure or trees to grow may be attributed to the orchardist's failure to observe this simple rule. It is very necessary to settle the soil around the tree, either by irrigating (running the water in furrows), or by tanking (using not less than fifteen gallons of water to a tree).

The winter following the planting in the orchard, the branches forming the head should be confined to not more than five at the very outside, and four is better. These should be cut back at least two-thirds and all laterals removed.

This pruning will not only cause the trees to grow stocky, but it will probably also serve the purpose of making the framework branches very sturdy. The tree will respond by making an immense growth and in the second winter the shortening-in of this growth will again have to be very severe, and thinning will have to be practised. The point to be considered in this case again is to give the tree not only the goblet form, but to perfect it, for this pruning increases its vigor.
and makes it capable of producing heavy crops which are well protected from any injury by the sun, due to its wealth of foliage. From the third year, two or three laterals are allowed to grow on each of the frameworks, and their growth is again shortened in severity. In the fourth year, the pruning need not be so severe, and a reasonable crop of fruit may be expected. Pruning in after years should be followed out regularly each season if good crops are to be secured and the longevity of the tree maintained.

It is a mistake to plant peach trees too close together. In former years it was customary to plant 20 by 20 feet, but now trees are planted 24 by 24 feet, as better results have been secured at this distance.

Thinning must be practiced when the crop is heavy, for, if not followed carefully, the fruit will lack size, and no matter for what purpose it is used it will go into an inferior grade and at prices which would be very unsatisfactory to the grower. The peaches should never be closer than 4 inches apart. If the ground underneath the tree has the appearance of being covered with a green carpet from the effect of the thinning, it is evidence that the work has been well done.

When shipped fresh, peaches are wrapped in soft paper and packed in twenty-pound boxes. The number of peaches shipped out of California is about 2,200 car-loads annually. For local consumption in the larger cities, the peaches are shipped in open lug boxes, holding about forty pounds.

Peach trees may be laid on one side with comparatively little injury, and when laid on in such a way as to expose every twig of lye, but to cause the skins to slough off. Peaches treated in this way sell at twice the price of the unpeeled peaches and the entire character of the fruit is changed. Outside of the lye bath, which is the only additional treatment the fruit receives, the process is the same as is followed when the peaches are not peeled.

The canning of peaches is another important branch of the industry, the output from California being in the neighborhood of 84,000 tons annually. This work is conducted exclusively by commercial concerns, every modern appliance to handle the fruit expeditiously and turn out uniform grades. Outside of the halving of the peaches, which is done by women, the work is accomplished entirely with machinery. Sanitary casks are used as containers and a limited quantity of the fruit is placed in glass jars. The commercializing of the industry has created a demand for well-defined standards. To illustrate this, the only peaches which are regarded as the leaders by the canning trade are the cling; and in the list of varieties, the Tuskena, Orange, and Phillips, all of which are yellow, are in the heaviest demand. Peaches that have no red at the pit are preferred for canning, as the syrup never becomes discolored. The important place which an efficient industry occupies in the peach business will be sure to bring about improvements in varieties to meet the demands for peaches with smaller pits, finer-grained and more highly flavored flesh. Already several new varieties, mostly chance seedlings, have been introduced and are attracting considerable attention. For shipping, Alexander, Briggs (Red May), Early Hale, Dewey, Imperial, Sneed, Elberta, and Salway are recognized as standards; for drying, Elberta, Foster, Late Crawford, Lovell, Muir, Susquehanna, and Wheatland; for canning, Tuscan, Runyon, and Seller (Orange) Clings, McDevitt and Philip and Levy (or Henrietta).

Fortunately, the California peach orchards have never been threatened with insect pests or diseases that cannot be controlled. The crown root-borer is troublesome in some sections, but it has always been under control. The San José scale is no longer regarded as a very serious pest, for it is held in check by predaceous insects and by spraying with lime-sulfur washes. Leaf-curl in some years gives considerable trouble, but if the trees are given a thorough spraying with Bordeaux, it is easily controlled.

The average life of a peach orchard is twenty years, but there are many profitable orchards much older than this, when they have received good care.

A failure of a peach crop has never been known in California, and although in some years the crop has been curtailed by late spring frosts, growers have never practised smudging to any extent.

GEORGE C. ROEDING.

Protecting peach trees in cold climates.

Numerous ways of protecting peach trees from the effects of trying winter weather have been devised. Such plans include the placing of a protective covering about the trunk and branches of the tree. Cornstalks, straw, hay, evergreen boughs, and similar materials may be used for this purpose. Some persons have tried the plan of laying the tree on the ground, but this only makes the work of covering easier as well as more effective.

Peach trees may be laid on one side with comparative ease and without much injury, providing the process is begun when the trees are small. The root-system is manipulated at this time in such a way that most of it extends in two opposite directions. This is accomplished by cutting the roots, beginning when the trees are small, preferably the first winter after planting and thus accustoming them to the treatment from the beginning. If this plan is followed from the start, a
little work with the spade will suffice to lay a tree down. Once on its side, the branches should be gathered together with twine and the covering put in place and weighted down.

An interesting method of laying a tree down without disturbing its roots was devised a number of years ago. This is accomplished by bending the newly planted tree over to the ground, where it is fastened. The side branches at first move as fast as they appear, thus inducing a long straight growth. After the prostrate stem has attained a length of 10 to 12 feet, an upright top is allowed to develop. At the approach of winter, the top of a tree trained in this manner can be pushed over easily, as the long prostrate trunk serves as a lever or pivot. The long exposed trunk will need to be protected at all times from the effects of the sun. This is easiest done by using an inverted trough made of light boards.

The process of laying trees down under irrigated conditions is somewhat simplified, as the ground can be made very soft by the use of water. Here, again, the work should be begun the first winter after planting. The ground about the young tree is first saturated with water from the irrigation ditch. The trees are then pushed over in the direction that offers the least resistance. After the branches have been drawn together with the cover, the first burlap, then with a light coating of earth. As the trees become more mature, a basin about 4 feet in diameter is made in the earth about the trunks before the water is turned in.

The neatest of judgment must be used in removing the covering in the spring, as a little too much warmth or a slight exposure to cold may mean the loss of the year's work. At the first sign of swelling buds in the spring, the earth covering must be lightened during the middle of the day and of covering for the night extends through a comparatively long period.

After the danger of frost is passed, the ground is again irrigated and the trees are raised. Trees so handled are unable to support themselves in an upright position, consequently they are supported at an angle by props. It is estimated that the entire labor of laying a tree down, covering and of raising again in the spring, can be done at a cost of 50 cents a tree.

PEANUT (Arachis hypogaea). Popularly the peanut, as the name indicates, is called a nut, but it may properly falls into the class of grain or forage crops. The fruit or "nut" is really a pod, comparable with a bean-pod or pea-pod. The plant is related to beans and gins. The seeds (comparable with bean seeds) furnish excellent food for man as well as for his beasts and fowls, and the cured tops make an excellent hay or forage. The peanut is usually not classed with horticultural crops; for a fuller account, see Vol. II, "Cyclopedia of American Agriculture".

Commercially, the peanut is not grown north of the latitude of Washington, D. C., but on the sandy and loamy soils to the south and west of the above-named city, on lands that have recently been limed, it may be used as a rotation or as a special money crop. North of this territory the plant can be used with profit as a forage for hogs, although only a portion of the pods set will come to maturity. As a garden plant, the peanut can be grown as far north as central New York, but only a few pods will actually mature seeds, except in long warm growing seasons.

There are two general types of peanuts: those known as bunch nuts, and as vine or trailing nuts. The bunch nuts are most desirable because the tops can be more easily harvested for forage, the row's may be closer together and the distance between the plants in the row may be less than with the vining types. The culti­vation, as well as the harvesting (digging) is easier. The bunch type of nuts, such as the Spanish and Valencia, may be planted in rows 30 to 36 inches apart, with the seeds scattered 6 to 10 inches apart along the row. The large-seeded thick-shelled nuts require to be shelled before planting in order to insure satisfactory germina­tion, but the smaller thin-shelled sorts may be planted whole and a good stand secured. The planting season, as well as the field care of peanuts, is practically the same as for corn. They are tender to frost and grow best during warm weather. The vines will be killed by the first frosts, but when desired for forage should be harvested in advance of that date. As the pods or nuts are borne beneath the surface of the soil, the crop is harvested by lifting or plowing out the whole plant, separating it from the earth and curing the plant and pods together by stacking them in tall narrow stacks built up around a slender stake about 6 feet high, at the bottom of which cleats 3 feet long have been nailed in such a way as to keep the plants off the ground. The stacks are so built as to cause the vines to protect the nuts. The roots with the nuts attached are placed next the stack, with the stake, with the top of it covered with a light coating of earth.

The cultivated pear, as known in North America, is derived from two distinct sources, the European Pyrus communis and the Oriental Pyrus serotina. Pears of the European stock have been grown in North America from the earliest settlement of the country. They thrive particularly well in the New England states and New York, and west to the Great Lakes, and again on the Pacific slope. In the great interior basin, pear-culture always has been precarious, due primarily to the great liability of the trees to blight.

In the southern states, the climate is too hot for the best development of the tree and the best quality of the fruit. In the north prairie states, the winter climate is so severe that the pear tree will not grow. Forms of pears are shown in Figs. 2806 and 2807, as representing the common species. Some time before the middle of the preceding century the sand or Chinese pear (Pyrus serotina, formerly Pyrus pyrifolia, Pyrus communis) was introduced into the eastern states, although it attracted little attention. It soon hybridized with the common pear, and a race of mong­rel varieties was the result. Of these hybrids, only two have gained great commercial prominence. These are LeConte and Kieffer (Figs. 2808, 2810, 2811). The LeConte, which appeared about the middle of last century and which is the first of the American hybrids, so far as we know, was found to be well adapted to the southern states and its general introduction there after the close of the Civil War marked the beginning of commercial pear-culture in the South. It was first supposed to be bight-proof, but, in later years, orchards have been nearly decimated by the

L. C. CORBETT.
blight, with the result that the LeConte is gradually lessening in importance and its place is being taken by the Kieffer, although the latter is by no means blight-free. The Kieffer pear originated with Peter Kieffer, of Roxborough, Philadelphia, an Alsatian gardener, who died in 1890. He grew the Chinese sand pear or Sha-

Lea and sold the seedlings as ornamental trees, for this species is of very distinct and handsome growth and the fruit is ornamental and fragrant. Alongside the sand pears were Bartletts. Amongst one of the batches of seedlings from the sand pear he noticed a plant with different foliage, and this he saved. Its fruit was found to be superior to the sand pear, and it was introduced as the Kieffer. It fruited in 1873. The Kieffer pear is now very popular in many parts of the country because of its great vigor, healthiness, productiveness, and the keeping qualities of the fruit. In point of quality, the fruit is distinctly inferior, but it meets the demands of the market and is an excellent fruit for canning.

Pyrus serotina itself bears a very hard pear which is inedible in the raw state, but it is excellent when used for quinces are. It is fragrant and ornamental. The tree is a most vigorous and clean grower. The plant is well worth growing as an ornamental. It is used for stock for ordinary pears, particularly in the southern states. For an historical and horticultural account of the oriental pears and their hybrids, see Bulletin No. 332, Cornell Experiment Station, by Cox (under direction of the late John Craig).

In the cold prairie countries and other parts of the cold north, Russian pears have gained some headway in recent years. These are hardy types of Pyrus communis. The fruit is usually of low quality, but the trees are considerably harder than the ordinary pear.

Pear-culture is the one American fruit industry which seems to show little expansion. Pears are not a popular dessert fruit in this country, and the product is largely used in canning. This is a great pity, and a loss to the people. The cultivation of the Kieffer on a large scale has probably bred a generation of people who are little aware that the pear is a fruit that may be good to eat out of hand; and the commercial and cultural difficulties are greater than with other fruits.

The pear thrives on a variety of soils, but it succeeds best on those that are rather hard clay. On sandy and loamy lands it tends to be short-lived. This is perhaps due, in part, to the fact that trees grow rapidly on such lands, and are, therefore, more liable to the attacks of blight. It is now generally accepted that trees which are making a strong and soft growth are more susceptible to blight than those which grow rather slow and firm, although all trees are liable to attack. Some varieties are more nearly immune than others. Caution must be exercised, therefore, in the tilling of the pear orchard. Whilst pears profit by the best tillage, as apples and potatoes do, it is easy to carry the tilling and fertilizing so far as to produce too vigorous growth and thereby invite the blight, and this disease is the one great menace to pear-culture. Therefore the most careful pear-growers use sparingly of stable manure and of nitrogenous cover-crops. They prefer to supply fertility by means of concentrated fertilizers which are not very rich in nitrogen. If, however, the trees are not making a strong and steady growth, it is as necessary to apply nitrogenous fertilizers to the pear tree as to any other.

In the interior country, pears are likely to suffer from sun-scald, and therefore the tops are started very low, usually not more than 2 or 3 feet from the ground. Standard pears (those not grown as dwarfs) are pruned much as are apple trees, except not so severely. Heavy pruning may open the top and invite sun-scald, and it also tends to make too strong and sappy growth. After the top of the pear tree is well formed and established, it is customary to do little pruning, only keeping the top fairly free and open.

The pear bears mostly on spurs which continue to branch and to bear for a number of years, and in pruning it is important that these spurs be not removed unless it is desired to thin the fruit. The flowers are borne in umbel-like cymes (Fig. 2805), but in most kinds only one fruit sets in a cluster. Pear trees are usually planted much closer than apple trees. The customary distance is 13 to 20 feet. Fig. 2812 shows an average east-American pear orchard. Fig. 2813 is a picking scene.

Many of the varieties of pears are infertile with themselves; they need the pollen of other varieties to cause them to set fruit freely. Probably any variety will fertilize any other variety in case the two bloom simultaneously. Such varieties as Kieffer and Bartlett are usually classed as self-sterile kinds, but the degree of sterility varies in different places and with different conditions. The safest plan in the setting of a pear orchard is to plant not more than two rows of one variety together, and to alternate with one or two rows of another variety.

Good varieties of pears are numerous. The one most important variety is the Bartlett (Fig. 2806), which was early introduced into the United States from Europe, where it is known as the Bonchretien. At present, the Kieffer probably holds second place. In the eastern states, the Seckel (Fig. 2814) is a prominent variety, and is the standard of quality. Other prominent varieties are Anjou (Fig. 2815), Clairgeau, Hardy, Howell, Sheldon, and Diel. These might be almost indefinitely extended. In the Gulf region, the oriental hybrids
alone are successful, and the leaders are Kieffer, LeConte, Garber, and Smith. The most notable pear of early American origin is undoubtedly the Seckel, which originated near Philadelphia in the eighteenth century. As late as 1880, the tree presented the appearance shown in Fig. 2816, which appeared (in larger size) in the Gardener’s Monthly. In 1906, all that remained was a dead and decayed stump (Fig. 2817).

The season of the maturity of pears runs from midsummer on, and it is introduced by Summer Doyenne and (Manning) Elizabeth, to late winter, when it is closed with such late winter varieties as Nels (Winter Nels), Malines, and others. The winter pears are relatively little known in the eastern states. As a rule, they come into bearing late or are not very prolific; but there is no reason why they should not be better known. Winter pears are kept as are winter apples, although somewhat greater care is necessary. They should be stored in a uniformly cool temperature. If allowed to hang too long on the tree, they become overripe, and then if placed in an ordinarily warm cellar, they do not keep more than one or two months.

Unlike most other fruits, all pears are greatly improved in quality if they are ripened indoors. They should be picked as soon as they have reached their full size and have begun to color, but before they have become soft, and be placed in a dry and rather cool room. If the wind is allowed to blow over them, they are likely to survive. If kept too warm, they ripen too quickly and soon rot. The best quality is secured when they are picked about two weeks in advance of their normal ripening.

Pears are marketed much as are apples, although the barrel is little used for the dessert varieties. For export, as well as for a good home trade, the following sentences by George T. Powell are useful: “The fruit should be gathered when it has reached its most perfect development, but not allowed to come to its full maturity or approximate ripening. This is the right condition of fruit when it is to be shipped without refrigeration. With refrigeration, a little fuller maturity may be allowed. Each specimen should be wrapped in paper. A layer of excelsior should be placed on the bottom of the box, which is marked to be opened; over this place a sheet of paper. Pack the pears in single layers, nailing cover securely under considerable pressure. Boxes should hold thirty-six large pears, and sixty of medium size. (Fig. 2818.) This is a refinement of even the best packing for the common domestic trade. (Fig. 2819.)”

Dwarf pears.

When worked on the quince root, the pear is easily grown as a dwarf. The free stocks—those grown normally on pear roots—are known in this country as standards. The dwarf pear comes into bearing earlier, and, since the trees are small, the fruit can be thinned and the trees sprayed, and the fruit therefore should be of the highest quality. Dwarf pear trees require more care than the ordinary standards, however, and they should not be planted unless the cultivator understands this fact and is willing to give the attention that they need. Although the trees are by nature dwarf, since they are worked on a smaller-growing species, they nevertheless tend to become half standard if left to themselves. Therefore they must be very severely headed-in every year. A dwarf pear tree should never reach a greater height than 12 feet. Light keep it down to this stature, from one-half to two-thirds of the annual growth is removed late each winter. The trees are often planted as close together as 10 feet each way, but this is too close. With the ordinary broad-top pruning, which is the general practice among American growers, each way is not too great. A good dwarf pear tree is one in which the union with the quince stock is very close to the ground. When the tree is planted, this union should be 4 to 6 inches below the surface after the ground has settled. This deep planting prevents the breaking of the union and places the quince beyond the reach of borers. If planted deeper than this, the pear union may throw out roots of its own; in fact, it sometimes does this if planted only 6 inches deep. This rooting of the stock is no particular disadvantage, although the tree thereafter tends to grow stronger and greater pruning is necessary. An expert grower can pick out the trees which are rooted from the pear stock by their more vigorous growth; if he desires to check this redundant growth he may cut off the pear roots. It is the common opinion that dwarf pear trees are short-lived. This may be true as regards the greater number of specimens which one sees about yards and on untilled areas, but a dwarf pear orchard on good well-drained ground, which is well-tilled and given regular pruning, will last a lifetime. Many varieties of pears do well when grafted on the quince root, but the one that is most often grown as a dwarf is the Angouleme (Duchesse d’Angouleme). (Fig. 2820.) This is a large pear of irregular shape which sells well because of its size, but it is of indifferent quality and may not be good enough for a special or personal market. Other varieties popular for dwarfs are Louise Bonne, Anjou, Clairgeau, Elizabeth, and, to a less extent, Bartlett and Seckel. Even Kieffer is sometimes dwarfed with satisfactory results. The growing of dwarf pears is a special practice; in general it is not commercially profitable.

Writing on dwarf pears from a long experience in New York, L. T. Yeomans says: "The soil best adapted to dwarf pears is a rich loam, with a subsoil that requires thorough underdraining—a tile drain within 5 feet of every tree in the orchard would be thorough draining. The soil should be good strong corn or potato ground, and kept in such condition of fertility from year to year, for which purpose good well-composted barnyard manure has no equal, but may be supplemented by other fertilizers—as ground bone and potash. Small crops, as beans and potatoes, may be grown between the trees the first few years after planting, but never should they be allowed in the least to interfere with thorough tillage, or to rob the trees of proper and desira-
nearly all efforts have been failures. The best success, according to C. L. Watrous, "The difficulties of pear-growing in
Above the 40th parallel and west of the Great Lakes, the upper Mississippi Valley are many and grievous. The general lines of pear-growing in the Atlantic states, but there are some radical points of difference. Accord-

"Dwarf pears require thorough annual pruning, which may be done at any convenient time after the falling of the foliage and before the buds become in the least swollen in the spring; but, where the cold is severe, it is better not to prune till about the first of March. This pruning should begin with the first year, and be continued annually during the life of the tree, cutting back all of the growth to within four to eight buds, and thinning out all surplus branches which will not be wanted for fruit. To three or four buds to the year, the tree shall be open-headed, with opportunity for plenty of air and sunshine all through the tree, without which superior quality of fruit cannot be grown. The lower limbs should be within 20 to 24 inches of the ground. Trees when twenty to fifty years old should not be more than 12 to 14 feet high, and the diameter of the branches about 12 to 16 feet. [See Fig. 2821.] It is a very erroneous impression that a dwarf pear orchard under proper conditions is short-lived. There are in the United States orchards in vigorous condition, and now producing annual crops, that are from thirty to fifty years old.

"Some of the advantages of dwarf over standard pears are: more trees can be planted to the acre, they come into bearing much younger, the fruit is not so liable to be blown off by early winds before maturity, it is much more quickly and easily gathered than from high

Insects and diseases.

The insect enemies of the pear are numerous, but, with two or three exceptions, are not very serious. The tree is attacked by borers, although to a less extent than peaches and apples. These are kept in check by digging them out once or twice a year as on other fruit stocks. The fruit is attacked to some extent by the codlin-moth, but the arsenical sprays keep this insect in check. Of late years the psylla, attacking the growing parts, has been very damaging in parts of the East, although it is irregular in its outbreaks. It can be controlled by thorough work with a spray in winter and also when the blossom-buds are expanding, at the former time by the use of "Black Leaf 40" tobacco preparation or kerosene emulsion and similar compounds, and at the latter period by lime-sulfur. If the rough bark is removed in winter and burned, very many of the pests will be destroyed. In some parts of the East the fruit is attacked by the pear midge, a minute fly whose mag-

2809. LeConte pear. (X 3/4)

trees, the fruit is larger and of better quality than that on standards. All varieties do not succeed equally well as dwarfs, because they do not all form an equally perfect union with the quince. Angouleme is the leading and most profitable variety now grown as dwarf, although many others succeed well."
(flowers and tips of shoots) and thrives in soft of 'succulent' parts. Gradually the micro-organism works down the stems, killing the tissues and causing the leaves to die. In the leaf-blight, which is a distinct disease, the leaves are more or less spotted and they fall; in the pear-blight, the leaves turn black and hang on the tree. The fire-blight also attacks apple trees, particularly in the Plains region. It is probably aboriginal on hawthorns and related plants. There is no perfect preventive of the disease. Some varieties seem to be relatively immune, as, for example, the Angouemar. It is now generally believed that trees are more subject to the disease when they are making excessive growth; therefore it is advised that tillage and the application of stimulating manures be moderate. As soon as the disease appears, cut out the affected parts, severing them some inches below the lowest point of visible attack. Do not allow blighted branches to remain on the tree over winter. Disinfect the wounds or stubs and the implements with bichloride of mercury or other antiseptic. Destroy hedgerows and thickets in which are other trees on which the blight is carried, as hawthorns, quinces, and diseased apple and pear trees. It is probable that there is a connection with insects in the spread of pear-blight.

Literature.

There are no recent American books on the pear. Two books have been written on this fruit: Thos. W. Fields’ “Pear Culture,” New York, 1858; P. T. Quinn's “Pear Culture for Profit,” New York, 1869, new edition, 1883. There are bulletins from the United States Department of Agriculture and some of the state experiment stations. Many years ago the writer secured from the venerable T. T. Lyon (Vol. III, page 1585), an article, for publication, on the pear. This was published in the “Cyclopedia of American Horticulture.”

The Editor is glad again to place this article alongside the others in order to contrast the viewpoints of two generations. Mr. Lyon’s article, which is excellent and cautious and characterized by beauty of style, is of the type that we no longer see. The person who is familiar with present-day points of view will discover that it lays the emphasis on formal presentation, propagation, pruning, varieties, whereas little or no attention is given to systems of tillage, pollination, spraying, and commercial methods. The methods in pear-culture, and the varieties, have probably changed less in the last fifteen to twenty-five years than those of any other standard fruit; as a whole, pear-culture is not extending to any marked degree; and the article that follows is still timely.

L. H. B.

The pear and its cultivation.

So far as cultivators generally are concerned, this fruit is less important than its near relative, the apple, for the reason that, while the two begin to ripen at nearly the same season, there are few, if any, desirable varieties of pears in season later than December (if we except a few austere ones, suitable only for culinary purposes), while apples are abundant for four or five months longer. Moreover, during its entire season, the pear is supplemented by the mass of luscious, though perishable, summer and autumn fruits. The liability of very many usually excellent varieties to be rendered indifferent in quality by unfavorable seasons, neglect or unsuitable soil, is also a serious detriment to the general popularity of this fruit. The liability to the loss of the trees by blight, beyond question detracts greatly from the value of the pear, especially for commercial purposes; while it also exerts a discouraging influence upon amateur planting. To the careful and discriminating amateur, as well as to the man of wealth, with a fondness for fruit-culture whether in person or by proxy, this fruit often assumes a prominence over any, if not all, others.

Extent of cultivation.

Doubtless, for reasons heretofore stated, pear trees are but sparingly planted by most persons. The fruit sent to market comes largely from the plantations of specialists who, with soils adapted to the purpose and the necessary knowledge of varieties, have undertaken the business as a commercial enterprise. In the climates of the seacoast, and, to a considerable extent, in the region of the Great Lakes, the pear is exceptionally successful; while away from the influence of large bodies of water, and especially in the prairie regions of the Mississippi Valley, from unsuitableness of climate or soil, or both combined, the trees are liable to be either killed or seriously injured in winter, and hence are short-lived and unprofitable.

Aspect.

Perhaps in no other important particular does the climate of eastern and central North America differ more widely from that of the pear-growing regions of Europe than in its liability to sudden and extreme variations of temperature. Owing to this climatic peculiarity, aspect becomes an important consideration in the selection of a location for a plantation of pear trees. As a means of avoiding the full influence of exposure to the rays of the sun, during the severer paroxysms of summer heat, while the trees are in actual growth, and also to mitigate the liability to alternate freezing and thawing in winter, a northerly or north-easterly slope is to be preferred; which, however, should be so gradual as not seriously to interfere with the convenience of cultivation. As we approach the northern limit of practicable pear-culture, however, a modification of this rule of selection may be found desirable, since, with the shorter growing season, a warmer exposure may prove necessary as a means of hastening maturity.

Soils.

While the pear tree will yield more or less satisfac-
tory results in a variety of soils, it is found to succeed most perfectly in a strong loam, of moderate depth, overlying a porous subsoil. Soils which are liable to be wet during any considerable portion of the growing season are unfit for this purpose, unless deeply and thoroughly underdrained; while even then they are quite liable not to prove fully satisfactory. A few varieties are found to be moderately successful on sandy soils, but for general planting such soils should be avoided.

**Manures.**

The liability of the pear tree, in this climate, to the attacks of blight is thought to be increased by excessive growth. It is, therefore, desirable that the annual growth be completed, and ripened at as early a date as practicable; and the more so since the liability to blight apparently exists only while growth is in actual progress. Stable and other nitrogenous manures should, for this reason, be applied in moderate quantities, in autumn, after the liability to excite renewed growth shall be past. Potash, lime, and phosphates, which enter more or less largely into the composition of both tree and fruit, and which rarely exist in excess in the soil, may be profitably applied in either autumn or spring. Sulfur may also be profitably applied to the comparatively dry soils recommended for the pear, but with care not to apply in excess. One or even two quarts may be safely applied to each tree, before the commencement of growth in the spring, if well distributed upon the surface over a space of at least 6 or 8 feet in diameter, and left to be carried gradually into the soil by dew and rain. It is believed to possess little, if any, manurial value; but to act rather as a conservator of moisture, and probably also as a repellant of insects. Coarse mulch may be placed about the trees, covering the soil as far out as the roots extend, for the purpose of keeping the earth cool, and also to check evaporation from the soil; but this should not be done as a substitute for cultivation; and the soil beneath the mulch should be kept well pulverized.

**Propagation.**

(a) By seedlings: Seeds, when to be planted for the origination of new varieties, should be selected from well-grown and fully matured fruits, of such varieties as possess in a high degree the qualities sought to be reproduced or improved, since a variety in which a characteristic is strongly developed and persistently manifested is the more likely to transmit such peculiarity to its offspring. Seeds resulting from known or artificial cross-fertilization, and therefore of known parentage on both sides, offer increased probability of valuable results. Seeds intended for the origination of new varieties should be planted very thinly in strong, rich, deeply prepared soil, in a single row, and covered with not more than an inch of earth, so that the young plants shall have ample space for development.

Seeds intended for the growing of stocks for nursery purposes should be collected from varieties in which the seeds are plump and well developed, as well as from healthy, vigorous trees. American nurserymen obtain pear seeds mostly from Europe. Seeds intended for nursery stocks are usually planted in broad, shallow drills. In our American climate the foliage and unripened wood of seedling pears are very liable to be attacked during midsummer by leaf-blight or mildew, which prematurely arrests their growth. For this reason European stocks are generally preferred by nurserymen. This attack of mildew may often be partially or wholly avoided by planting in virgin soil remote from other cultivated grounds. Pear seedlings form a very long taproot during their first year, with few, if any, side-roots. For this reason they are taken up preferably in autumn, and the tap-roots shortened to 6 or 8 inches, when they may be replanted in nursery rows, and earthed up, or otherwise protected from heaving, or other injury during winter; or, preferably, they may be heeled-in, in a frost-proof cellar, and planted in spring, to be budded during the ensuing summer or left to become more fully established for budding a year later.

Seedlings intended for fruiting are usually transplanted in rows, about 8 feet apart each way, with the expectation that many will be found worthless, and either removed or destroyed. Seedling pears usually require to be fruited several years before their characteristics become fully developed. This generally recognized fact may be taken as a warning that the occasional effort to hasten the puberty of a seedling by fruiting a cion from it upon a bearing tree of different variety cannot be trusted to indicate the ultimate character of the fruit of the yet incipient variety, since it is impossible to foresee to what extent such transfer may interfere with the occult formative processes through which its ultimate qualities would have been developed.

(b) By budding: Seedlings of one or two years' growth, intended for standard trees, are usually planted from 6 to 10 inches apart in the nursery row; for the reason that space, as well as cultivation, must be economized in correspondence with prices, although it is impossible to grow trees of good form and properly branched of the size and age demanded by most planters when thus closely planted. Trees thus closely planted should be removed, or at least thinned, after having made one year's growth from the bud; while trees intended to be grown two or more years in the nursery row, and properly branched, should be given twice or even three times the space mentioned.

The budding of pear stocks may be done during July and August if they continue in a growing condition,
But they are liable to be attacked by mildew of the foliage, for which reason they must be closely watched, and should the malady prove troublesome the budding must be done as soon as properly matured buds can be obtained. Such stocks as, for any cause, were left un budded at budding time, together with any in which buds shall have failed, may be grafted the following spring; but this, as well as any and all grafting of the pear, must be done very early, before the earliest movement of the sap in spring. In the spring, as soon as the swelling of the buds indicates that the germs are alive, the stocks are cut back to force them into growth. Often to insure the formation of straight, upright, symmetrical trees, careful nurserymen leave 3 or 4 inches of the stock above the insertion of the bud, to which the young shoots may be tied, if it shall fail otherwise to take an upright direction. Shoots may also be thus tied to prevent their being blown out, or otherwise injured by the wind. These stubs should be cut back to the bud when no longer needed for the purposes indicated. Such sprouts as spring from the stock in consequence of the cutting back must be removed from time to time to encourage the growth of the bud. This should be done while they are yet tender and succulent, and cut, therefore, be taken off without the use of a knife. This process must be repeated as they reappear, unless it is rendered unnecessary by the failure or loss of the bud.

**Pruning.**

Beyond that described under the head of budding, little pruning is required during the first season, except to pinch in such side shoots as threaten to rob the one intended to become the trunk of the future tree. Early in the spring of the second year, all lateral shoots must be wholly cut away, and since the pear tends strongly to renew its growth from the terminal buds of the previous year, the shoot intended to become the trunk of the future tree must be cut down to the point at which the top is to commence, when the branches to form the head will start from the buds nearest the top. The uppermost shoot must, if needful, be confined in an upright position to constitute the continuation of the trunk.

The habits of growth of varieties differ so widely that no inflexible rule can be laid down to determine the height at which the top of a pear tree should be commenced, unless it be that the heads of the more spreading varieties should be started higher than those of a more upright habit. The preferences of the larger number of purchasers have begotten among nurseriesmen the practice of forming heads of all varieties at a height of 3 or 4 feet. This height is open to the objection that, while not seriously faulty in the case of such spreading varieties as Onondaga, Osaband (Summer), or Flemish (Beauty), it is essentially unsuited to such very upright growers as Buffum, Sterling, Clapp (Favorite), and even Anjou. In this particular, as in various others, the practice of nurseriesmen, begotten by the preferences of the average of their customers, fails to adapt itself to the needs of the more intelligent and considerate orchardist, and to those of even smaller planters, who regard the health and productiveness of their trees as of higher importance than the possibly increased convenience of cultivation.

A proper system of primary branches, upon which to grow a permanent head, should be provided from the growth of the second season. Probably the most satisfactory provision for this purpose consists of a central shoot with a few branches, at a height at its base. A head should, in no case, be grown upon two shoots, forming a crotch, since this will be very liable to split and thus ruin the tree. A few varieties, of which Rostiezer is a notable example, have the habit of producing but few branches, and also of making successive annual growths, mainly from the terminal buds of the previous year, thus forming a too open or straggling head. Such tendency is best overcome by cutting back the branches in spring, the effect being to increase their number, though at the expense of vigor.

After the primary branches have been developed, and the growth of the third year is in progress, comparatively little pruning will be found necessary beyond the occasional cutting away of a straggling or crossing branch, although there is a class of varieties, of which Summer Doyenne and Winter Nelis are types, which, especially when growing vigorously, incline to twist and straggle so awkwardly that the branches must frequently be tied in position to insure the formation of a satisfactory head.

Prior to the third or fourth year, all pruning must necessarily have for its object the direction and encouragement of wood-growth, for which purpose it is most effective when performed in late winter or early spring, while the trees are yet dormant.

The fact should not be forgotten that pruning, in proportion to its extent or severity, may be a tax upon the vigor and health of the tree, and, therefore, to be practiced as sparingly as possible. Such necessity may be a considerable extent avoided if the orchardist, with a well-defined ideal in mind of a tree such as he desires to produce, will, during the growing season, pass frequently through his plantation and pinch out, while yet small and succulent, all growths not needed for his purpose, at the same time "stopping" such of the reserved ones as may be too far outgrowing their fellows. With the efficient performance of this process while the framework of the top is being developed, very little pruning will remain to be done on the arrival of spring, while nearly the entire growth, which would otherwise have been pruned away in spring, will have been employed in developing the reserved branches.

While the cutting away of an occasional small branch may be done at almost any time, large branches should be removed only in case of actual necessity, and at a period early enough to permit the thorough drying and hardening of the cut surface prior to the movement of the sap in spring, as a means of preventing bleeding and consequent decay.

Summer pruning tends to check rather than encourage wood-growth, and since it acts to a greater or less extent as an obstruction to the circulation, it also tends,
as does the permanent bending of the branches and the hardening of the tissues, to hasten the formation of fruit-buds and the production of fruit.

The pear may be successfully grafted upon the white thorn, the mountain-ash, and the apple, and such grafts have occasionally proved more or less productive for a time, but in such cases the union between stock and elion is generally, if not always, imperfect; and such uncongenial combinations are therefore usually short-lived. The quince is the only dissimilar stock upon which the pear is extensively grown. Quince stocks for this purpose are largely imported from France. The Angers quince is generally preferred for this purpose. These stocks are usually planted in nursery rows at the age of two years, to be budded during the following summer, in the same manner as pear stocks. When intended for dwarf trees, nurserymen usually cut them back after one year's growth from the bud to the nearly uniform height of 18 inches, although with the more upright-growing varieties it is by many deemed preferable to branch them even 6 or 8 inches lower. Aside from the height at which they should be branched, the pruning and management should be identical with that prescribed for standards, with the important exception that when planted out for fruiting the junction between the quince and the pear should be 3 or 4 inches below the surface to encourage the formation of roots from the pear. Trees thus planted will begin to bear while yet growing solely from the quince stock, and will continue to produce fruit after rooting from the pear, thus affording the early fruiting of the dwarf, as well as the permanency of the standard.

Not more than a specimen or two should be permitted to grow upon a dwarf the first and second years after planting. Such trees, if left to fruit freely, will almost certainly be ruined from overbearing before they are fully established. Many varieties when grown as dwarfs can never be safely allowed to mature more than a small portion of the fruit which they will naturally set.

While several varieties are found to be especially successful when grown upon the quince, most others prove only moderately so, requiring careful and expert management to insure satisfactory results. A few others, of which Bose may be named as a prominent case, are obstinately unsuccessful upon the quince, and even when double-worked upon a dwarf of a congenial variety, their success appears to be by no means assured.

Dwarf trees trained as hereinbefore specified are commonly known as half-standards. Other and more elaborate forms are known as pyramids, cordon, and the like, descriptions of which are not deemed necessary here.

**Choice of trees.**

Aside from the selection of the location for an orchard, the first important particular is the selection of the trees, leaving the choice of varieties for subsequent consideration. Trees of one year's growth from the bud are to be preferred for the following reasons: (1) Fewer roots need be injured or lost in the process of lifting and replanting, for which reason the tree may be expected the more promptly to recover from the shock of removal. (2) The single season's growth may be cut back and the top commences to suit the preferences of the planter. (3) The top will present little or no obstacle to the force of the wind until the roots shall have gained such hold upon the soil that there will remain little liability to displacement from this cause. (4) The risk of failure from removal is greatly diminished, while the more prompt recovery and increased rate of growth of the trees in the more open orchard rows may be expected to compensate fully for one or two years more of growth in crowded nursery rows. (5) Something will also be saved in the cost of the trees and in the expense of transportation, as well as in the labor of planting.

If older or high-branched trees are not objected to, it will usually be found that they are but imperfectly branched from having been grown in crowded rows.

**Preparation of the soil.**

When the late John A. Warder was asked how large the holes should be dug for planting orchard trees, he replied, "Of the full size of the orchard;" and it may also be remarked that when the ground for an orchard has been well tilled and fertilized to a depth at least equal to that at which trees are to be planted, there is no longer occasion for holes larger than shall be necessary to receive the roots in their proper position. If the subsoil be not freely pervious to water, the ground must be deeply and thoroughly underdrained, and in no case should the hole in which a tree is to be planted be sunk into a subsoil so impervious as to retain water beneath or about its roots. If such retentive subsoil occurs too near the surface and is not considered suitable to be mixed with the surface soil, it should be thoroughly disintegrated to the requisite depth by means of the plow or other equivalent device. In all nearly level retentive soils, it will be found advantageous to "back-furrow" a land along the line of each row in the direction of the surface drainage, so that when the trees have been planted the drainage will be away from them.

**Laying out, staking, and planting.**

The most economical mode of laying out and planting an orchard, so far as space is concerned, is doubtless that commonly, but erroneously, designated as quincunx, and more correctly as hexagonal; but whether planted thus, or in rectangles, the work may be most rapidly and accurately done by planting a stake where each tree is to stand, and using what is known as a planting-board, consisting of a strip of board 6 or 7 feet long, with a hole for a stake near each end, and a notch or a slot intermediate and in line between them to receive the stake, and to support the tree while the earth is being carefully filled in, under, among, and above its roots.

The following are good general rules to be observed
in the digging, handling, preparing, and planting of trees:
1. In digging trees, aim to secure as many of the main fibrous roots as possible.
2. Expose the roots as little as possible to the drying influence of sun and wind.
3. Prepare the roots for planting by cutting away the bruised and broken portions.
4. If the roots have been essentially shortened in lifting, cut away the superfluous branches and also cut back such as are to remain till a proper balance of root and top is secured.
5. In heavy retentive soil, plant the tree very little if any deeper than it stood in the nursery, and, in addition, raise a slight mound about the trunk to avoid the occurrence of standing water at that point.
6. In strong but dry soil, a tree may be planted an inch or two deeper than it stood in the nursery.
7. In light sand, with dry subsoil, a tree should be planted 3 or even 4 inches deeper than it stood in the nursery.
8. Dig the hole in which a tree is to be planted deep enough to receive 2 or 3 inches of fine soil, before putting the tree in place, making it large enough to allow the roots to spread out in their natural position.
9. See that good, friable surface soil is well filled in beneath, among, and over the roots.
10. Should the soil be dry, with no immediate prospect of rain, it will be well after nearly filling the hole with earth, to apply a pail of water, and, after it shall have settled away, to fill up the hole with earth and tamp it down firmly. Staking will rarely be found necessary, except, possibly, in the case of trees old enough to have been already branched, but such stake must be watched and the tree protected against injury by rubbing against it.

Subsequent cultivation.

(a) Newly planted trees: Ground occupied by young trees must be kept well cultivated during the spring and early summer. If hoed crops are planted, larger quantities of manure will be required; but, in either case, cultivation should cease as early as the beginning of August in order to hasten the ripening of the young wood. This process should be continued during at least five or six years, after which green crops may be grown and plowed under as a means, in part, of maintaining the fertility of the soil.

(b) Mulching: Especially during the first few years after planting, in case of hot dry weather during the growing season, mulch may be applied to check evaporation from the soil and to keep it cool, but it should not be permitted to take the place of cultivation. The soil should be well pulverized before applying it.

(c) Manuring: As stated previously, manures should be applied sparingly but regularly, preferably in late autumn, and should be plowed under, or otherwise mixed with the soil at that time or in the early spring, as a means of promoting early growth and the thorough ripening of the wood in advance of severe cold.

Thorough manuring of the wood should also be assisted, as already said, by ceasing cultivation the early part of August.

Gathering and ripening the fruit.

All selected pears, whether intended for the market or for use at home, should be carefully hand-picked.

(a) Gathering summer and autumn pears: With very few exceptions all pears acquire a better quality if gathered before they are fully ripe. The generally accepted rule is to gather the crop when an occasionally fall-grown wormy specimen is ripe, or when there is a perceptible change in the color of the mature specimens, or when the stem parts readily from the branch if the fruit is slightly lifted.

(b) Ripening summer and winter pears: When gathered, the fruit should be placed in a cool, frost-proof room devoted to the purpose, and spread upon shelves, or in lack of a suitable room they may be placed in shallow boxes or drawers, where in due time they will acquire their full color and flavor. Since this fruit parts with moisture quite freely, it, and especially the later ripening varieties, should be protected from drafts of air, which will cause the fruit to shrivel and become tough and leathery. It is also true of at least very many varieties that even if blown off or gathered when but two-thirds grown, the fruit if put away as already described will usually acquire a satisfactory quality. Fruits thus gathered and ripened are found to have less tendency to decay rapidly at the core.

(c) Gathering and ripening of winter dessert pears: These should remain upon the tree as long as practicable without danger from frost. When gathered, they should be placed in a cool, frost-proof room, and it will be well also to wrap each separately in soft paper. Some varieties are found to ripen perfectly without further attention, but the quality of most kinds will be much improved if they are brought into a temperature of 60° or 70° a fortnight before their usual season of maturity.

(d) Winter cooking pears: These should be gathered and put away in close packages in a cool, frost-proof room, in the same manner as russet apples, like which they will shrivel, and become tough and leathery if left exposed to the air. They may remain in this condition until needed for use.

Packing and marketing.

In America, pears are generally packed for market directly from the tree, without awaiting the process of ripening. Barrels are largely used as packages, although this fruit is frequently put up in half-barrels and sometimes in bushel, peck, and even in half-peck baskets.
American growers rarely ripen their fruit before marketing it. Thus, if done at all, is more generally accomplished by the dealer, doubtless with decided profit, since in the larger cities fully $50 have been known to be paid for a single barrel of selected fruit, and yet the same fruit ripened and offered in quantities to suit customers has been sold at ten or three times the original cost. The marketing of unripened pears is obviously unprofitable so far as the producer is concerned.

In Europe, the choicest fruits are carefully selected and house-ripened. When approaching their best condition the fruits are separately wrapped in soft paper, and are then put up in packages of perhaps one or two dozens, and sent so as to appear upon the market when in the best possible condition. Such fruits command prices quite in excess of what they would have realized had they been offered in an immature condition.

**Varieties.**

Since the popular and desirable varieties of pears may be found fully described in standard pomological works, such descriptions here are not deemed necessary. Among the very numerous varieties of pears described in such works there are doubtless many possessing high quality and other valuable characteristics, which, for some unexplained reason, have failed to attract the attention of growers.

Since varieties vary in their season of ripening with change of latitude, and often, to some extent, with change of location, even in the same latitude, the designation of such season becomes a matter of more or less difficulty. In the following lists the season given will be approximately that between parallels 42 and 45 of north latitude.

(a) Amateur pears: It is as true of the pear as of most other species of fruits that very many varieties are of small size, unattractive appearance, or of such delicate texture when ripe as to disqualify them for the market, although they may possess, in an eminent degree, the peculiar characteristics which render them desirable, and to persons of cultivated taste, indispensable for the supply of the family. Such are termed amateur pears.

The following is a list of a few of the most popular of these, arranged approximately in the order of maturity:

<table>
<thead>
<tr>
<th>Name</th>
<th>Season</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madeleine</td>
<td>m. july</td>
<td>Earliest good pear</td>
</tr>
<tr>
<td>Summer Doyenne</td>
<td>e. july</td>
<td></td>
</tr>
<tr>
<td>Bloodgood</td>
<td>e. july</td>
<td>m. aug.</td>
</tr>
<tr>
<td>Giffard</td>
<td>m. aug.</td>
<td>Excellent, but very per-</td>
</tr>
<tr>
<td>Doherty</td>
<td>m. e. ab.</td>
<td>Injurable</td>
</tr>
<tr>
<td>Roatesser</td>
<td>m. aug.</td>
<td>m. sept.</td>
</tr>
<tr>
<td>Elizabeth</td>
<td>e. aug.</td>
<td></td>
</tr>
<tr>
<td>Bra zwyne</td>
<td>e. aug.</td>
<td>b. sept.</td>
</tr>
<tr>
<td>Tyson</td>
<td>e. b. ang.</td>
<td>A tardy bearer.</td>
</tr>
<tr>
<td>Stevens (Genesee)</td>
<td>b. sept.</td>
<td>Rots soon at the core.</td>
</tr>
<tr>
<td>Clapp</td>
<td>b. m. sept.</td>
<td>Rots soon at the core.</td>
</tr>
<tr>
<td>Washington</td>
<td>m. sept.</td>
<td></td>
</tr>
<tr>
<td>(Belle) Lucrative</td>
<td>m. e. sept.</td>
<td></td>
</tr>
<tr>
<td>Bose</td>
<td>e. sept.</td>
<td>Oct.</td>
</tr>
<tr>
<td>White Doyenne</td>
<td>e. sept.</td>
<td>Nov.</td>
</tr>
<tr>
<td>Seckel</td>
<td>Oct.</td>
<td></td>
</tr>
<tr>
<td>Sarah</td>
<td>Oct.</td>
<td></td>
</tr>
<tr>
<td>Gray Doyenne</td>
<td>m. oct.</td>
<td>Nov.</td>
</tr>
<tr>
<td>Reeder</td>
<td>Nov.</td>
<td></td>
</tr>
<tr>
<td>Huyot (Emile d’Huyot)</td>
<td>Nov.</td>
<td>Dec.</td>
</tr>
<tr>
<td>Mount Vernon</td>
<td>Nov.</td>
<td>Dec.</td>
</tr>
<tr>
<td>Dana Hovey</td>
<td>Nov.</td>
<td>Jan.</td>
</tr>
<tr>
<td>Langelier</td>
<td>Nov.</td>
<td>Feb.</td>
</tr>
<tr>
<td>Germain</td>
<td>Nov.</td>
<td>March.</td>
</tr>
<tr>
<td>Lawrence</td>
<td>Dec.</td>
<td></td>
</tr>
<tr>
<td>(c) early; m. middle; b. beginning.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Culinary pears: Very few dessert pears are found to be satisfactory for culinary uses, since they too generally lose at least a portion of their flavor and aroma in the process of cooking. There are, however, several varieties of high, lustre character which prove adapted to this purpose, among which are the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Season</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veyr</td>
<td>Nov.</td>
<td>Jan.</td>
</tr>
<tr>
<td>Napoleon</td>
<td>Nov.</td>
<td>March.</td>
</tr>
</tbody>
</table>

(c) Market pears: The markets demand varieties of attractive appearance, of at least medium size and of fine texture. To the grower, productiveness and vigor of tree are also of primary importance. If possessing the foregoing characteristics, a variety may prove at least temporarily popular, even though of comparatively low quality. The following varieties, some of which may also be found in the amateur list, are all more or less popular as market fruits:

<table>
<thead>
<tr>
<th>Name</th>
<th>Season</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterling</td>
<td>e. Aug. m. Sept.</td>
<td>Products, and exceedingly beautiful.</td>
</tr>
<tr>
<td>Clapp</td>
<td>b. m. sept.</td>
<td>Rots soon at the core.</td>
</tr>
<tr>
<td>Bartlett</td>
<td>b. e. sept.</td>
<td>Leading market pear.</td>
</tr>
<tr>
<td>(Souvenir du) Congress</td>
<td>b. e. sept.</td>
<td>Sometimes very large.</td>
</tr>
<tr>
<td>Ruffin</td>
<td>m. sept.</td>
<td>Variable in quality.</td>
</tr>
<tr>
<td>Howell</td>
<td>m. sept. Oct.</td>
<td></td>
</tr>
<tr>
<td>Flemish (Beauty)</td>
<td>m. e. sept.</td>
<td></td>
</tr>
<tr>
<td>Bose</td>
<td>e. sept. Oct.</td>
<td>Excellent for all purposes.</td>
</tr>
<tr>
<td>Bousseck</td>
<td>e. sept. Oct.</td>
<td></td>
</tr>
<tr>
<td>Louise Bonne</td>
<td>e. sept. Oct.</td>
<td></td>
</tr>
<tr>
<td>Osmonds</td>
<td>e. sept. Nov.</td>
<td></td>
</tr>
<tr>
<td>Superfin</td>
<td>Oct.</td>
<td></td>
</tr>
<tr>
<td>Sheldon</td>
<td>Oct.</td>
<td>Is russeted and dull.</td>
</tr>
<tr>
<td>Le Conde</td>
<td>Oct.</td>
<td>Nov...</td>
</tr>
<tr>
<td>Angouleme</td>
<td>Oct.</td>
<td>Nov...</td>
</tr>
<tr>
<td>Columbus</td>
<td>Nov.</td>
<td>Jan.</td>
</tr>
<tr>
<td>Lawrence</td>
<td>Dec.</td>
<td></td>
</tr>
</tbody>
</table>

**Relative desirability of dwarfs.**

There are a few varieties, among which Louise Bonne and Angouleme may be especially mentioned, which on free (pear) stocks are either tardy bearers or require to be fruited several years before developing their ultimate qualities, but which succeed unusually well upon the quince. These, especially the Angouleme, are valued as market varieties when grown as dwarfs. Angouleme, and perhaps some other varieties as dwarfs, occasionally bloom so profusely as apparently to prove unable to develop the fruit, which in consequence proves abortive. The natural and obvious remedy in such case is disbudding, or its equivalent, cutting back the fruit-bearing shoots before growth is commenced.

The fact that very many varieties are not permanently successful when grown upon the quince is doubtless partially, if not in many cases even wholly.
due to their increased tendency to early and excessive productiveness when grown upon that stock, which, owing to the very common unwillingness of the grower to plow up the trees of fruit, is allowed to consume the material needed for wood-growth, and thus to occasion exhaustion before the tree has gained a thorough hold upon the soil.

The variety capable of forming a satisfactory union with the quince, and with the tree planted in the manner heretofore described, the entire crop of bloom upon the soil.

Vineyarding had become a matter of little gain, picking a few, flailing some and shaking off the remainder. All—good, bad, and bruised—are dumped into barrels and rushed to market."

There were growers who hand-picked their product, carefully packing it into ventilated barrels. These, however, were the smaller days of the industry $1 an ace was often paid for trees.

2819. Box of fancy pears; each fruit wrapped in paper.
same destination (a decreasing product because of the 2,725 carloads sent overland to eastern and foreign increasing demand for shipping fresh and canning); 2,821 Dwarf pear trees forty-five years old, in a New York city.

The distribution is still poor, and for the past few years some of these old trees grafted over mission trees, and some of these old trees grafted over the mines in 1849-1850 were gathered from the old ling pear trees in the mission gardens. Many of these trees survived the neglect which came upon the mission for particularly isolated and special places.

The profits from the remaining trees have not been sufficient to warrant further planting.

At present, the South as a whole cannot be considered as a pear-producing section. There are still quite a number of pear trees around the homes. These are rapidly disappearing, due to the blight and the lack of care. The old orchards along the Atlantic and the Gulf are rapidly dying with blight. The hybrid pears, LeConte, Kieffer, and Garber, do remarkably well in this part of the country; but the pear industry will never thrive as it did once until there is a systematic fight made upon the blight. Besides this disease, the pears are subject to bitter-rot, brown-rot and crown-gall, as well as the codlin-moth and the San José scale; but of course these insects and diseases can be easily controlled by spraying.

In the catalogue of fruits appended to the Proceedings of the Thirty-Ninth Annual Session of the Georgia State Horticultural Society is to be found this remark concerning pears: "Owing to the prevalence of the pear blight, the commercial production of pears is an uncertain and hazardous industry. Until it is demonstrated that pear-blight can be successfully controlled, it is useless to recommend the planting of pears in commercial quantities. So far as is known, the Kieffer pear is the most resistant to the pear-blight of the commercial varieties." This report of the Georgia State Horticultural Society can be taken as a general recommendation for practically all of the South, except for particularly isolated and special places.

T. H. McHatton.

The pear in California.

Visitors at the old California missions during the early part of the last century noted many thrifty seedling pear trees in the mission gardens. Many of these trees survived the neglect which came upon the mission properties after their secularization, and were in thrifty growth and bearing at the time of the American occupation. The first pears sold in San Francisco and in the mines in 1849-1850 were gathered from the old mission trees, and some of these old trees grafted over gave the first California product of the European and American varieties of more than half a century ago. From this beginning the growth of pears increased until the commercial product of 1914 included the following: 2,726 carloads sent overland to eastern and foreign markets (about the same as for the five years preceding); 2,805,740 cases of canned pears, mostly Bartletts—a product which is rapidly increasing. There are about 2,000,000 pear trees in California orchards. The decade 1905-1915 was a sensational period in California pear-growing because of the appearance of the pear-blight about 1902. It made such rapid progress that in 1904 practically all the pear trees in one district were seriously attacked and largely destroyed. Control measures were provided by state appropriation in 1905 and continued several years, and it was demonstrated that the disease can be held in check and profitability of trees continued by cutting out all blighted parts from twig to root—disinfecting between cuts and tools used in the work. This demonstration, coupled with an apparent lessening of the virulence of the disease, restored confidence among growers and resulted in largely increased new planting in 1914-1915.

It is a most interesting fact that a single variety furnishes a very great part, perhaps as much as four-fifths, of the pear products of the state, and that is the Bartlett. Whatever it may lack in high quality is more than compensated for by its commercial serviceability. It is handsome and of good size, endures long carriage, cans well and dries well, and is of sufficiently good quality to please consumers; in fact the California-grown Bartlett is said to be better than the same variety grown in the Atlantic states and in the west of Europe. This is not, however, the chief reason why the Bartlett so largely preponderates in California. The ruling condition is found in the fact that owing to the marked differences in localities not widely distant and yet differing in elevation, in exposure to coast influences and away from them, and other local causes, the Bartlett has a very long ripening season, and valley, coast, and mountain Bartletts follow each other through nearly three months and thus make succession of different varieties during this period unnecessary. There is, however, at present a greater disposition than heretofore to extend the season by growing other varieties, but they are selected for resemblance to the Bartlett type. Clapp Favorite is sold as an "Early Bartlett," and a Winter Bartlett, an Oregon seedling, has been planted to carry the same style of pear as late as possible. Still some progress is being made in extending the California list of popular pears and some of local and of distant origin will probably achieve prominence, especially in the shipments to distant markets.

California pears are grown on pear-seedling roots (especially of the Japanese pear because of less liability to blight in the root), very little recourse being had to rooted cuttings or to dwarfing stocks. A dwarf pear tree is almost a curiosity. The heavier loams and even clay soils are sometimes planted with pear trees, not because they are best for pears but because other fruits do...
worse than they. To plant fully the area intended for fruit, pears will go on the intrusions of heavy or too moist soils, while the freer soil will be given to other fruits. Still the chief product of pears is from the best loams California affords, and the profits from the tree warrant the use of such land. Pear trees are regularly pruned to a low vase form, but seldom opened in the center, the interior being used for bearing wood, and foliage enough retained partially to shade the fruit. The pear is thinned to favor size and to relieve the tree from overbearing. Irrigation is employed in some parts of the state. The varieties chiefly grown are the following: Bartlett, Winter Nelis, Easter, Comice, Glout Moreau, Hardy, P. Barry (a California seedling), Seckel, Lawson (Comet), Winter Bartlett, Wilder.

E. J. WICKSON.


PEAT is a kind of soil formed by the partial decay of plants in the swamps of the temperate zone. It is a standard potting material in greenhouse work for certain classes of plants, as ferns, orchids, heaths, rhododendrons, and other ericaceous plants, woody plants from Australia and the Cape of Good Hope, and many other choice and difficult subjects. American gardeners complain that they are handicapped in growing such plants because American peat is poorer than European, the lack of fiber being chiefly deplored, but it is probable that just as good peat is to be found in this country. The peat-bogs of England are often 5 or 6 feet deep, and some of the Irish ones are said to be as deep as 40 feet. They have been forming ever since the glacial period, but are now on the decline, owing largely to natural causes. Peat-bogs consist of the remains of many kinds of aquatic and marsh plants, but chiefly sphagnum (which see). This moss grows upward and decays partially below, complete decay being prevented by the antiseptic organic acids formed in the process. Near the top the peat is brown, fibrous, light and porous; lower down it tends to be black, heavy, dense and without visible indication of its vegetable origin. The ash varies from 1 or 2 per cent in newly formed peat to 30, 40, or even 50 per cent in the older peat. Peat is commonly used for fuel by the Irish peasantry, but almost never in America, where other and better fuel is plentiful. In greenhouse work peat is valued more for its porous moisture-holding properties than for its plant-food. If dried, it may be used as an absorbent for liquid manure, "not so much for its inherent value," says Roberts (in his "Fertility of the Land"), "as for conserving the nitrogen in the manure, and for improving the condition of the stables." For this reason the half-decayed peat is extensively used in Europe, under the name of moss litter, as a bedding in stables. For this reason the half-decayed peat is extensively used in Europe, under the name of moss litter, as a bedding in stables, and later of course applied to the land.

The transformation of peat-bogs into arable land is rarely a pressing problem in America. It is usually too costly for a new country. The notion, however, is very common that peat lands are extraordinarily rich in plant-food. Nevertheless, according to Roberts, swamp muck and peat are not richer in plant-food than the good soils, with the exception of the nitrogen in the peat, which, however, is far less available than it is in good soils. (American peat contains about .67 per cent nitrogen, .21 per cent phosphoric acid, and .13 per cent potash.) Peat lands differ from good arable soil in being cold, sour, and too wet. To reclaim them, one must drain off the superfluous water and apply lime freely to destroy the harmful organic acids. Sometimes sand or clay may be added to improve the texture of such soils. It takes time to reclaim peat lands. Thoroughly decayed peat intermingled with wet soils is much. See the article on Muckland-Gardening, Vol. IV, page 2072.

WILHELM MILLER. PECAN, Carya Pecan, Engler and Graeb. (Carya glabra, Nutt. Hicoria Pecan, Brit.). Plate LXXV, Vol. IV. Of the nut-trees native to North America, the pecan unquestionably ranks first in economic importance. This is true both because of the quantity and value of the wild crop and because of its cultural promise. The acceptability of the quality of the kernel and the relative thinness of shell and ease of cracking in contrast with the other hickories and the native walnuts, have since an early day continued to win favor among consumers, so that the wild crop of Louisiana and Texas long ago assumed commercial importance and for at least thirty years has, in the latter state, been systematically harvested and distributed in carload shipments to northern markets.

The relatively wide climatic range of the species and the extent of variation in form, size, and quality of nut have stimulated effort to develop methods of nursery propagation in widely separated localities. This has resulted in a larger and more widely scattered development of commercial nursery propagation of the pecan than of any other nut-tree.

Under favorable conditions of growth, the pecan tree attains very large size, trunk diameters of 4 to 6 feet being not infrequent, with heights ranging from 100 to 175 feet and tops spreading 60 to 70 feet. Some of the largest trees reported were in the Wabash Valley, near the northern limit of natural distribution. A tree having a girth of 18 feet 3 inches breast high from the ground, an estimated height of 130 feet and a spread of 125 feet, is recorded by Reed in Ascension Parish, Louisiana. One having a girth of 19 feet 6 inches with an estimated height of 150 feet and spread of 100 feet, is recorded in Ascension Parish, Louisiana. A still larger tree near Webb's Falls, Oklahoma, has the following dimensions: Girth 23 feet 9 inches at 3 feet from ground; estimated height 180 feet.
The pecan is one of the hickories which comprise an American group of great interest. The trees are monoecious; that is, the male and female (staminate and pistillate) are separate on the same plant. (Fig. 2822, adapted from Bulletin No. 251, Bureau of Plant Industry.) The staminate or pollen-bearing flowers are in slender hanging catkins, and the pistillate or fruit-bearing flowers are in small erect or stiff clusters (Fig. 2823, page 676). Several of the staminate or male flowers are shown separately at a, Fig. 2822, and one of the pistillate or female flowers at b.

Natural and cultural range.

The species is native in river-bottoms and lowlands of the Mississippi River and its tributaries as far north as Davenport, Iowa; Covington, Kentucky; Terre Haute, Indiana; and the vicinity of Kansas City, Missouri. It is also found throughout most of the river-valleys of Texas and the adjacent parts of Mexico. It does not appear to have been found native at any point in close proximity to the Gulf of Mexico. It thus occurred wild in considerable regions of Texas, Oklahoma, Louisiana, Mississippi, Alabama, Arkansas, Missouri, Kansas, Tennessee, Kentucky, Indiana, and Illinois, and small areas in southeastern Nebraska and southeastern Iowa. The species was scatteringly introduced throughout the southeastern states from Florida, northeast, to Virginia at an early date, so that trees of considerable age are found at many points in them. The earliest efforts at commercial planting appear to have been made in Louisiana, Mississippi, and Texas, but some of the greatest activity in this direction in recent years has been outside of the native habitat, in Georgia, Florida, and South Carolina, and considerable plantings have been made also in North Carolina, Virginia, Maryland, and some on the Pacific Coast in California and Oregon.

Commercial importance.

As an article of commerce, the pecan did not receive much recognition until after the Civil War; but, increasingly large shipments of wild nuts moved northward from Louisiana and Texas about 1870 to 1890 at prices which encouraged farmers and ranchers to harvest them systematically, though not to engage in orchard planting. Early in the nineties, as the result of the marketing in New Orleans of the product of a few individual trees yielding nuts of large size and thin shells, demand developed for such nuts at much higher prices, frequently bringing 40 to 75 cents and in some cases as high as $1.50 to $2.50 a pound, so that early interest in the planting of seedling orchards grown from the nuts of these high-priced varieties, with the result that many thousands of such trees, mostly dating to the decade 1890-1899, are now found in the Gulf and South Atlantic states. While these seedling orchards contain many productive trees yielding nuts of desirable quality, few of them have proved profitable, largely because of the wide variation in precocity, productivity, and disease-resistance of the trees, and in the size, cracking quality, and other features of the nuts, so that a large part of the present production still consists of wild nuts. Reed estimated in 1912 ("The Pecan," Bureau of Plant Industry Bulletin No. 251) that the annual wild crop of pecans in Texas during the preceding six or eight years had varied from 3,645,000 to 17,820,000 pounds, the crop of that state being considered approximately three-fifths of the total product. The census of 1910 put the crop of 1909 as 9,800,769 pounds, valued at $971,596.

While no accurate statistics regarding later production are available, the product of the orchards of named varieties planted prior to 1905 is now gradually coming to market, and may be expected to appear in rapidly increasing quantity in the future, to offset the gradually declining production of wild nuts resulting from the destruction of trees as the fertile river-bottom lands on which they stand have been brought under cultivation in farm crops. The gradual development of power nut-cracking machinery, mainly accomplished since 1900, has resulted in a greatly increased demand for pecan meats from confectioners, which promises to keep pace with production for many years to come. These devices greatly lessen the labor cost of cracking, and render possible much more varied use of the nut.

Climatic and soil requirements.

Much confusion of thought with regard to the climatic range of the pecan has resulted from failure to recognize the difference in cold endurance of wild trees of the species in different parts of its native range. Rather early in the period of pecan exploitation, which began about 1865-1890, nuts and young trees of the large varieties conspicuous in the exhibits and advertising matter of that time were planted at many points in the northern states. These rather promptly succumbed to the winter temperatures of the North, very few surviving north of the Potomac, Ohio, and Mississippi rivers. More recently trees well adapted to the winters considerably farther north, and which are now in process of experimental introduction. On suitable soils it now appears probable that among these varieties of northern origin may be found sorts fairly well adapted to most of the eastern United States.

Though practically restricted in its native distribution to the low-lying moist sandy loams of the river-and creek-bottoms, gradually accumulated experience has demonstrated the suitability under cultivation of a wide range of soils. The essentials are good depth and fertility, adequate drainage, and freedom from drought. Shallow soils underlain with hardpan or other impervious strata and loose droughty sands are unsuitable, as are mucks and peats. Occasional overflow, as experienced on creek- and river-bottom lands, is beneficial, but the pecan is about as sensitive to a water-logged soil condition as most orchard trees. While the orchards thus far planted are too young to determine with accuracy the area of profitable com-
Commercial planting will, from present indications, be south of Pennsylvania and Iowa with some probability of success under irrigation in the Southwest and in the great valley of California.

Propagation and top-working.

Few of the earlier efforts to perpetuate trees bearing superior nuts by budding and grafting were successful, the methods commonly practised with fruit-trees in the Gulf States not proving effective with the pecan. Because of this, most of the plantings prior to 1900 were of seedling trees grown from selected parents, even where orchards as large as 500 acres were involved.

Occasionally skilful propagators succeeded in securing fair stands with crown-, trunk- and top-grafting, however, and some by annular-, patch- and chip-budding, so that by 1895 there were a number of budded and grafted trees of several choice varieties growing in Louisiana, Mississippi, and Texas and a few nurseries offering such trees for sale.

The earliest successful grafting was by Antoine, a slave gardener, on Oak Alley Plantation, St. James Parish, Louisiana, who, under the instruction of his owner, the late Telephistor J. Roman, in 1846 or 1847 succeeded in trunk-grafting sixteen trees of the variety later named the Centennial (Fig. 2823). Somewhat later he propagated 110 more trees of the same variety, so that 126 grafted trees of this variety were growing on that plantation at the end of the Civil War. About 1877, the late Emil Bourgeois, of Central, Louisiana, successfully top-grafted the variety now known as the Van Deman upon his Rapidan Plantation in the same parish, while in 1882 the Rome and Frotscher, as well as Centennial, were propagated by Wm. Nelson in the nursery of the late Richard Frotscher at New Orleans from the original trees in St. James and Iberia parishes. In 1886, the variety now known as Stuart was successfully budded by the late A. G. Delmas on his place at Pascagoula, Mississippi, from the original tree of that sort on the Castanera place near by.

Successful top-working of wild trees was accomplished by E. E. Risien, of San Saba, Texas, about 1889. He transformed a number of such trees by cutting back heavily in late winter with a cross-cut saw, practically be-heading trees of diameters up to 12 to 15 inches at points 20 to 30 feet from the ground. An abundant growth of strong shoots was secured by hacking the bark of the trunk for some distance down from the stubs. A sufficient number of the best of these shoots were budded in July by the annular method quickly to develop a symmetrical top.

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The San Saba variety was chiefly used, the original tree of this standing on Risien's place (Fig. 2824). Although most early efforts failed, as propagators have acquired experience in pecan-propagation most of the methods of budding and grafting practised on the apple and pear have been found to succeed, so that at the present time practically all except shield-budding are more or less practised. The methods most commonly used by nurserymen are ordinary cleft- and whip-grafting, and annular-, patch-, and chip-budding.

While there has been much discussion of other stocks for the pecan and considerable individual experimentation with mockernut (Carya alba), pignut (Carya glabra), and water-hickory (Carya aquatica), commercial nursery propagation is practically all upon pecan stocks. Nuts from trees of vigorous growth, yielding well-filled kernels, are preferred for seed and should be from a region at least as far north as that where trees are to be planted to insure stocks of sufficient cold-endurance. Nuts for seed should not be permitted to dry out before planting in fall, or, if spring-planted, should be stratified in moist sand soon after harvest. Soil for the nursery should be rich, deep, friable, and well drained, as the control of growth during the
propagating season necessitates maintenance of a high state of cultivation with which clods, stones, or continued wetness seriously interfere. Nursery rows should be 5 to 6 feet apart, with nuts planted 8 to 12 inches apart in the row, 2 to 3 inches deep.

When stocks exceed 3\(\frac{1}{2}\) inch in diameter at the point of grafting, cleft-grafting is preferred. If done above ground, the grafted stub should be securely bound with raffia or waxed cord to avoid splitting, and then thoroughly waxed and wrapped with waxed cloth to exclude air and moisture. (Fig. 2826.) Cions should be entirely dormant and have all exposed cut ends waxed to reduce evaporation. All grafting in place is best done shortly in advance of the pushing of buds on the stock. When stocks are under 3\(\frac{1}{2}\) inch in diameter at the crown, ordinary whip-grafting in place is considerably practised, selecting cions as near the size of the stock as practicable and tying securely with raffia or waxed cloth. (Figs. 2826 and 2827.) Bench-grafting, though possible, is rarely practised with the pecan.

On account of the length of season during which these methods may be practised, annular- and patch-budding have been widely adopted by pecan-propagators, and special tools for cutting the "rings" and "patches" have come into general use in the southern states (Figs. 2828 and 2829), though expert operators succeed well with the ordinary budding-knife. These methods may be used at any time during the growing season when the bark of both stock and cion "slips" well-and the bark and buds of the new growth on the cion trees are sufficiently mature to endure the necessary manipulation. The essentials are good "slipping" condition of both stock and cion, close fitting of "rings" or "patches," secure tying with raffia or other suitable material, careful attention to removal of ties and gradual heading back of stock as growth proceeds to avoid "drowning out" the bud, and after growth begins the protection of it against splitting off or breaking down by wind and storms, by tying up to stubs or stakes. (Fig. 2830.)

One of the simplest and most effective methods is that long used by E. W. Kirkpatrick, of McKinney, Texas, commonly known as "chip-budding." This may be practised prior to and during the early growing season. DORMANT cions are used. It consists essentially of the removal of a "chip," that is, the stem and its replacement by a bud-bearing chip of approximately identical size from the cion, which is securely tied in place without waxing. As this method requires only the ordinary budding-knife and is equally applicable to walnut, persimmon, and other species rather difficult to propagate, it is growing in favor, especially in Louisiana and Texas. (Fig. 2831.)

With all methods of budding and grafting, both in nursery and orchard, careful attention to the tying up of the young buds during the first growing season is required. Their soft and luxuriant growth renders them peculiarly subject to destruction by storms, the only effective protection against which is secure tying to stock, stubs, or stakes.

The large number of seedling trees in orchards and gardens yielding nuts of indifferent quality is arousing much interest in top-working. This can be done by all methods described, but top-budding or grafting should be as low in the tree as practicable to prevent the head from becoming "leggy" and "prongy.

Successful methods of budding and grafting the pecan are described by Charles L. Edwards, of Texas. The budding method is shown in Fig. 1686, page 1387, Vol. III. The crown-graft or crown-bud is shown in Fig. 2832 and is described as follows: "Buds from wood that has partially lost its vitality, or has been injured by sap starting before it is cut or after it is cut in early spring, may often be saved by this method when all others fail. But the work must be carefully done and instructions strictly observed, for if the bud is lost, the remaining stock is badly disfigured. The stock is cut off bodily at the desired height. A slit is then made at the top, the bark opened, the bud inserted and part of the flaps of bark pared away. Then the wrapper is put on so as to cover not only the cut made for the insertion of the bud, but the top of stump also. The wrapper should cover not only the stump, but should be long enough at the top to pass over and go down far enough on the opposite side to be caught by the string used for tying on the bud. The waxed cloth covering the top of the stump should be pressed down firmly before tying, and if the top of the stump is 3\(\frac{1}{2}\) inch across or more, there should be two thicknesses of cloth put over it and firmly pressed down. On large stumps, two buds may be placed on opposite sides so as to increase chances of a 'take.' If both buds live, one of the shoots may be selected to direct the flow of sap to the new bud."

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**PECAN**

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**Annular-budding.** a, bud stick from which the bud has been removed; b, the bud ready for insertion in the matrix of the stock; c, the stock ready to receive the bud; d, the bud after being placed in position and carefully wrapped; e, growth taking place, the wrapping having been removed; f, growth from the bud supported by being tied to the stock, g, shows the scars above the union, where the buds were removed in order to direct the flow of sap to the new bud.
removed later. In working over-grown nursery seedlings and stout wildings, this has been found to be an excellent plan. With good workmanship and favorable weather conditions, excellent savings may be had, and the bud shoots make a beautiful upright growth, with the slightest crook at the point of union. And, oddly enough, they grow straight without stakes to support them even in a windy country. Buds put on in March and April on nursery stocks easily make a salable tree with 4 to 6 feet of bud-growth the same season in Texas. In summer work, the modified shield-bud may be peeled from the cion, but it is well to cut them to beveled edges on the sides (D, Fig. 2832) before removing from the cion. The bark of the stock fits down over them more snugly when so treated and they seem to live better. But the lower ends should always be so trimmed as to remove the fleshy rim of bark at the lower end, in order that the inner bark of the bud and the inner bark of the stock may be brought into contact. The flaps of bark folding down over the bud should always be pared down, so that the waxed wrapping will fit close and exclude these pestiferous little insects that get in under other forms of wrapper and destroy so many buds. Another thing requiring eternal vigilance is to be sure that sap is flowing more freely in the stocks than in the budwood."

**Distance, method of planting, and cultivation.**

The large size of the tree and the lack of any suitable dwarfing stock render wider planting necessary than for other orchard trees. Many of the earlier orchards were spaced at 40 or 50 feet, with some planted as close as 25 feet, with a view to thinning out to 50 feet after some years of bearing. Accumulated experience indicates that upon all soils suitable for the pecan, a distance of 60 feet will be required before the age of maximum productivity is reached, and that closer planting than this is inadvisable unless in sections where growth of trees thirty years old and upward indicates that closer distances will not involve harmful crowding and shading, to which the pecan as a nut-bearer is peculiarly sensitive. Well-ripened trees two years old, ready to cut, can be propagated by budding and grading, to the cion trimmed at point; G, H, the work completely protected by waxed cloth; PECAN 2521, the crown-graft or budding. A, B, C, the cion; D, cion trimmed at point; E, stock ready to receive the cion; F, cion in place; G, H, the work completely protected by waxed cloth.

The preferred practice in harvesting is to permit the nuts to fall as the hulls open, gathering frequently to prevent soiling by contact with the ground. As the efficiency of this method is largely dependent on the continuance of clear and reasonably dry weather throughout the harvest season, it is usually necessary gently to "thresh" the later-maturing portion of the crop from the trees with bamboo or other light poles. Preference is given to supplying both in an immature quality of crop and in injury to the trees through the breaking off of fruit-spurs. After gathering, the nuts should be cured by storing in a cool dry place for two or three weeks, during which time there is some loss of weight by evaporation of moisture, after which they are ready for marketing.

A considerable portion of the wild crop is washed and polished by running it over revolving barrels or drums. Some tinting of the nuts with dye is also practised. While polishing and tinting are not in themselves harmful, they have so frequently been used to conceal inferiority of damaged or stale nuts and such as are immature that discriminating purchasers show preference for the nuts in their natural state. This is specially true with regard to the product of the named varieties, which is coming to be sold on known varietal merit as to cracking quality, plumpness of kernel, flavor, and the like. While the product of cultivated orchards still constitutes but a small proportion of the market supply, it is destined to early and considerable increase.

Marketing by parcel post direct to consumers is coming into practice and cooperative selling by growers' associations is being undertaken to some extent. Prices of wild nuts have risen considerably in recent years and the resulting increased demand from commercial crackers. Prices of the leading orchard varieties, though gradually receding from the fictitious and novelty values of the exploitation period, range from 30 to 50 cents a pound wholesale, with good demand, and retail at 50 to 75 cents in most markets.

**Varieties.**

The fact that until about 1900 there were few nurserymen able to propagate the pecan by budding and grafting, coupled with the very high prices received for choice nuts from certain individual trees, stimulated the sale of nuts from such trees under varietal names for the planting of seedling orchards throughout the Gulf States. This was true to a large extent with regard
Varieties for northwestern Arkansas, southern Missouri, north-central Kansas, Oklahoma, and northern Arkansas: Only varieties of northern or local origin should be considered for planting in this general area, as none of the southern sorts is sufficiently hardy to justify their recommendation. The best of these are the Major, Niblack, Indiana, Busseron, and Posey.

Some of the best known sorts now in the trade, with locality of origin indicated, are the following:

- **Major (syns.: Jumbo, Jumbo, Risien, Georgia Belle)**
- **Niblack (syns.: Hollis's Jumbo, Jumbo, Risien, Georgia Belle)**
- **Indiana (syns.: Post's Select, in part)**
- **Busseron (syns.): Knox County, Indiana. Recently disseminated and considered promising for Indiana and other northern sections.**
- **Posey (syns.): Central Louisiana. The first variety propagated by grafting. Exhibited at Philadelphia in 1876. A large long nut, with rather thick shell and slender kernel. Tree a symmetrical, vigorous grower but very tardy in bearing. Practically discarded in favor of better varieties.**
- **Curtis (syns.: Olivier, Louisiana. One of the most widely disseminated and distinct of the older varieties. Very large and thin-shelled but with kernel rather dark and unattractive in appearance, frequently not filling well. Rapidly giving way to more reliable sorts.**
- **Hollis (syns.: Hollis's Jumbo, Jumbo, Risien, Georgia Belle, Post's Select, in part).**
- **Bend, Texas. A medium to large, roundish**

The varietal adaptability of the pecan so far as possible to summarize as the result of several years of systematic study in the field was outlined by Reed in 1915 (Farmers' Bulletin No. 700, "Pecan Culture," with special reference to varieties and propagation) as follows:

- Varieties now considered best for planting in the plains section of southeastern Virginia and eastern North Carolina are the Stuart, Mantura, Van Deman, Moneymaker, Schley, Pabst, and James.
- Varieties which may be recommended for eastern South Carolina, eastern and central Georgia, central Alabama, and central Mississippi are the Schley, Stuart, Van Deman, Moneymaker, James, and Carman.
- Varieties for planting in south Georgia and north Florida are the Schley, Curtis, Bradley, Alley, Van Deman, Stuart, Moneymaker, President, Palst, and Russell.
- Varieties for central and north Florida: Curtis, Bradley, Kennedy, President, Schley, Van Deman, and Moneymaker.
- Varieties for the coastal section of Alabama, Mississippi, and Louisiana: Schley, Curtis, Alley, Van Deman, Russell, Stuart, Pabst, Success, and Havens.
- Varieties for east Texas: Very few sorts have been given a fair trial in this section. The varieties here mentioned are recommended very largely because of their performance farther east. They are the Stuart, Moneymaker, Schley, Curtis, Van Deman, Bradley, Carman, and James.
- Varieties for west Texas: Sovereign (syn. Texas Proflue), Kincaid, Colorado, San Saba, Halbert, and Burkett.
- Varieties for northern Louisiana, southern Arkansas, and northern Mississippi: Very few sorts have been given a fair trial in this section. The following varieties are mentioned because of certain evidence of superior hardiness which they have shown and the general merit of the nuts themselves, but they are recommended for conservative planting only: Moneymaker, Carman, Stuart, Van Deman, Schley, Pabst, and Success.

Varieties for the section including central and western Tennessee, central and western Kentucky, southern Indiana, southern and southwestern Illinois, eastern and southern Missouri, southeastern Kansas, Oklahoma, and northern Arkansas: Only varieties of northern or local origin should be considered for planting in this general area, as none of the southern sorts is sufficiently hardy to justify their recommendation. The best of these are the Major, Niblack, Indiana, Busseron, and Posey.
PECAN

2523

nut, rather widely disseminated for several years as Post’s Select. Mainly planted in central Texas.

Indiana.—Knox County, Indiana. Of medium size, with thin shell and kernel of excellent quality. Promising for northern planting.

Jewel.—Pascagoula, Mississippi. Widely disseminated at one time, but generally discarded because of unproductive and unfruitfulness of tree and unsatisfactory filling of the large long nut. Known.—San Saba, Texas. A large, shrunken nut, with moderately thin shell and plump kernel of fine quality. Scales badly in South Atlantic States.

Joseph.—Henderson County, Kentucky. Recently introduced, but considered promising in northern pecan territory. Of only medium size but thin-shelled, with plump kernel of fine quality.

Mobile (syn., Laurendine, Bates’s Perfection).—Bayou La Batre, Alabama. A very large and handsome nut, coming into bearing early but not filling well in most sections where tried, and therefore little planted in recent years.

Sen Saba (syns., Papershell, Risien’s Papershell, Royal) (Fig. 2833).—Though small, is thin-shelled, juicy, sweet, and sweetness of kernel make it a highly desirable nut where it succeeds. Very productive, though slender grower; very productive; scales badly in eastern districts.

Shelby (syn., Admiral Shelby) (Fig. 2834).—Pascagoula, Mississippi. One of the most widely successful and generally large, with thin shell and plump kernel of excellent quality. Tree pendulous in habit but vigorous and productive.

Sonora (syn., Texas Prolific).—Seedling of San Saba, larger than the parent, with somewhat thicker shell. Very productive in Texas but susceptible to scab in eastern districts.

Success (Fig. 2833).—Ocean Springs, Mississippi. A large nut with a relatively thin shell and plump kernel.

Teche (syn., Protosher No. 2, Duplicate Protosher, Fake Protosher, Sperische Protosher) (Fig. 2831).—Probably a seedling of Protosher, mixed with that variety in nursery and disseminated as Protosher. Rather small and not of high quality, but very productive throughout the southeastern states.

Van Deman (syns., Mire, Dominic Mire, Paragon, Bourgeois) (Fig. 2834).—A large to very large nut, cracking well, with plump kernel of high quality. Widely planted in lower Mississippi Valley and Gulf Coast sections. Subject to scab farther east.

Hybrids.—Numerous hybrids of C. texana with C. laciniosa and C. aequa have been named and propagated in a small way. Of these the McCullister (syn., Floyd), found near Mount Vernon, Indiana, is a very large nut, probably the largest known hickory-nut. The original tree has for many years failed to mature more than a small proportion of plump kernels and top-grafted trees of the variety have exhibited the same weakness, so that it cannot be regarded as of commercial value.

Literature.


The following bulletins on the pecan have been issued: Florida Experiment Station Bulletins Nos. 54, 57, 85; Texas Experiment Station Bulletin No. 69; North Carolina Department of Agriculture Bulletin Nos. 30, 150, 224; Georgia Station and College of Agriculture Bulletin No. 82; Georgia Experiment Station Bulletin No. 116; Bureau of Plant Industry Bulletins Nos. 30, 251; Farmers’ Bulletin No. 700.

Pectináriá (comb-like). Asclepiadaceae. The genus as described by Haworth, not of other authors, comprises succulent leafless herbs: sts. tufted, usually procumbent, acutely or obtusely or obscurely 4–8-angled; fls. small, solitary or in fascicles in the grooves or on the sides between the angles; calyx 5-parted; corolla small, budlike, with a short cup-shaped hemispheric or broad and shallow tube and 5 lobes connate at the apex; corona double, outer cuplike and variably cut into 10 to numerous teeth or of 5 minute lobes, inner of 5 lobes incumbent upon the backs of the anthers or erect and about equaling or longer than them and connivent-erect over them; filaments of the stamina connate, forming a tube around the ovary and adnate to the dilated top of the style; style slender, narrowly fusiform, glabrous.—Five species, all S. African. The following species have been intro. at Kew: P. saxatilis, N. E. Br. Sts. acutely 4-angled, with flat or slightly concave sides and distal acute deltoid teeth along the angles: corolla broadly ovoid or subglobose, covered with fine hairs on the inner surface, blackish purple or purple-brown. P. asperofolia, N. E. Br. Sts. cylindric, with 6–8 series of closely placed tubercles: corolla papilate outside and with 6–8 pentagonally subglobose, with the papilla on the inner surface

2834. Varieties of the pecan: 1, San Saba; 2, Teche; 3, Stuart; 4, Van Deman; 5, Centennial; 6, Schley; 7, Delmas. (X 3/4)
covered with short spikelike processes, dull purplish outside, the whole surface inside frosted white, dotted with crimson.

F. Tracy Hubbard.

**PEDDAIEA** (named after Major Peddie). _Thymelaeaceae_. Glabrous shrubs, hardy in the extreme south of the United States.

Leaves sparse, subcoriaceous or membranaceous: _fls._ yellowish green, in peduncled umbels at the tips of the branches, pedicelled, perfect; perianth-tube cylindrical, lobes 4 (rarely 5?), short, spreading; stamens 8 (rarely 10?); disk hypogynous, cup-shaped, entire or toothed; ovary glabrous or densely pubescent, many at the apex, 2-celled: _fr._ a drupe succulent, with 2 nutlets.—About 10 species, Trop. and S. Afr.

**PEDDICULARIS** (from Latin for _louse_; application not evident). _Scrophulariaceae_. _Lousewort_. Herbs, mostly perennial, sometimes planted in grounds for the showy spikes of flowers and often finely cut foliage.

Mostly erect, only seldom annual or biennial: _lvs._ alternate or whorled (sometimes opposite), rarely subopposite, 1- to many times pinnately divided, rarely merely dentate: _fls._ purplish, red, rose-color to white, in short, showy spikes of flowers and often finely cut foliage. _Prop._ by seeds and division. The following American species are perennial.

*A. Les. undivided; galea long-beaked.*


Stems thick and fleshy, juice milky: _lvs._ alternate, often rudamental, the midrib thickened and often keeled below: _inf._ of terminal or axillary cymes: the fl. and fr. characters as in Euphorbia, but the involucre with a deep fissure and a short spur on the upper side, the spur containing the glands.—About 30 species in Trop. Amer. Prop. and cult. similar to the succulent euphorbias. See Millsbaugh in _Field Museum Nat. Hist._, Publication 172, 1913, for a revision of the species.

**A. Lobe of the involucre above the spur entire.**

*P. tithymaloides*, Poit. (_Euphorbia tithymaloides_, Linn. _E. canaliculata_, Lodd. _E. carinata_, Donn.). _St._ 4-6 ft. high: _lvs._ dark green, ovate or oblong, acute; midrib keeled below and dentate: involucres bright red or...
purple, \( \frac{1}{2} - \frac{3}{4} \) in. long, in dense terminal cymes, glabrous inside and out; pedicels of the stamens hairy, of the ovary smooth. Fl. to Venezuela. B.R. 837. L.B.C. 8:727. B.M. 2514.—Two varieties are in cult., cuelitius and variegatus, Hort., both with white-bordered lvs.

pedifolius, Poit. Sts. green, glabrous: lvs. few, oblong-ovate, obase: cymes terminal, open: tube of the involucre hairy only within; pedicels of both stamens and ovary hairy. W. Indies.

AA. Lobe above the spur 2-parted; bracts of the infl. green
aphyllus, Boiss. Branches slender, leafless: cymes terminal; the pubescent peduncle attached at the back of the involucre, which is hairy within; pedicels of the stamens and ovary glabrous. Mex.—Intro. as a wax-yielding plant.


J. B. S. Norton.

PELARGONIUM (stork, because the fruit is long and slender like a stork’s bill). Geraniaceae. Geranium of gardens. PELARGONIUM. STORK’S BILL. Many kinds of pot-plants, popular for indoors and for bedding; and some of them much planted permanently out-of-doors in California and elsewhere; flowers showy.

Plants of various habit: some are fleshy and tuberous and are treated as succulents, but those commonly grown are erect or trailing leafy herbs or woody below (sometimes shrubby) with sts. somewhat soft and succulent or small and firm: lvs. mostly opposite, entire to decompound, stipulate, the foliage often strongly scented: infl. mostly umbel-like, on axillary peduncles: lvs. irregular, the petals 5 (rarely fewer by abortion), the 2 upper usually larger and more prominently colored, the lower mostly narrow and rarely very small, the colors pink, red, purple, white, sometimes yellow, often attractively blotched or veined; calyx 5-parted (or the sepals said to be ciliate at base), the uppermost sepa. produced at base into a slender nectar-bearing tube or spur attached to the pedicel; stigma 0, of which 7 or less are anther-bearing and fertile: fr. of 5 valves, each 1-seeded and separating from the beak-like apex mostly by coiling and more or less hygrometrically.—Nearly all the pelargoniums are from S. Afr. All the species mentioned in this article are from that region, unless otherwise stated. Harvey, in Vol. I of Harvey & Sonder’s Flora Capensis (1859–60), admits 163 species; and his descriptions are followed closely in the characterizations of species given below. Knuth, the most recent monographer (in Engler’s Pflanzenreich, IV. 129, 1912), admits 232 species and very many well-marked hybrids. Pelargonium is distinguished from the genus Geranium by technical characters. In most cases, the fls. of Geranium are regular, but those of Pelargonium are irregular, the 2 upper petals differing from the others in size and shape and often in coloring. The most constant difference between the two genera is the presence in Pelargonium of a nectar-tube, extending from the base of one of the sepals and adhering to the side of the calyx-tube or pedicel. This tube is not seen by the casual observer, but it may be discovered by making a longitudinal section of the fl. and pedicel.

The person who wishes to study the contemporaneous evolution of plants may find his heart’s desire in Pelargonium. With great numbers of species and many
of these, variable and confusing in a wild state, with plant-breeding in many places and continued through two centuries, and with a large special literature, the genus offers exceptional advantages and perplexities to the student. Most of the species early came into cultivation by the English and Dutch, the South African plants forming at one time almost a separate department of horticultural knowledge. P. cucullatum, the dominant parent in the florist's pelargoniums, was known in England as early as 1690. The two originals of the race of zonal or bedding geraniums were introduced into England in 1710 and 1714. Early in that century, a half-dozen species were grown at Eltham, in the famous garden of James Sherard, and these were pictured in 1732 in Dillenius' account of that garden, "Hortus Elthamensis," a sumptuously illustrated work in quarto. Even at that time, P. inquinans had varied markedly (see Fig. 2836). In his "Species Plantarum," 1753, Linnaeus described the few species which he knew (about twenty-five) under the genus Geranium. In 1787, L'Heritier founded the genus Pelargonium, and transferred many of the Linnaean species. L'Heritier's work "Germiologia," a quarto, appeared in Paris in 1787 to 1788, with forty-four full-page plates. Recently Kunthe has revived the Linnaean name Geraniopsis (1736) for this genus, but it is not likely to find acceptance.

Early in the nineteenth century, many species were in cultivation in Europe, and experiments in hybridizing and breeding became common. There appears to have been something like a geranium craze. The experiments seem to have been confined largely to the development of the show or fancy pelargoniums, as greenhouse subjects, for bedding plants had not reached their present popularity. The geranium interest seems to have culminated in Robert Sweet's noble work on "Geraniaceae," published in five volumes in London, 1820 to 1830, containing 500 well-executed colored plates of geraniaceous plants. At that time many distinct garden hybrids were in cultivation, and to these Sweet gave Latin botanical names. His fifth volume is devoted chiefly to garden forms of the show pelargonium type, to which the general class name Pelargonium is given in the following sketch. The development of the zonal or bedding geraniums had begun in Sweet's time, and he includes them in his pictures, but the larger part of their evolution is subsequent to his history. Various small works on pelargonium have appeared. De Jonghe's "Traité Méthodique de la culture du Pelargonium," Brussels, 1841, contains good bibliographical and cultural data.

Few classes of plants should have more interest to the amateur and fancier because the species are numerous and varied, the colors mostly very attractive, the habit of the plant interesting, and the foliage often with pleasing fragrance; yet, excluding the older window and bedding geraniums of the P. zonale and P. inquinans type and the Lady Washington or Show types, they are very little known to gardeners. A cool greenhouse could be made to yield very interesting subjects in the species here described and others that may be secured from collectors in the regions where they grow.

Most of the cultivated forms of pelargonium may be grouped into four general horticultural classes:

1. The zonal, horseshoe, fish, or bedding types, known to gardeners as "geraniums." They comprise a mongrel class, designated as the Hortorum class.

2. This race seems to be derived from P. zonale and P. inquinans. These two species were made by Linnaeus in 1753, but he founded them on descriptions in earlier works rather than directly on the plants. In America, the zonal geraniums are very popular, for they develop their colors well in the bright climate. They are popular in all countries, however. They probably stand closer to the lives of a great number of persons than any other ornamental plant. If a window or a garden can have but one plant, that plant is likely to be a zonal geranium. The old race of large-flowered and large-clustered geraniums was known as "nosegay geraniums," because they were bouquet-like, but this term is not known in America. Another race has been developed for its zone-marked leaves. There is also a race of double-flowered zonals, which have appeared chiefly since 1860. The very full double and close-clustered forms lose much of the grace and charm of the single types. Some of them are better developed, while the older types are still the best. Recently Kuntze has revived the Linnaean name Geraniopsis (1736) for this genus, but it is not likely to find acceptance.

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LXXXVI. The common garden geranium, a form of Pelargonium.
peared under the name of "gros bois," or "large-wood" race. It is characterized as follows by Daubeney: umbels ordinarily 4 to 5 inches in diameter; flowers very large; petals roundish, or sometimes triangular, the limb always large and giving the corolla a remarkably round contour: leaves very large, thick and coriaceous, plane or incurved, more or less indented, strongly nerved, their diameter averaging about 5 inches, pedicels large and short; peduncles large, rigid, and projecting beyond the foliage: wood soft, fleshy, very large, often 1½ inches around. To this type Daubeney refers the Bruant geraniums, dating from 1882. A special handbook is devoted to these plants: Daubeney, "Les Géraniums," Paris, 1897.

II. The ivy-leaved geranium, products largely of Pelargonium peltatum (Fig. 2839). The species is said to have been introduced into England in 1701. It is a weak and straggling plant, used mostly in vases, hanging-baskets, and other places in which an overhanging subject is desired. The foliage is thick and shiny, slightly peltate and prominently angle-lobed, and the pink or reddish two-lipped flowers are always admired. Much-improved and double forms are now in commerce. "Pelargonium" and "Lady P. cucullatum, P. Radula.

III. The "show" or fancy type is known to gardeners as "pelargonium," and in this country also as Lady Washington geraniums (Fig. 2845). These plants are very popular in Europe, being grown in numerous varieties. They are prominent at the exhibitions. Because of the hot trying summer climate, these plants are of very secondary importance in America, although there are many gardeners who succeed well with them. This race of pelargoniums seems to have descended chiefly from P. cucullatum, although P. angulosus may be nearly equally concerned in it. P. grandiflorum is also thought to have been a formative parent. It is probable that two or three other species are concerned in the evolution. In fact, the late Shirley Hibbard once wrote (G.C., July 3, 1880) that "it must be evident to every cultivator of these flowers that the blood of a score or so of species is mingled in them." This marked garden race, which represents no single wild species, is designated as the Domesticum group. Various scented-leaved pelargoniums, known mostly as "rose geraniums." These are of several species, with their hybrids and derivatives. The common rose geraniums are nearest P. graveolens and P. Radula. The nutmeg geranium is P. odoratissimum or P. fragrans.

Aside from the above groups there are several species which appear sporadically in the trade, as P. temenocentrum, P. echinatum, P. triste, P. quinquelobatum, P. fuliginosum, and P. gracleolus; and P. graveolens, and P. Radula.

Few great collections of pelargonium species and varieties have been made in this country, and this is much to be regretted.

Culture of zonal geraniums. (C. W. Ward.)

While the general florist may consider geranium culture the easiest of all gardening, the fact remains that it is as necessary to observe the requirements of the geranium as it is to observe the requirements of any other plant, in order to succeed and produce the best effects attainable. While it is true that the geranium will grow and bloom under some of the more sparingly little care, there is as much difference between a skillfully grown geranium plant and one carelessly grown as there is between a fancy and a common rose or carnation.

To secure the best results it is necessary to propagate from perfectly healthy stock. The dangers of overpropagation are great with the geranium. The best propagating wood comes from the field-grown variety in good health, it is necessary to plant the stock intended for propagation in the field and to propagate either from the field-grown wood in August or early September, or to lift the plants in the month of September and plant them on benches in the greenhouse, where they will become established and will maintain a vigorous constitution throughout the winter season. The propagating field-grown wood is far less successful than from wood grown inside, and when the field-grown cuttings are placed in sand, a large percentage of them is likely to damp-off, especially if there has been a comparatively abundant rainfall in the month of July. The best method that the writer has found for striking the field-grown cuttings is to put them in 2-inch pots, using a light sandy soil free from all manure and chemicals, and to place the pots in the full sunlight either in a coolhouse or a frame. These cuttings must be kept on the dry side until the calluses have been well formed, although they should not be allowed to shrivel at any time. If the cuttings show signs of shriveling, a light syringing is preferable to a heavy watering. After the roots have started, the treatment of the plants is the same as if the cuttings had been rooted in the sand and repotted. The writer considers wood grown inside superior to field-grown wood, as the cuttings are much shorter-jointed; most of them can be taken from the plant with a heel and 95 to 100 per cent of them will root in sand in the ordinary cutting-bench.

A good temperature for the geranium propagating-house is 58° to 60°, with a bottom heat of 65° to 68°. While the cuttings are in the sand and before they are rooted, care must be taken to keep them moist for fear of "damping-off," or what geranium-growers know as "black-rot." As soon as the cutting is thoroughly callused and begins to emit roots, it should be potted up at once. The best soil for geraniums, according to the writer's experience, is a firm pliable clay loam; this is best if used absolutely without any manure, especially fresh manure. After potting the cuttings they should be lightly watered and shaded for a day or so if the sun is extremely hot, until the roots take hold and the foliage fills up and the stems begin to look plump. The geranium should not be grown at any time in its young state in a soil that is too rich, and care must also be taken that the plants are not kept too wet.

The geranium is subject to few diseases, and so far as the writer has been able to observe these diseases are brought on by too much fresh manure in the earth combined with too much moisture induces a condition of the leaves ordinarily called "spot." It usually appears in the hottest weather or immediately after extreme heat accompanied by copious showers or rains.

Excellent specimen geranium plants may be grown in pots, especially of some of the newer French and English round-flowered varieties. In order to produce the best results, choose young vigorous plants that have
be propagated either in the latter part of August or the forepart of September, and that have shown a disposition to take hold immediately, both in rooting and in starting to grow after being potted. The soil should not be too rich, and it is best to start with the plant in a rather small pot, say 2½ inches, and proceed onward with light shifts—that is, shifting the plant from a 2½-inch to a 3½-inch pot, and so on, letting the sizes increase an inch at each shift until a 7-, 8-, or 9-inch pot is reached, which will usually be large enough to flower the finest specimens. Whenever shifting the geranium, be sure to pot firmly, as a firm soil produces a short-jointed stocky growth, and far more bloom than a loose or over-rich soil. When the plants reach a 5- or 6-inch pot they may be regularly fed with manure-water. The most critical time for these specimen geraniums will be in the months of July, August, and September; in these periods exposure to intense sun will be avoided. Too much water and a cold temperature are always detrimental to the geranium. Syringing the foliage frequently to keep down the temperature is also injurious. If these plants are kept under glass, a light shading or stripping upon the glass is beneficial. Probably the best position for such plants in these three extreme months is on the north side of a row of trees, some distance away from the trees, where the plants will have the benefit of the subdued shading of the foliage. If kept under glass and shaded, abundant ventilation should always be provided. As the winter approaches, a night temperature of 60° and day temperature of 70° to 75°, with plenty of ventilation in the daytime, especially in bright weather, seem best to suit the plants. Syringing ruins the flowers, and too much moisture either in the pot or upon the foliage causes the spotting of the leaves known as "dropsy." In planting the geranium in the field or in beds, always avoid an over-rich soil. The earth should be in good condition and fertile, but must not be loaded with either chemical or animal fertilizer. Too much water at any period during the hot weather produces a rank growth, reduces the quantity of bloom and in most instances induces the spotted foliage to appear.

Another disease, which is sometimes serious, especially in extremely hot seasons accompanied with a superabundance of moisture, is "stem-rot." This frequently attacks imported stock. It is most serious in intensely hot seasons; the entire plant turns black and fades and withers away. The stem-rot occurs in varieties that have been very heavily propagated.

The insects that affect the geranium are also comparatively few. The red-spiders are sometimes a serious pest in summer and is difficult to get rid of when it is once well established. The only method is to syringe the plants with an extremely fine spray, and also to pick off the leaves that are seriously affected and burn them. The green-fly is also troublesome at times, but is easily managed with the ordinary fumigation of tobacco. There is a small caterpillar that eats the foliage and sometimes provokes a serious pest. If one can induce a few ground sparrows or any of the warblers, or even English sparrows, to make their home about the greenhouse, they will put a speedy end to these caterpillars. Another remedy is to go over the plants carefully and to pick the caterpillars off and destroy them. This is tedious, as it must be done frequently.

In the way of bedding geraniums, as a rule the Bruant section produces the best results, but there are a number of English and French varieties that do especially well in our hot climate. The greatest difficulty in successful geranium-culture in America is the intense heat of the summer months, chiefly July and August. Some varieties withstand the heat better than others.

Show pelargoniums. (T. D. Hatfield.)

What are known as show pelargoniums have enjoyed a long popularity. By the general public, and by old people especially, they are known as Lady Washington geraniums. They are not so commonly grown as the so-called geraniums, chiefly on account of their limited season of bloom and the fact that they cannot endure our hot midsummer suns. Through the greater part of the summer they are liable to be neglected. They also require different treatment from geraniums, and—if skill there be—more skill in cultivation.

At the end of the blooming season, they require rest—a season of ripening the growth already made. At this time very little water will be needed, and they may be stood out in the full sun. Only the old flower-stems may be removed. In no sense should they be cut back at this time, neither should water enough be given to encourage new growth. All the leaves should stay on until they naturally turn yellow with age, thus securing a thoroughly ripened growth. In September, one may prune them into shape, some times rather severely, but in any case cut out all weak and soft shoots. They should then be shaken out and repotted in a light compost, not rich, into the smallest-sized pots that will hold them, for the process of growing them on has to be gone over every season. After potting, a good soaking will be necessary, and they may be placed in a well-lighted coldframe. There is no need to keep them close; the stimulation of water, and the slight protection of a frame are usually enough to start them into new growth. No forcing will ever be needed at any season, and if the grower wished, he might keep them in a coldframe until very late in the season, so long as adequate protection against frost is afforded. They are at their best in May, and to have them in good condition, one may grow them slowly in a house averaging about.
50° night temperature (slightly less in midwinter), from October onward.

After the turn of the days,—in January—repot them, using now a richer compost. Give a fairly good shift, depending in part on the size of plants desired, the vigor they show, and the difference in varieties. If we wish to bloom in April or, as some florists might, at Easter, they should have been potted at once—in late August or September—into the size they should bloom in,—a medium size, probably the same as they had lately occupied, and have been taken indoors to grow continuously. But for display in May and June, they are potted again in January, and some plants may be given another shift when extra vigor or the possible need of a few extra-large specimens demand it. They will need careful stopping. Some rubbing out of weak shoots, when they break abundantly, will help those that remain, and one may even have to do a little pruning. Stopping, however, must be discontinued as soon as the flowering stems begin to show, which is about the end of February in the writer's practice. These stems can be distinguished easily by a slight silky on both sides, the lateral segms. 3-lobed, all shrubby, densely pubescent: lvs. pinnately 3-parted, oblong, velvety, and pale-edged; calyx-tube as long as the petals, somewhat hairy, the lobes obtuse—bicolor, Sims. Caulescent: lvs. sub-bipinnatifid, the segms. linear, tolong. Var. laxatum, Harv., has lvs. 4-pinnate, the pinn: stalked and ultimate segms linear. Daucus, B.M.1641. Var. daucifolium, Harv. and P. villosum, Mill.). St. or caudex very short, succulent: lvs. large, 2-3 pinnately compound, pubescent, the ultimate teeth gland-tipped: calyx-tube long and stalk-like, much exceeding the pedicel, the lobes half as long as the petals: lvs. brown-yellow with dark spots.—A well-marked species, sometimes offered in the trade. It runs into several forms. The various names and synonyms suggest the divided lvs. of the umbellifers and other plants. Var. filipendulifolium, Sims. Caulescent: lvs. sub-bipinnatifid, the segms. oblong. B.M.1841. Var. daucifolium, Harv. (Geranium daucifolium, Linn.), has lvs. narrow-linear or linear-oblong. Var. luteum, Harv. has lvs. 4-pinnate, the pinnae stalked and ultimate segms linear.

2. quinquevulnerum, Wild. Somewhat shrubby at base, sparingly branched, hirsute: lvs. 2-pinnatifid with linear toothed segms., the stipules broadly corolate and mucronate: lvs. purple, scentless, the petals obovate, velvety, and pale-edged; calyx-tube as long as the pedicels, somewhat hairy, the lobes obtuse.—Thought by Sweet to be a hybrid of P. triste and P. biolor, and so regarded by Kruith. It runs into several forms. The various names and synonyms suggest the divided lvs. of the umbellifers and other plants. Var. filipendulifolium, Sims. Caulescent: lvs. sub-bipinnatifid, the segms. oblong. B.M.1841. Var. daucifolium, Harv. (Geranium daucifolium, Linn.), has lfs. narrow-linear or linear-oblong. Var. luteum, Harv. has lvs. 4-pinnate, the pinnae stalked and ultimate segms linear.

3. fulgidum, Ait. (Geranium fulgidum, Linn.). St. shrubby, densely pubescent: lvs. pinnately 3-parted, silky on both sides, the lateral segms. 3-lobed, all

INDEX.

I. Lvs. on the pinnate order, although sometimes entire, usually pinnately lobed or compound. (Nos. 1-5).

A. Plant with short, more or less succulent st. and tuberous or thickened roots: lvs. pinnate or pinnately parted, long-petioled: lfs. in many-ifd. Cane umbels, on very short pedicels: petals 5, nearly equal; stamens 5-7, one filament broad. (Polyactium.)

1. triste, Ait. (Geranium triste, Linn. G. pastinac-e-folium and P. villosum, Mill.). St. or caudex very short, succulent: lvs. large, 2-3 pinnately compound, pubescent, the ultimate teeth gland-tipped: calyx-tube long and stalk-like, much exceeding the pedicel, the lobes half as long as the petals: lvs. brown-yellow with dark spots.—A well-marked species, sometimes offered in the trade. It runs into several forms. The various names and synonyms suggest the divided lvs. of the umbellifers and other plants. Var. filipendulifolium, Sims. Caulescent: lvs. sub-bipinnatifid, the segms. oblong. B.M.1841. Var. daucifolium, Harv. (Geranium daucifolium, Linn.), has lvs. narrow-linear or linear-oblong. Var. luteum, Harv. has lvs. 4-pinnate, the pinnae stalked and ultimate segms linear.

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2842. Pelargonium cordatum (× 3). No. 18.

2841. Pelargonium odoratissimum (Natural size). No. 15.
Pelargonium angulosum. From Dillenius' figure in 1732.
and sharp-toothed, the stipules ovate and mucronate: fls. about 3 on each pedicule, the stalk-like calyx-tube 3–4 times as long as the lanceolate segms., the obvate white petals (upper 2 with red lines) 3 times as long as calyx-segms.—A handsome and distinct species, probably not now in cult. in its pure form. Intro. to England in 1794.

9. multibracteatum, Hochst. Somewhat shrubby below, 1–2 ft., thinly hairy but becoming glabrous: lvs. palmately about 7-cut or -lobed, the segms. broadly oblong or ovate, serrate or crenate, more or less hairy, 2–5 in. across; stipules about ½ in. long, ovate to elliptic: peduncles long, 6 in. to 1 ft., bearing 6–10-fld. umbels; fls. whitish or white on pedicels about 1½ in. long; petals obvate-spatulate, entire, twice longer than the narrow sepals. Trop. Afr. G. M. 54.028.

10. transvaalense, Knuth (P. Thorncroftii, Hort.). Erect, 16 in. to 2 ft. in bloom, the sts. terete and soft-hairy, sparingly branched: lvs. few, cordate-angular in outline, 5–7-lobed, the lobes triangular or rhomboid, serrate-dentate, the petiole as long as blade or longer; stipules broadly ovate, acute: umbels many, corymbose at apex of st.; fls. nearly sessile, rose-colored or carmine, white, on pedicels about ½ in. long, ovate, serrate or crenate: peduncle 3–4 times longer than the lanceolate segms.; petals broadly ovate, scarlet, but now varying to lighter colors.—“Among shrubs and on hillsides.” This is the Geranium inquinans of Linnæus, who founded the species on previous descriptions. One of the descriptions (Dillenius, in “Hortus Elthamensis,” 1732) was accompanied by a picture, and this picture, reduced, is reproduced in Fig. 2836. It will be seen that even in that early day the species had varied into a form with short-notched petals and short pedicels. Intro. into England in 1714. Said by Harvey (1559–60) to be the parent or one of the “scarlet geraniums” of English gardens.

13. hortorum class. COMMON FISH or BEDDING GERANIUM. Fig. 2840. The common geranium in great numbers of forms, derived from the variation and probably the breeding of P. zonale and P. inquinans (and possibly others) in more than a century of careful selection. The original species are not now in cult. Practically all garden geraniums have the zonal marks on the lvs., or bands, or a central blotch of variegation. Some of them have intermingled colors of green, white, and red on the same if. Some are “silver-banded” and some “gold-banded.” (See Fig. 2840.)

AAA. Plant with a short and thick more or less fleshy st. or caudex, from which arise slender branches, the lvs. long-petioled and reniform or cordate and obscurely lobed: stamens 6 or 7. (Cortusina.)

B. With spine-like stipules.

14. echinatum, Curt. Fleshy caudex armed with persistent spine-like stipules: lvs. long-petioled, white, tomentose, coriaceous-ovate and obtuse, about 3–7-lobed, the lobes rounded and crenulate: peduncle long and branched; fls. white, with a spot near the center (varying to all purple), the petals notched; calyx-downy, the tube several times longer than the lobes. B.M. 308. G. C. III. 46.245. J. H. III. 49.71. G.W. 15, p. 303.—Now and then advertised. The fls. are said to change color during the day; and the color may be shades of purple. It is offered in Calif.

BB. Without spines.

15. odoratissimum, Ait. (Geranium odoratissimum, Linn.). NUTMEG GERANIUM. Fig. 2841. Plant lax, the sts. ascending or more or less tortuose: st. or caudex very short, throwing up many slender and weak soft-pubescent branches: lvs. very long-petioled, soft, round-cordate and very obtuse, the blade 1 in. or somewhat more in length and broader, obscurely 3- or more-lobed, the margins dentate-crenate; peduncle 3–4 in. long and shorter above; stipules triquetrous or broadly ovate, usually connate: peduncles long and borne opposite the lvs., 5–10-fld.; fls. pedicelled, white or whitish; calyx more or less pubescent, the spur ½ in. or less long, the sepals or lobes lanceolate, acute, with membranaceous margins; petals twice or less longer than calyx-lobes, about ½ in. long, linear-spatulate, rounded at apex—

PELARGONIUM

and sharp-toothed, the stipules ovate and mucronate: fls. about 3 on each pedicule, the stalk-like calyx-tube 3–4 times as long as the lanceolate segms., the obvate white petals (upper 2 with red lines) 3 times as long as calyx-segms.—A handsome and distinct species, probably not now in cult. in its pure form. Intro. to England in 1794.

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PELARGONIUM 2531

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Some plant in bloom. The plant is cultivated as *P. fragrans*, Willd., to *P. exstipulatum*; but Knuth separates it as follows:

10. *fragrans*, Willd. (*P. odoratissimum × P. exstipulatum*, Sweet. *Geranium fragrans*, Poir. *G. odoratissimum erctatum*, Andr.). Plant strict, the branches more or less erect; scarcely suffrutescent, the sts. more or less squarrose-branched, leafy; fl.-blade to 1 in. long and nearly as wide, obtuse-cordate, the margin crenate or crisped, pubescent, the upper lvs. sessile and the lower long-petioled; stipules triquetrous, free: fls. nearly sessile, whitish, and more or less red-veined; calyx pubescent, the spur 1/4–1/6 in. long; sepals or calyx-lobes lanceolate or ovate-lanceolate, acute; petals twice or more longer than calyx-lobes, about 1/2 in. long, much narrowed at base, the apex rounded.

**AAAAA. Plant woody, not succulent, much branched, the foliage often scented but not "fishy": fls. various, but not pinnately parted: fls. paniculate or umbellate; 2 upper petals longer and broader than the others, marked; good stamens 7 or 6. (*Pelargonium.*)**

**b. Lvs. not distinctly lobed, though often angled, mostly oval or ovate and cordate (exceptions in *P. domesticum*).**

17. *betulinum*, Ait. (*Geranium betulinum*, Linn.). Erect and shrubby, downy on the young growths: lvs. subglabrous, stalked, ovate or ovate, obtuse or not prominently acute, rounded or truncate at base, the stipules sharp and deciduous; fls. light purple, the broad upper petals with dark streaks; petals 2-3 times longer than lanceolate sepals, nearly equal, 1 in. or more long, lanceolate-obovate, rounded and cuneate at apex. B.M. 148.—A handsome and neat plant.

18. *cordatum*, L'Her. Figs. 2842, 2843. Shrubby and erect, villous or nearly glabrous: lvs. long-stalked, cordate-acute, denticulate and sometimes obscurely lobed; peduncles usually branched, the pedicels and calyx soft-hairy; fls. purplish, the petals twice as long as the sepals, the two larger nearly or quite 1 in. long, cuneate-obovate, the apex rounded and entire. B.M. 165 (as *P. cordifolium*). G.M. 54:627.—Distinguished from *P. exstipulatum* by its flat cordate acute lvs. It is a handsome plant in bloom. The plant in cult. as *P. cordatum* (Fig. 2843), has lvs. more truncate at the base than the descriptions and old pictures call for, although on some shoots the lvs. may be typically cordate. In the wild, the plant runs into several forms, distinguished largely by pubescence.

19. *cucullatum*, Ait. (*Geranium cucullatum*, Linn.). Tall and shrubby plant, much branched, softly and densely villous: lvs. long-stalked, kidney-shaped and cupped or cucullate, denticulate, very soft-pubescent, the stipules ovate-acute and withering: fls. red or reddish, in many-fl. panicles, the pedicels and calices densely silky-hairy, the petals twice as long as the lance-acuminate...
P. domesticum is not the first name that has been applied in this group, but the writer is not aware that any collective or group name has been given. Sweet, in particular, has given Latin names to various forms. These old names, however, apply to particular historical forms, and it would be violence to enlarge their application to cover the entire group, and it would be difficult to choose any one of them as more applicable, under botanical rules, than others. It is probably also, inaccurate to call this garden form either P. cuellatum or P. angulosum.

BB. Lvs. cordate-lobed, soft and velvety.

22. tomentosum, Jacq. Plant rather thick- and soft-stemmed, the branches becoming several feet long, white-hairy all over: lvs. very long-stalked, very broadly cordate-ovate or hastate-ovate at base, 3-5-7 lobed and small-toothed, soft and velvety on both surfaces; stipules ovate-saccate, withering; fls. small, white, with red near the center, in a lax panicle, the pedicels many times longer than calyx-tube; 3 long petals longer than sepal.-An old cult, plant.

BBB. Lvs. sharply 3-7-lobed and sharply toothed or serrate.

23. capitatum, Ait. (P. Drummondii, T.uenz. Geranium capitatum, Linn.). Sts. weak and trailing, but suffruticeous at base, with long white hairs: lvs. long-stalked, cordate, 3-5-lobed and the lobe round and toothed; stipules broad-cordate, pointed: peduncles longer than the lvs., densely many-fl., the fls. sessile, rose-purple, with calyx-tube much shorter than the hairy mucronate calyx-lobes. B.M. 7446. -Plant rose-scented, but not in general cult, in its pure form; fls. in dense many-fl. heads.

24. vitifolium, Ait. (Geranium vitifolium, Linn.). Erect, more or less woody, densely hairy and villous: lvs. long-petioled, cordate at base, 3-lobed, the lobes shallow and very obtuse and rounded, dentate; stipules broad-cordate: peduncle longer than fl., simple and densely many-fl.; fls. sessile, small, purplc; calyx-tube not half so long as the hairy aristate segments; petals twice longer than sepals, 2 of them larger and purple at base and the other 3 smaller and unicolored. -Differing from P. capitatum in erect habit and lvs. less deeply cut.

BBB. Lvs. deep well many-folded, with narrow divisions, rather rough or stiff, strong-scented. Rose Geraniums.

25. quercifolium, Ait. (Geranium quercifolium, Linn. f.). Oak-leaved Geranium. Scarlet-flowering Rose Geranium. Fig. 2846. Shaggy and branchy, somewhat hairy and glandular: lvs. with stalks 2-3 in. long, cordate-ovate in outline, with 2-3 pairs of oblong side lobes (lvs. pinnatifid), which extend nearly to the margin and are again toothed and notched; stipules small, 2 pairs at each node (or bifid); fls. few to several, rather small, red or purplish, in umbels and with short pedicels, the bracts lanceolate; sepal elliptical and mucronate, half as long as the petals.-A rather common greenhouse plant, the lvs. often with a dark spot, and not agreeably scented.

26. graveolens, L'Her. (Geranium graveolens, Thunb.). Fig. 2847. Much like the last, but lvs. longer-petioled and palmately 5-7-lobed or parted, the broad lobes fist and pinnatifid into many mostly oblong lobes; stipules cordate-acute; fls. mucronate, mostly long peduncles, pink or light purple, small, the calyx hairy and nearly sessile, the calyx-lobes half as long as the petals. -This is one of the commonest forms of rose geranium, a leafy plant with a rather heavy balsamic odor. A fl. is well depicted in Fig. 2847. There are many derivatives from it.

27. hispidum, Wild. (Geranium hispidum, Linn. f.). Woody at base but herbaceous upward, 2-3 ft., much branched, hairy and glandular: lvs. long-stalked, hispid on both surfaces, 4-5 in. across, 5-7-lobed, the lobes acuminate and unequally sharp-toothed and more or less lobulate; stipules cuspitate; fls. paniculate, small, white to carmine; calyx-tube shorter than pedicels, the segments lance-acuminate; petals about twice longer than sepals.-An old cult, plant.

28. Radula, L'Her. (P. multijidum, Salisb. Geranium Radula, Cav. G. revolutum, Jacq. f.). Fig. 2848. Differes from P. graveolens in the narrower divisions with revolute margins of the lvs.: the lvs. are deeply palmately parted, the lobes narrow linear and pinnatifid, all rough-hispid on the upper surface and soft-pubescent beneath: fls. small, pale purple, with dark streaks, the peduncles and hispid calyx-tube and about 4-5-fl., fls. pedicellate; calyx-tube short, the lobes or sepals setose and glandular. B.M. 95.-Does not appear to be in the trade in a pure form, but the narrow-lobed rose geraniums are probably hybrids between this and P. graveolens.

29. denticulatum, Jacq. (Geranium denticulatum, Poir.). Fig. 2849. Much like P. Radula, but the fls. very denticulate and flat: lvs. glabrous and viscid above, somewhat hispid beneath; stipules ovate-lanceolate: fls. 3-4, subsessile, on short hairy peduncles, lilac or rose-purple, the 2 upper petals toothed or 2-lobed and with dark streaks; calyx-tube short, the segments or lobes oblong, mucronate and viscid.-Plant weaker than P. Radula. It has a balsamic odor. Perhaps it has entered into the garden forms of rose geranium. Intro. into England in 1789.

BBB. Lvs. small, round-cordate, 3-lobed half their depth and the margins toothed or jagged.

30. crisatum, L'Her. Much branched and very scabrous or rough, shrubby, glandular: lvs. 2-ranked, small and rigid, short-stalked, cuneate, or slightly cordate at base, coarsely toothed, more or less 3-lobed: fls. 2-3 on short peduncles, violet, the lower petals narrowly calyx-tube glandular and roughish, shorter than the pedicels, the lobes or sepals oblong and acuminate. -A neat strict-growing plant with lemon-scented foliage. Probably not in general cult, now in a pure form. Variable in the wild. Var. latifolium, Harv., Figs. 2850.
Any number of Latin-formed names of Pelargonium may appear in the trade, for the hybrids and varieties are numerous and not always readily referable to the species as forms or varieties. —P. Blandifolium, Sweet. (P. graveolens × P. edulis.) A good grower, shrubby, the branches roughish pubescent; lvs. flat, 7-lobed, the lower lobes deeply lobed again, all bluntly toothed, strong-scented; fls. white or pale blush, the upper petals with 2 red spots. G.M. 54: 626. —P. brevicalx, G. E. Br. —P. polybotiunutum. —P. Cultivatum, L. Her. Lvs. evergreen, at base of plant, cordate, 3 in. across, entire or nearly so, whitish beneath, wrinkled above; fls. on scape-like peduncles above the lvs., 3 in. across, white. St. Helena. Requires little heat. G. 26: 235. —P. tricoloratum, Mast. Allied to P. multibracteatum. Pinnate lvs. 3-lobed, the terminal lobe ovate-lanceolate and again lobed in middle, margins toothed; fls. greenish yellow with purple in base. Trop. Afr. Perhaps same as P. Fasheri, Eng. —P. latifolium, N. E. Br. A very recent species from S. Afr.; herb with bulbous rootstock. lvs. 4 or 5, all radical, twice ternately divided, 1½-2 in. long and broad, the ultimate segms. linear; petals nearly ½ in. long, pale yellow with 2 red lines at base. —P. polybotiunum, R. Muy. (P. brevicalx, N. E. Br.) Th. thick and fleshy, ovoid, rising very little above the ground, short-branched at top; lvs. in a rosette, bipinnately divided, ovate-oblong in outline, thick and fleshy; petals 5 or 6 petals, greenish-yellow; fls. pale yellow, the petals shorter than sepals. Cape Colony. —P. violaceum, Hort. is a name of no botanical standing, applied to some of the common forms of rose campion of the P. hybridum group.

PELECYPHORA (Greek, hatchet-bearing; from an alleged resemblance in the tubercles). Cactaceae. Hatchet Cactus. Two species closely allied to Mammillaria; sometimes seen in cactus collections. Stems globular, short-cylindrical or clavate, small, often cespitose; tubercles strongly compressed from the sides; areoles very long and narrow, bordered on each side by a row of about 20 very short, appressed com- like spines: fr. naked.

asselliiformis, Ehrb. (from a fancied resemblance to Asellus, the wood-louse). Juice watery; tubercles ashly green, more or less deeply grooved to the woolly axil; spines not projecting beyond the margin of areole; fls. purple with paler segms. fr. near the center, red. Nuevo Leon and San Luis Potosi, Mex. L.H. 5: 186. Var. concolor has pure purple fls. B. M. 6601.

Peltanatá, Schum. Juice milky; tubercles bright green with naked axils; spines projecting a little beyond the margin of tubercle: fls. yellow, lateral. Oaxaca, Mex. K. BATARINE BRANTZ.

PELIOSANTHES (Greek, livid flowers, referring to the flowers of certain species). Lactuceae. Plants with short horizontal rhizomes, long-petioled radical lvs. and fls. borne in spikes or simple racemes; perianth-tube above the ovary, short, broad, campanulate; limb spreading-rotate with 6 subulate lobes; stamens 6 with very short filaments; ovary inferior, 3-celled: stigma 3-lobed; cells with 2 ovules erect from the base, anatropous; seeds oblong or globose, fleshy. About 12 species from India, the E. Indies, and Malaya Peninsula. The following have occasionally appeared in cult: P. Teto, Andr. Lvs. 2-7; petiole variable in length: scape naked or with a few scales above and large membranous sheaths at the base; raceme 6-12 in.; bracts 1-3 to every fascicle of fls., pedicels short; fls. ⅓-⅔ in. diam., purplish or bluish green; seeds as large as a pea, olive-blue. Himalaya, Malaya. B. M. 1302. The var. Mantegazziana, Panamani, is a form with less rigid lvs. than the type. Malaya. P. violacea, Wall. has the habit of P. Teto and fls. of the same size and color but solitary in the bracts: seeds 2½ in. long, oblong. Himalaya, Burma. Var. Clarkii, Baker, differs from the type in having more conspicuous transverse nerves and a darker purple fl. Assam and Malaya. B. M. 8276. Cult. in botanic gardens in the tropical house.

R. TRACY HUBBARD.

PELLÉA (Greek, pellós, dusky; from the usually dark-colored leaf-stalks). Polygalaeeae. Small rock-growing ferns thriving best on lime; one rosette lvs., oblong or oval, softer and longer in the base, anatropous; seeds as large as a pea, olive-blue. Tropics of the world. About 40 species, usually found in many countries. Some of them are glasshouse plants and others are hardy.

P. Lvs. simply pinnate.

P. Lfts. 4-5 pairs.

Pringlei, Dav. Lvs. with 4-5 pairs of large triangular hastate stalked lfts. 1 in. or more across either way: sorus forming a wide marginal band. Mex.

P. Lfts. 5-8 pairs.


P. Lfts. 5-8 pairs.

rotsanfibia, Hook. Fig. 2852. Lfts. mostly short-stalked, oblong or roundish, entire, obtuse. New Zealand.

falciata, Fée (Platycléma falciatum, J. Smith). Lfts. nearly sessile, lanceolate or lanceolate-oblong, mucronate and often slightly falcatc: sorin in broad lines. India to Austral. and New Zealand.

PELARGONIUM

PELECYPHORA

PELIOSANTHES

PELLÉA

PELLÉA
PELLÉIA

AA. Lvs. bipinnate.

B. Pinnae (at least the lower ones) of more than 3 lfts.

ternifolia, Link. Lvs. 6-12 in. long on strong dark chestnut stalks, narrow, with 6-12 opposite pairs of pinnae. Lfts. closely rolled together, linear. Trop. Amer.

BB. Pinnae formed of 3 sessile lfts.

mucronata, Eaton (P. Wrightiana, Hook.). Lvs. 3-6 in. long, 1-3 in. wide, deltoid; pinnae with several linear-oblong pinnules on each side ½ in. long, with inrolled edges and a sharp mucronate point. Texas to Calif.

atropurpurea, Lillie Lvs. 4-12 in. long, 2-6 in. wide, lanceolate to ovate-lanceolate, with several pinnules which are sessile, auricled or heart-shaped at the base, the broad line of sporangia nearly hiding the narrow marginal indusium. E. Amer., to the Rocky Mts.

AAA. Lvs. at least tripinnate.

B. The lvs. triangular-deltoid, with narrow ultimate divisions.

désa, Hook. Cliff Brake. Lvs. 2-3 in. long, 1-½ in. wide, on slender brown stalks; segms. linear with inrolled edges sharp-pointed; indusium permanently covering the sori. Pacific N. Amer., and eastward to Wyo.

BB. The lvs. elongate, ovate, or lanceolate.

andromedafolia, Fée. Lvs. 6-12 in. long, 3-6 in. wide; ultimate divisions 1½-2 lines long, linear-oblong, with inrolled edges. Calif.—Sometimes known as the coffee fern.

viridis, Prantl (P. hastata, Link.). Fig. 2853. Lvs. 6-24 in. long, 6-12 in. wide; ultimate divisions ovate or lanceolate, 1-2 in. long, nearly sessile; sori in a narrow marginal line. E. and S. Afr. Small lvs. are sometimes only bipinnate. Very commonly used in small ferneries.

P. mutleri, Beddome (P. gracilis, Hook.), a rare membranous species of the eastern states is more serrate allied to the genus Cryptogramma, to which Prantl has referred it.

L. M. UNDERWOOD.

PELLÓNIA

(J. Alphonse Pellion, officer in Freycinet's voyage around the world). Urticaceae. Two choice tender creeping foliage plants of this genus are cultivated, suitable for baskets and for the borders of greenhouses under the benches.

Herbs, often creepers, rarely subshrubs from Trop. and E. Asia and the Pacific Isls.: lvs. alternate, 2-ranked, unequal at the base, entire or serrate frs. monoeious or dioecious, mostly in dense cymes; perianth-segms. 5, rarely 4, in fr. sometimes unchanged but usually increased and investing the fr. —Species 15-20. The cult. species require warm temperature and moist atmosphere. Prop. by cuttings and division. One of the species was once advertised as a Peperomia.

Daveauana, N. E. Br. Prostrate, 1-2 ft. long, the sts. succulent and creeping below, the tips pubescent: lvs. 1-2½ in. long, sessile, obliquely oblong or orbicular, crenate and obtuse at tip, dark brownish olive-green more or less flushed violet or red, with a fern-like figure of light green down the middle of the fr., the figure being narrowly oblong and crenate. This figure is sometimes absent from some of the lvs. The lvs. are more acuminate than in the next. Burma to Cochín-China. R.H. 1880:290 (as Begonia Daveauana, a charming picture). I.H. 29:272.

púlchra, N. E. Br. Practically glabrous, with creeping fleshy sts. tinged purplish: lvs. obliquely oblong and very obtuse, dull blackish along the midrib and veins, the inter-spaces being light green, the under surface pale purplish. Cochín-China. I.H. 30:479. A.G. 15:4.

WILHELM MILLER.

L. H. B.

PELORIA

(Greek for monster). A term applied to the phenomenon when usually irregular flowers, such as those with some of the petals or sepals spurred or saccate, develop all the parts of each set alike, thus becoming radially symmetrical. The case was observed by Linnaeus in Linaria vulgaris, Fig. 2854, and the term peloria was given by him. Flowers often become peloric on account of changes in their relations to light, but other causes certainly contribute. A reverse change, by which radial flowers become zygomorphic, occurs in many Composita when the corollas of disk-florcs become strap-shaped, as in the cultivated asters and chrysanthemums. Sometimes, on the contrary, all sorts fail to develop

wilhelmi Miller.

L. H. B.

PELORIA viridis. A good greenhouse fern, likely to be known to gardeners as P. hastata.

PELÓRIA

Normal columbine flowe...with spurs present.
PELORIA

(Figs. 2855, 2856.) Peloric forms have been of little significance in horticulture. See Keeble, Pellew and Jones on inheritance of peloria in foxtgloves, "New Phytologist," Vol. IX, page 98 (1910).

PELTANDRA (Greek, referring to the peltate anthers). Araceae. Arrow Arum. Stemless herbs, being excellent submerged aquatic plants, their large thick sagittate leaves always adding variety and interest to margins of ponds and to bog-gardens.

Leaves glossy, arrow-shaped, arising from strong underground parts: fls. monoeous and naked, the stamine ones on the upper part of the long spadix, the anthers sessile and impeded and opening by terminal pores, the 1-loculed ovaries attached by 4 or 5 scale-like bodies or staminodia: spathe usually exceeding the spadix: fr. a 1-3-seeded, mostly leathery berry, borne in large globose clusters.

—Two species in E. Amer., which have been much confused. Single specimens or clumps are usually more prized. Peltandras are easy to colonize.

virginica, Kunth (P. undulata, Raf.). Lvs. narrow-sagittate, the basal lobes longer and nearly or quite acute: spathe 4-8 in. long, green, convolute around the spadix for its whole length; sterile part of the spadix much longer than the pistillate part: fr. green, 1-3-seeded. In shallow pools or bog margins, New England to Fla. and west. A.G. 14: 111.—The root is composed of thick cords or fibers.

Peltaspera, Morong (P. alba, Raf.) Lvs. broader the basal lobes short: spathe white, the upper part expanded and calla-like; sterile part of spadix little, if any, longer than pistillate part: fr. red, 1-seeded. Va., south.—Root tuberous.

L. H. B.

PELTÁRIA (Greek, small shield, referring to the roundish form of the pod). Cruciferae. Tall glabrous herbs with entire cauleine lvs. sagittate-cordate at base; fls. white, subcoriaceous, fruiting pedicels spreading or recurved, filiform, without bracts; sepals broad; stamens free, not toothed; silique orbiculate or obovate, 1-celled, indehiscent, much compressed, reticulate. About 4 species, natives of S. Eu. Asia Minor, Syria. P. alliaceum, Jacq. About 1 ft. high, with entire petals, smooth flat pods, and sagittate-cisplasing lvs. This species has the odor of garlic, as its name would suggest. E. Eu. Offered in the trade as a cut-fl. R.H. 1908, p. 131.

PELITIFLÁMUM: Sazirago.

PELTOPHORUM (Greek, shield and bearing, referring to the peculiar stigma). Leguminosae. A few species of splendid tropical trees, belonging to the same tribe as the gorgeous Poinciana and Casalpinia.

Flowers yellow; petals 5, roundish; stamens 10, free, deciduous; filaments plicate at base; ovary sessile, 2-10-many-ovuled; pod flattened, indehiscent, with narrowly winged margins. Peltophorum is distinguished from Casalpinia and Poinciana by the valvate calyx-segments of the latter, while the two former have their calyx-segments, strongly imbricated. The peculiar stigma of Peltophorum readily distinguishes it from its close allies, Casalpinia and Harnatuxylon (logwood). These genera represent a type of structure widely different from the northern pea-shaped fls., as they have 5 distinct petal parts which are all about the same size and shape. There is a fine colored plate of a Peltophorum in Blanco's "Flora of the Philippines," where the golden fls. are nearly 1½ in. across, a dozen of them in each raceme, and 4 racemes uniting to form a great panicle. Peltophorums have the Mimosa type of foliage. Each fl. of P. nieme has 8-10 pairs of pinnae, and each pinna 10-20 pairs of lts. The generic name is preoccupied by Peltophorus, a genus of grasses, and is consequently replaced by some recent authors by the name Baryxylum.

A. Lvs. ½-3½ in. long, 10-20-pinnate.

B. Flowering stalks as in Panicum, but surrounded by several bristles that fall with the spikelet.—Species about 40 in tropical regions, one species cult. for fodder, some of the others for ornament.

Plainted grass known to gardeners as P. longistylosum is much used for bedding. It is, perhaps, the finest dwarf grass which is grown chiefly for its flower parts. It sometimes survives the winter at Washington, D. C., but should always be treated as a tender
subject. Plants raised every year from seed are satisfactory if seed is sown early enough, but divisions of old plants will give larger pieces which flower sooner and require less attention than seedlings. The old plants may be wintered anywhere out of reach of frost. About February 1, in the latitude of Washington (a month later North), cut off the old leaves to within 6 inches of the crowns; divide the clumps into small pieces, trim the roots so that they will ultimately go into 3- or 4-inch pots, and place the pieces thickly together in boxes of sandy soil in a greenhouse with a temperature of about 60°. As soon as new roots have started, pot the young plants. They may be removed to a coldframe long before the soft bedding material demands all the available indoor space. (G. W. Oliver.)

A. Annual: bristles about as long as the spikelet.
   
   **Pennisetum typhoidesm**, Rich. (Penicillaria spicata, Willd. *Pennisetum typhoides*, Rich.). **PEARL MILLET.** Culm 3-8 ft., pubescent below the spike: lvs. long and broad: spike cylindrical, 3-10 in. long, ½ in. thick, the globose grain bursting through its lemma and palea. Native country unknown.—Occasionally grown in the southern states, where it ripens seed. May be grown farther north for forage. A luxuriant annual, long cult. in the Old World for forage and more or less for the grain which is used as food.

   **B. Bristles plumose.**

   **villosum**, Brown (P. longistylum of florists, not of Hochst.). Fig. 2857. Spike broad, 2-4 in. long, and feathery from the bearded bristles; culm 1-2 ft. high, pubescent below the spike. Abyssinia. R.H. 1890, p. 489.

   **Ruppelii**, Steud. (P. Ruppelidnum of some works). Fig. 2858. Culms taller and spikes 6-10 in., longer and more graceful than the preceding. Abyssinia. R.H. 1897, pp. 54, 55. I.H. 42, p. 206. G.W. 1:363.—The form most frequently cult. has a pale roseate spike. This is sold under the names *P. atrorubens*, *P. hybridum Henkelianum*, or CREMSON FOUNTAIN GRASS. G.W. 1:255. R.B. 36, p. 58.—A half-hardy form with dark purplish foliage and purplish crimson spikes has recently been intro. under the name of *P. capreum*. It does not reproduce reliably from seed.

   **BB. Bristles naked.**

   **c. Spikes several on each main culm, borne on short branches; one bristle in each cluster much longer than the others.**


   **cc. Spikes single, terminating each main culm; bristles more or less equal.**


   **macrostachyum**, Trin. (Gymnnothorax caudatum, Schrad.). Culms tall, bearing a slender spike as much as a foot long. S. Afr.

   **macrostachyum**, Trin. (Gymnnothorax macrostachys, Brongn.). Culms 4-5 ft., blades broad, flat; spike 8-12 in., resembling that of *P. Ruppelii*. E. Indies.—A half-hardy form with dark purplish foliage and handsome dark crimson spikes has recently been intro. under the name of *P. macrophyllum atrorubens*. M.D.G. 1906:9. Does not reproduce reliably from seed.

   **nervosum**, Trin. Tall branching perennial with tawny or purplish compact spikes is offered by a western nursery. S. Amer. A. S. HITCHCOCK.

PENNYROYAL of Europe, Mentha Pulegium; of America, Hedeoma pulegioides. Bastard P., or blue curls, is Trichostema dichotomum. All are members of the mint family.

The garden pennyroyal, Mentha Pulegium, is a European perennial, used for seasoning. It is one of the
“sweet herbs.” It is easily grown, profiting by a winter protection of leaves or litter. Propagation is mostly by division. Beds should be renewed frequently.

PENTACHÉTA (Greek, referring to five bristles at the base of the pappus). Compositae. A few species of how slender California annuals with thread-like alternate lvs. and small or medium-sized heads, the rays when present usually yellow, sometimes white: the disk-fls. sometimes purpling. P. aërea, Nutt., grows 1-1½ ft. high and with 7-40 deep golden rays, was once offered and was pictured in Go. 84:1168, but it has no horticultural standing.

PENTÁPETES (Greek, having five leaves; an ancient name of some cinquefoil, transferred by Linnaeus to this plant, which has five leafy growths (staminodes) accompanying the stamens; or perhaps to the 5-merous arrangement). Sterculiaceae. A pretty red-flowered tender annual, widely distributed in tropical Asia, rare in gardens.

Species one, P. phrenica, Linn. Erect branched herb, nearly or quite glabrous, 3-5 ft. Ivs. 3-5 in. long. Last-flate-lanceolate, 1-nerfed, crenate-serrate; pediole 1 in. long. Stems: red, about 1½ ft. high, crossing, opening at noon and closing early following morning; bractlets 3, caducous; sepals 5, lanceolate, connate at the base; petals 5; stamens 20, connate at the base of 3 each, alternating with 5 staminodes which are nearly as long as the petals; ovary 5-celled; cells many-ovuled: caps. loculicidally 5-valved; seeds 8-12, in 2 series in each cell. B.R. 255.—An interesting plant for amateurs in the warmhouse or for cult. in the open in summer. Prop. by seeds and cuttings.

L. II. B.

PENTASTER (Greek words, five and a small wing; alluding to the five-winged calyx). Eriocereae. Epiphytic shrubs, glabrous or strigose-hirsute, with alternate subsessile lvs., rather large and scattered or small and sub-distinctly clustered; fls. rather large, axillary, solitary or in few-fl. corymbs; calyx-tube tubinurate or hemispherical, 5-winged; limb of 5 persistent leafy lobes; corolla tubular, 5-angled, with a limb of 5 suberect or recurved lobes; stamens 10; ovary 5-celled. About 6 species, 1 from the Malay Peninsula, the remainder from the temperate Himalayan region. Two species have been occasionally in cult. P. rugosum, Hook. Fls. pendulous; corolla nearly white, beautifully marked between the 5 angles with purple or blood-red bands; lvs. almost sessile, subcordate at base, very much narrower towards the apex, ovate-lanceolate. B.M. 3, 1835. Mt. B.M. 5198. G. 36:617. G.W. 2, p. 502. P. serpens, Klotzsch. Fls. numerous, axillary, hanging along the under side of the branches; calyx green, 5-angled; corolla bright red, with darker V-shaped marking; lvs. small, lanceolate: sta. slender, drooping; rootstock large, tuberous. Himalayas. B.M. 6777. G.W. 13, p. 90.

PENTARHÁPPHA (Greek, five needles, referring to the form of the open calyx). Gesneriaceae. Shrubs or subshrubs, one or two of which are grown under glass for the fls. This genus is most commonly treated as a section of the genus Gesneria, but is considered distinct by some. The principal characters of the section are the relatively bare branches, the 1- to several-fl. elongated peduncles borne in the H.-axils: fls. with a crooked cylindrical tube; stamens more or less long-styled. At least 10 species. Mex., W. Indies, and S. Amer. P. fimbriata, Carr. Much of the material cult. under this name is referable to Gesneria libanensis (Vol. III, p. 1333), but some of it may be other species, as there appears to be more than one plant passing under this name. R.H. 1878:301; J.J. 32:490. R.B. 27:214. These portraits may not all represent the same plant.

PENTAS (Greek, five, referring to the floral parts) Rubiaceae. Tender herbs and subshrubs, resembling bouvardias and of the same family, grown under glass for the lilac or white bloom. Herbs or subshrubs, erect or prostrate, hispid or tomentose: lvs. opposite, stalked, usually ovate or ovate-lanceolate; stipules multiform or multi-setose: fls. usually corollaless: calyx-lobes 4-6, unequal; corolla pilose, the long tube dilated and villous in the throat; lobes valvate; stamens 4-6, inserted below the throat; filaments short or long; anthers fixed at the back, included or exserted; disk tumid or annular, often produced into a cone after anthesis; ovary 2-loculed; ovules numerous; style-branches papillos; caps. membranaceous or leathery, 2-loculed, loculicidal; seeds minute.—There are about 30 known species in Trop. Afr., including Madagascar. Only one is well known in cult., whose color varieties range through lilac and flesh-color to crimson-pink and rosy purple. A good cluster is 3 in. across and contains 20 or more fls., each of which is ½ in. across. The fls. are about ¼ in. long, funnel-shaped, and usually have 5 spreading lobes, sometimes 4 or 6. It is mostly grown like bouvardia in warm conservatories for winter bloom, but it is sometimes used for bedding in warmer countries, as it gives 3 months of rather showy bloom when treated like bouvardia. In general, the species seem to be less worthy than bouvardias.

The pentas may be propagated from February to the middle of April. Choose cuttings of half-mature wood and place in a warm moist and shaded pot. When the pots have made too long roots, lift and transfer into small pots. They like a sandy open mixtura, as of loam, peat, and sand in equal parts for the first potting. Place where they may have shade until well started, or when they should have sun. In their growing season, which is from the end of January until autumn, they should have a temperature of 60° to 65° at night with 10° to 15° rise during the day with sun. Keep the young plants vigorous by giving larger pots until they are in a 4-8 in. pots. For a compost give them fibrous loam four parts, fiby peat one part, well-decayed cow-manure one part, and enough sand to keep it open. Always give plenty of drainage in the pots, and pot moderately firm. The spring and summer will require 8-10 in. of water. In the hot days of summer give daily syringing, getting well under the foliage. As they grow, tie the branches out horizontally; they then will break away and make a number of growths which will make headway for flowers in autumn. If they show bloom before this time, pinch the flowers out. When the pots become well supplied with roots, give liquid feed once a week. The flowers are very useful for cutting. The care in winter should require a lower temperature; they do well in 55° to 68° at night, with about 10° more with sunshine. Give enough water to keep them in good health and a good syringing now and then. After January, they may have any necessary repotting, such as renewing the old compost with a good rich material and growing on as treated the preceding spring and summer with the exception of cutting back the shoots well. (J. J. M. Farrell.)

lanceolata, Schum. (Ophiórhatta lanceolatá, Forsk. P. aërea, Beeth, under which name it is known to gardeners). Erect or decumbent, 1-2 ft. high, shrubby at base, merely puberulous, not rusty-hairy; lvs. 1-6 in. long, 4 lines to 2 in. broad, ovate, elliptic or lance-oblong, more or less acute, narrowed at base into a short petiole, the lateral veins many: cymes peduncled in 5 groups of 3 each alternating cranial or leathery, 2-loculed, loculicidal; seeds minute.—There are about 30 known species in Trop. Afr., Arabia. B.M. 4086. B.R. 30:32. R.B. 21:217. Gentian. 121, p. 329. J.J. 81:3. J.R. 3:209; 32:417. G.W. 10, p. 378. Var. kermesina, Hort. Fls. carmine-rose, tinted violet in throat. B.R. 1530-1531. Var. aërea Hort. has

2538 PENNYROYAL PENETRATIFLÓRUM (Greek words, five and a small wing; alluding to the five-winged calyx). Eriocereae. Epiphytic shrubs, glabrous or strigose-hirsute, with alternate subsessile lvs., rather large and scattered or small and sub-distinctly clustered; fls. rather large, axillary, solitary or in few-fl. corymbs; calyx-tube tubinurate or hemispherical, 5-winged; limb of 5 persistent leafy lobes; corolla tubular, 5-angled, with a limb of 5 suberect or recurved lobes; stamens 10; ovary 5-celled. About 6 species, 1 from the Malay Peninsula, the remainder from the temperate Himalayan region. Two species have been occasionally in cult. P. rugosum, Hook. Fls. pendulous; corolla nearly white, beautifully marked between the 5 angles with purple or blood-red bands; lvs. almost sessile, subcordate at base, very much narrower towards the apex, ovate-lanceolate. B.M. 3, 1835. Mt. B.M. 5198. G. 36:617. G.W. 2, p. 502. P. serpens, Klotzsch. Fls. numerous, axillary, hanging along the under side of the branches; calyx green, 5-angled; corolla bright red, with darker V-shaped marking; lvs. small, lanceolate: sta. slender, drooping; rootstock large, tuberous. Himalayas. B.M. 6777. G.W. 13, p. 90.
white fns. G.W. 10, p. 611. Var. Quaritina, Hort. (P. Quaritina, Oliver) is a rosy-ld. variety said to be much better than the type. Gr. 45, p. 464.

WILHELM MILLER.
L. H. B.†

PENTÁNIA: Ericáceas.

PENTSTEMÓN (Greek for five stamens, all five stamens being present, whereas related genera have only four; but in Pentstemon one of the stamens is sterile). Sometimes written Pentstemon. Scrophulariáceas. Pentstemon. Beard-Tongue. Tubular-flowered and border plants, mostly of bright colors; many are natives in the United States.

Perennial herbs or shrubs of medium or small size, some of the summer-blooming, glabrous or pubescent, the sts. mostly little branched: lvs. opposite or whorled, entire or toothed (the upper ones sometimes alternate): fns. in terminal racemes or thyrsoid clusters, mostly showy, blue, red, purple, white; calyx 5-parted, with imbricated segments: corolla tubular, usually fililated at the throat, distinctly or obscurely 2-lipped, the upper lip 2-lobed and notched and the lower 3-lobed; fertile stamens 4, didynamous, the fifth sterile and sometimes bearded, all of them included or not exserted; style filiform and stigma capitate: fr. an ovoid, globose or oblong dehiscent caps. with numerous seeds.

Pentstemon is a typical American genus. One species is native to N. E. Asia and many to the cooler parts of Mex., but the larger number of the species inhabit the U. S. and Canada, particularly the western parts. Krauter admits 148 species in his monograph in 1908 (Contr. Bot. Lab. Univ. of Pa. I.). They are all herbs, although some species are somewhat woody at the base. It is difficult so to arrange the species of Pentstemon as to make them easy of determination by the horticulturist. Gray’s account in the Synoptical Flora (Vol. 2, Part 1) describes the American species north of Mex.; and this account has been followed here in the main. The arrangement of species, however, has been modified considerably to admit the Mexican species and to make the group easier for the beginner. Later writers are inclined to raise the Grayan varieties to the rank of species.

For the hardy border, pentstemons are most satisfactory plants, and the great number of showy species allows much latitude in choice of color and habit. All are perennial, but some of them bloom the first year from seed. In a dry and hot place they are likely to be short-lived, although nearly all the species thrive best in full exposure to sun. They should have good deep garden soil. They are propagated by division and by seed, the latter usually being preferred. Many of the species are not hardy in the northern states, but P. barbatus and its varieties, P. hirsutus, P. laxiflora and variety, P. concolorus and variety, P. divervasusus, P. ovatus, P. grandiflorus, P. acuminatus, P. angustifolius, P. glaber and varieties, and others, may be expected to stand in the North, particularly if given a protection of leaves. An excellent garden race has been produced, here designated as P. gloxinoides. This seems to be a product of hybridization and selection. It is little known in American gardens, although it is a handsome and deserving plant. Some of the forms of it are treated as annuals. Most of the species described in this account are not domesticated or modified plants, but are sold or distributed as stock secured more or less directly from the wild.

PENTSTEMON

INDEX.

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1. Manziesii, Hook. Woody at base, 1 ft. or less high: lvs. thick, obovate to oblong, serrate or entire, mostly glabrous, the lower ones short-stalked: cluster a raceme, pubescent; fls. 1 in. or more long, violet-blue to purple, usually 1 on each pedicel, the upper lip 2-cleft and the lower 2-cleft. Wash., north. G.M. 45:100.

Var. Newberryi, Gray (var. Robinsonii, Mast.). Fig. 2859 (adapted from Pacific R. R. Rep). Fls. pink or rose-purple: lvs. ovate or oblongate, serrate or entire, Calif. to Wash. G.C. 1872: 969.—Kept specifically distinct by recent authors as P. Newberryi.


2. Davidsonii, Greene. An alpine dwarf, differing from P. Manziesii in having its tough and almost herbaceous branching sts. underground except the very short and erect flowering branches, and ovate and oval obtuse or acutish entire veinless lvs.: proper st. mainly subterranean and horizontal, rooting at joints; free branches 1-2 in. high, the fls. usually exceeding in size all the remainder of the plant above ground: corolla
1 in. long, lilac-purple, ventricose from near the tips of the sepals, the lobes rather short and not very unequal; stamens included, very woolly. Discovered by George Davidson, on Mt. Conness, Calif., altitude 12,300 ft., occurs on Mt. Shasta and north to Wash.—Offered abroad.

**BB. Anthers glabrous or only hairy (not woolly).**

3. cordifolius, Benth. Plant very leafy, somewhat pubescent, clambering over shrubs; lvs. ovate, often more or less cordate, serrate, 1 in. or less long; cluster or thyrese short and leafy, the peduncles several-fl.; corolla tubular, scarlet, the tube 1 in. long, and the limb half as long. S. Calif. B.M. 4497. R.H. 1850:221. J.F. 1:14.

4. ternatus, Torr. Flowering shoots 2-4 ft. long, virgate, glabrous and glaucous; lvs. linear-lanceolate, rigid, serrate or denticulate, the upper ones in 3's; fls. in a raceme-like thyrese, pale scarlet; calyx with ovate-accuminate parts; corolla 1 in. long, the lips 3/4 in. long. S. Calif., in mountains.

**cc. Plant semi-cascading (somewhat climbing) by means of long slender branches, or at least some of the branches long and weak or slender.**

8. labrósus, Hook. (P. barbátus var. labrósus, Gray). Much like *P. barbátus*, but narrower-lvs., the infl. almost simply racemose and the corolla more slender, light scarlet, not bearded, the limb longer; 3 lobes of lower lip linear, spreading, half the length of tube, equaling those of upper lip. Calif. and Low. Calif. B.M. 6798. G.C. II. 20:557.—A good perennial, 1-2 ft., making many sts.

9. *Étonii*, Gray. Sts. 1-2 ft. high: lvs. lanceolate to ovate, the upper ones partly clasping; fls. bright carmine-red, in a simple and strict thyrese, the peduncles 1-3-fl.; calyx-lubes or sepals ovate-lanceolate; corolla 1 in. long, tubular, the throat naked and scarcely enlarged, the lobes broadly oval and all much alike; sterile filament sometimes minutely beardcd. Utah, Nev., New Mex., Ariz., and S. Calif. B.R. 10:14. F.S. 3:232 (as *P. minutus*).

10. isophyllus, Robs. Sts. somewhat decumbent at base, erect, 2 ft. or so high, simple, purplish, pulvulent, very leafy, with lvs. in nearly equal pairs: lvs. lanceolate, entire, thickish, glabrous, sessile, acute, margin revolute; fls. in a long second panicule, nodding, scarlet; calyx deeply 5-parted; corolla about 1 in. long, the 5-lobed limb crenulate-crenulate, the throat somewhat enlarged and more or less white-puberulent. Mex.

11. trifórsus, Heller. Perhaps to be entered at this point: glabrous or nearly so to the infl., 2-3 ft.: lower lvs. spatulate or oblong; almost entire, with margined petioles; upper lvs. oblong to ovate: fls. rose-purple, the pedicules glabrous and usually 3-fl.; calyx-lubes lanceolate or oblong-lanceolate; corolla about 1 in. long, the tube gradually dilated; sterile filament glabrous. Cent. Texas.—Under this name a coral-red perenniu pentestemon with fls. 11/4-13/4 in. long is offered abroad, said to be Mexican.

12. *Hartwegii*, Benth. (P. gentianoides, Lindl.). Fig. 2800. Tall and erect (3-4 ft. high), somewhat branched, the sts. dark purple: lvs. lanceolate to lance-oblong-linear, the lower lvs. shortly petioled, the upper ones broader, sessile, glabrous and entire: fl.-cluster somewhat pubescent, long and open, the pedicels 3-6-fl.; fls. drooping, dark rich scarlet, slightly curved, the limb somewhat 2-lipped and the lobes acute. Cool regions in Mex. B.M. 3661. B.R. 25:21. R.H. 1896, p. 347. G. 32:75. Mn. 7: 141.—Showy perennial, common in cult. Hillsides, Utah, Colo., south and to Texas.—Excellent.

13. gloxiníolus, Hort. A race of garden hybrids, issuing largely from *P. Hartwegii*, the other most important parent being *P. Co哲a*. Probably other species have entered into the amalgamation. The group needs critical study from the growing plants. The fls. are large, with a broad nearly regular limb, and in many colors. The plants are strong and floriferous. Fls. sometimes measure 2 in. across. Some of the strains bloom freely from seed the first year. Not hardy in N. Y. unless very thoroughly protected; it is probably better to winter it in deep coldframe.

14. centranthifoílius, Benth. (?Chelóne centranthi­folia, Benth.). Plant strict and leafy, 1-3 ft. tall, very glaucous: lvs. thick and entire, from ovate-lanceolate
to linear, mostly sessile and clapping: infl. long and narrow, the peduncles 2-3-fld.; ils. about 1 in. long, scarlet, narrow-tubular, the lobes short and acute; sterile filament naked. Calif. to W. Ariz. B.M. 5412. B.R. 1737. F.S. 22:2500.

ff. Corolla (except in P. rotundifolius) with a prominently enlarging tube, which is often contracted near the base: thick-flld. species. Corolla nearly straight but short in P. confertus.

g. Ils. entire (sometimes serrulate in P. confertus).

h. Infl. usually rather close and compact.

i. Some or all the ils. lanceolate to broad-lanceolate.


Var. alpinus, Gray (P. alpinus, Torr.). A foot or less high. Ils. narrow or broad-lanceolate: these short and few-fld. High plains and mountains, Rocky Mts. Kept distinct from P. glaber by some authors.

ii. Some or all the ils. as broad as ovate, oval or obolate.

16. arizonicus, Heller. St. slender but erect, 6-8 in. high, usually with several leafy short prostrate branches at base: ils. glabrous, dull green, coriaceous, oval and finely crenate or undulate on prostrate branches, ob lanceolate to ovate-lanceolate on the erect sts. and crenate or entire: ils. in a lax more or less secund infl., purplish; calyx nearly ⅔ in. long, pubescent and somewhat glandular, the lobes long-acuminate and ciliate; corolla about 1 in. long, minutely puberulent, abruptly dilated into a short tube, bright blue; sterile filament glabrous, not enlarged above. Mt. San Francisco, Ariz.

17. puncteus, Gray. Very glaucous, with short ovate sometimes connate ils.: fl. about 1 in. long, more funnel-form (or widening upward) and with wide-spreading rounded lobes, scarlet; sterile filament bearded down one side. N. Mex. R.H. 1892. p. 448.

18. Wrightii, Hook. Rather stout, 2 ft. or less tall; more or less glaucous: lowest ils. obaceous, the upper ones oblong and clapping: infl. long and loosely flld.; to-peduncles about 2-fld.; ils. about ⅔ in. long, bright red, the mouth broad and the rounded lobes spreading ⅔ in.; sterile filament bearded. W. Texas to Ariz. B.M. 4601. F.S. 7:885. J.F. 2:190.

19. grandiflorus, Nutt. Fig. 2861. Stout, very glau­cous: ils. thick, broad and obaceous, the floral ones with very broad bases: peduncles very short or almost none; ils. nearly or quite 2 in. long, lilac or blue, enlarging near the base, somewhat 2-lipped and the upper lip the smaller; sterile filament minutely pubescent at the lip: fl. large. Prairies, Ill. and Minn., westward. G. 29:82. Handsome.


21. acuminatus, Douglas. Glaucescent, strict and usually stiffish, 2 ft. or less tall; ils. thickish, the lowermost broadly ovate to obaceous, the uppermost broad-lanceolate to broad-ovate and clapping and usually acuminate, the floral ils. shorter than the ils.: infl. narrow, the peduncles 1-3 or more-flld.; ils. nearly 1 in. long, lilac to violet, wide at the throat, the obtuse lobes spreading; sterile filament bearded at the tip. Neb. and Minn., south and far westward. B.R. 1285.

—Very satisfactory. There is confusion in the application of the name P. acuminatus. P. nitidus, Douglas (P. Fendleri, Gray), sometimes referred to, is considered to be a distinct species, with upper ils. ovate or narrower. Sask. to Mex., and westward.

iii. Some or all the ils. lanceolate to linear.

22. angustifolius, Pursh (P. carolus, Nutt.). Fig. 2862. Mostly lower: ils. linear to lanceolate, those at the base of the fl.-cluster usually exceeding the ils.: infl. usually close; ils. blue, varying to lilac or white. Dakota to Colo. and New Mex. G.M. 54:377.—Seems to run into P. acuminatus.

23. secundiflorus, Benth. About 2 ft. tall: ils. narrow-lanceolate, somewhat glaucous, the radical ones spatulate: infl. long and strict, the peduncles 1-3-flld.; ils. lilac or purple, the basal tube about twice the length of the calyx, the throat broad and bell-shaped and about equalled by the spreading rounded lobes; sterile filament glabrous or bearded at the top. Colo. and Wyo.—Handsome.

24. confertus, Douglas. One to 2 ft., pubescent in the infl.: ils. oblong to lanceolate to linear, usually entire but sometimes minutely serrate: infl. a narrow interrupted spike, the peduncles sessile or slightly 3-flld.; ils. less than ½ in. long, cream-white to sulfur-yellow, narrow, 2-lipped, the lower lip bearded within. Rocky Mts. to Ore. and Calif. B.R. 1260.—Variable, and has received many names, but little known in cult.

Var. cariceo-purpureus, Gray (P. priscus, Douglas). Ils. blue-purple to violet. Colo. and west north. B.M. 2954. L.B.C. 17:1616.—A common form in gardens, and a reliable and satisfactory plant, often kept as specifically distinct.
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**PENTSTEMON**

25. *rotundifolius*, Gray. Fig. 2863. About 2 ft. tall, branching from the base, glaucous; lower lvs. thick and leathery, orbicular-ovate and obtuse, long-petioled, st.-lvs. sessile and cordate-ovibratil; fls. 1-1½ in. long, narrow-tubular, yellow-red, the lobes short and acute; sterile filament glabrous. N. Mex. B.M. 7055. G.C. III. 4:265. G.F. 1:473 (reduced in Fig. 2863).

ag. Lvs. serrate or dentate.

h. Sterile filament bearded at the tip or along one side (Nos. 26-32).

i. Color of fls. purple, blue or rose, sometimes ranging to white.

26. *campanulatus*, Wild. Branching from the base, 2 ft. or less tall; lvs. lanceolate or the upper ones ovate-lanceolate, long-acuminata, broad at the base and sessile, strongly serrate: infl. long and narrow, the peduncles usually 2-fl.d.; fls. 1 in. long, rose-purple or violet (sometimes white in cult.), the corolla funnelform the throat spotted here, IS by and villous, sterile filament bearded at end. Mex. B.R. 1138.


lobes rounded and spreading and the lower lip broader than the upper, the sterile filament hairy at the top. Mex. and Guatemala. B.M. 3884.—An old garden plant which is variable in color and which has received many names, as *P. angustifolius*, *P. atropurpurea*, *P. roseus*. See B.R. 1122. L.B.C. 15:1429, 1436. G.C. III. 50:93 (a white form). P. pulchellus, Lindl., by some referred here, is by others kept distinct, differing in corolla abruptly ventricose or swollen above, violet or lilac with white veins, the lips nearly equal, throat spotted and villous, sterile filament bearded at end. Mex. B.R. 1138.

27. *hummilis*, Nutt. Low, usually not over 6 in. tall, pubescent in the infl.: lvs. oblong to lanceolate, somewhat glaucous, the upper ones small-toothed: infl. 3-4 in. long, with 2-5-fl.d. peduncles; fls. ½-in. long, rather narrow, deep blue or sometimes ranging to white. Rocky Mts., west. F. 1875:241.


ii. Color of fls. nearly or quite white, but sometimes shaded with red or purple.

29. *tubiflorus*, Nutt. St. 2-3 ft., erect, not leafy above; fls. oblong to ovate-lanceolate, barely serrate, passing into small bracts above: infl. of densely-fl.d., somewhat whorled clusters; fls. about ½ in. long, scarcely 2-lipped, the spreading limb nearly as long as the tube, white or nearly so and sometimes tinged with purple. Mo., Kans., and Ark.

30. *levigatus*, Soland. (Chelone *Pentstemon*, Linn.). Tall and slender, 2-4 ft., more or less glaucous; lvs. either firm, purplish, somewhat glossy, ovoid to ovate-oblong-lanceolate and clasping, the radicles oblong or broader, all small-toothed: infl. long and loose; fls. about 1 in. long, white and sometimes tinged with color, rather slender, narrow at the base, the short pedicels not wide-spread; the small lower lip bearded at the base. Pa., west and south. B.M. 1425.—A common plant, best known in the following form.

Var. *Digitalis*, Gray (P. *Digitalis*, Nutt. Chelone *Digitalis*, Sweet). Very tall, 4-5 ft., with larger white or purplish inflated fls. B.M. 25 mouth ¼ in. long. *Pentstemon* becomes a weed in old fields, from Maine south and west, but probably not indigenous in all this range. It is in cult., as a border plant. By some authors kept distinct as a species. P. Smallii, Heller, is a handsome allied species from N. C. and Tenn., with bright pink-purple gibbous corolla, pubescent or puberulent st.: root-lvs. oval or ovate; st.-lvs. lanceolate or ovate-lanceolate, smooth both sides, serrate.

31. *plumieri*, Gray. Plant 2-3 ft. tall, the foliage glaucous; lvs. thick, ovate to oblong-lanceolate, the lower pedioted and the upper connate, very sharp-dentate or sometimes almost entire: infl. long, mostly glandular; fls. cream-white tinted with pink, the narrow part of the tube about as long as the calyx, the upper part very wide and open, the lobes wide-spread, the spreading limb 1½ in. long, scarcely 2-lipped; sterile filament yellow-bearded. Utah, south and west. B.M. 6064. F.S. 20:2094. F. 1874:37.

iii. Color of fls. red.

32. *Cléverandii*, Gray. Two fls. or above, more or less glaucous, becoming woody at the base: lvs. rigid, oblong or ovate, sharp-toothed, the upper ones usually connate by their bases: infl. long and narrow; fls. ¼-in. long, crimson, with narrow throat; sterile filament bearded at top. S. Calif. and Low. Calif. G.M. 36:62. F. 1878, p. 149.

33. *deustus*, Douglas. Sts. 1 ft. or less tall, from a woody base, glabrous throughout: lvs. thickish, varying from nearly linear to lanceolate to ovate, some or all of them serrate, the uppermost sessile: infl. many-fl.d. loose and open; fls. ½-in. long, dull white or yellowish white and sometimes tinged with purple, wide-mouthed, the lobes wide-spread. Mont. and Wyo. to Calif. B.R. 1318.

34. *spectabilis*, Thurb. Two to 4 ft., erect, somewhat glaucous; lvs. ovate to ovate-lanceolate or sometimes oblong, acute, the upper ones acuminate and connate by their bases, very sharp serrate-dentate: infl. long and many-fl.d.; fl. in. or more long, rose-purple or lilac, the narrow part of the tube about twice the length of the calyx, the upper part broad and full, the lobes rounded. New Mex. to S. Calif. B.M. 5260.—A beautiful species.

iv. Corolla 2 in. long.

35. *Cobea*, Nutt. Fig. 2864. Straight and erect, stout, about 2 ft., minutely pubescent: lvs. thick, ovate-oblong to oblong to broad-lanceolate, the upper ones clasping: infl. mostly simple and open; fls. very large, reddish purple to white, the base very narrow but the upper part of the fl. broad and open, the limb only obscurely 2-lipped; sterile filament bearded. Prairies, Mo. and Neb., south. B.M. 3465. Gn. 49:406. G. 29:83. F.S.R. 2, p. 271. Mn. 4:113.—Very showy, and probably one of the parents of the garden race of hybrid pentstemons (see No. 13).
36. eriáthera, Pursh (P. crístátes, Nutt.). Only a few inches high, pubescent, usually viscid above; lvs. linear-lanceolate to narrow-oblong: infl. erect, leafy below; fls. about 1 in. long, purplish, rather abruptly dilated above, the lower lip bearded; sterile filament strongly yellow-bearded. Dakota to Colo., north and west.—Good.

37. ováta, Douglas. St. slender but erect, 2-4 ft., more or less pubescent; lvs. ovate, rather thin, bright green, serrate, the upper ones clasping; infl. erect but lax, the peduncles 2-5-fid.; fls. about 3/2 in. long, blue changing to purple, 2-lipped and the lower lip bearded. Idaho, west and north. B.M. 2903.—Good.

38. hirsútus, Willd. (P. pubésens, Soland. Chélonia hiréts, Linn.). Loose-growing, the slender often decumbent sts. reaching 2 ft., usually viscid-pubescent; lvs. oblong to narrow-lanceolate, small-toothed, the radical ones ovate to spatulate: infl. loose and open, the peduncles 2-3 in. long and the pedicels often 1 in. long; fls. about 1 in. long, drooping, dull purplish or violet or varying to flesh-color, rather narrow, with 2 short lobes densely bearded on the palate; sterile filament densely bearded. Dry fields and banks from Maine and Ont. to Fla. and Texas. B.M. 1424. G.M. 56:493.—The common Pentstemon of the E., and useful in cult. P. Mackayánumus, Knowlès & Westc., is perhaps distinct: corolla often shorter, sparingly bearded in throat, purple: upper st.-lvs. with dilated or rounded bases rather than narrow-lanceolate. Ala. to Ark.

AA. Cells of anthers not dehiscent or opening to the base, the basal part remaining saccate.

b. Lvs. dentate or serrate.

c. Plant viscid and soft-pubescent.

39. glandúbus, Douglas (P. staticífolius, Lindl.). Rather stout, 2-3 ft. tall; lvs. rather thin, ovate-lanceolate, acuminate, the upper ones clasping, the radical ovate or oblong, all toothed or serrate: infl. narrow, leafy below, the peduncles few- to several-fid.; fls. large, somewhat over 1 in. long, lilac, with inflated throat, the lips short and broad; sterile filament glabrous. Idaho to Wash. and Ore. B.M. 3688. B.R. 1262; 1770.—Showy.

c. Plant not viscid, either glabrous or puberulent.

40. vendátus, Douglas. St. erect, nearly simple, leafy, 2 ft. or less tall, glabrous: lvs. thickish, oblong-lanceolate to ovate-lanceolate, very sharply serrate: infl. narrow, not leafy, the peduncles 1-3-fid.; fls. usually more than 1 in. long, somewhat 2-lipped, light purple, somewhat hairy within; sterile filament hairy above. Idaho, Ore., and Wash. B.R. 1309.


BB. Lvs. dentate or serrate.

42. Richardsonii, Douglas. Rather loosely branching; lvs. ovate-lanceolate to narrow-oblong, deeply cut or pinnatifid, the upper ones not opposite: infl. loose; fls. 3/2 in. long, light purple; sterile filament somewhat hairy at top. Ore. and Wash. B.M. 3391. B.R. 1121. L.B.C. 17:1641.

BBB. Lvs. entire.

c. Sterile filament somewhat bearded.

43. graciléntus, Gray. A foot or more tall from a woody base, naked above: lvs. lanceolate to linear or oblong-lanceolate: infl. loose, the viscid pedicels 2-5-fid.; fls. 3/2 in. long, violet-blue, the lobes very short. N. Calif., Nev., and Ore.

PEPERÓMIA (Greek, pepper-like). Piperaceae. An enormous genus of tropical and subtropical herbs, including a few small but choice foliage plants for warmhouse, conservatory, or house decoration.

Annual, or perennial by a creeping caudex or by
of many kinds is uncertain, while great numbers are
of peperomias are much confused, partly owing to the vast
which always increases the difficulties of discrimi-
partly to the minute size of the genus, and hence the
names of peperomias are given. The names are those that
Peperomias are very attractive and beautiful small-
approximately 10 at night; this may be increased until they are having 65° to 70° with an
spraying and be very careful in giving water during the dark and dull time, otherwise the roots will rot.—They can be propagated readily from pieces of the stems or leaves placed in pans of silver sand and plunged where they will have bottom heat of
February on they will stand an increase in temperature to about 62° at night; this may be increased until they are having 65° to 70° with an increase of 10° to 15° on bright days. As the sun gets powerful in the spring, they will need shade, or as soon as the foliage shows signs of losing color. In the summer they need a good supply of water, but in autumn and winter they require very careful watering. In spring and summer they profit by frequent light spraying. Keep the atmosphere of the house in a moist state, but avoid a stuffy or stagnant condition. In the slow time of winter, they will stand the temperature to be lowered to about 60° with 10° to 15° increase with sun. Give less spraying and be very careful in giving water during the dark and dull time, otherwise the roots will rot. They can be propagated readily from pieces of the stems or leaves placed in pans of silver sand and plunged where they will have bottom heat of 75° to 80°. Do not cover with glass as it tends to make them rot. Keep shaded and be very careful about watering, and they will soon root. When they make sufficient roots, they may be potted up into small pots, using loam four parts, fibrous peat two parts, and well-decayed cow-manure. By July or August they should get their last shift, until the coming of spring. They will stand full sun by the end of September and through the winter, and this greatly aids in keeping them in good condition at that season. (J. J. M. Farrell.)

a. Plants for pots or pans, erect-habited.

b. Lvs. alternate.

c. Sts. short or waxying.

Sandersii, A. DC. (P. arifolia, Hort., not Miq.). Fig. 2865. Stemless; lvs. alternate, petaloid, 5 x 3 in., rounded at base; petioles dark red, 4-8 in. long. Cult. only in the form var. argyrea, Hook. f., which differs from the type in having broad, parallel longitudinal bands of white between the nerves. Brazil. B. M. 5634. F. S. 23:2438. G. 25:197. A. G. 19:17. F. R. 1:637.—This plant seems to be the commonest in cult. here, under the name of P. arifolia var. argyrea. However, Casimir De Candolle thought that this plant is not the true P. arifolia, and he renamed it P. Sandersii (after Wilson Sanders), but the name is often spelled Sandersii in trade catalogues. The distinctions which De Candolle makes are technical. The evident ones are that P. arifolia has a short st. and catkins much longer than the lvs., while P. Sandersii has no st. and the catkins are about as long as the lvs.

Verschaffeltii, Lem. Distinguished from P. marmorata, which it much resembles, by the lvs. being alternate, by the basal lobes, which do not overlap but are separated by a notch as in a typical corolla fl. A smaller and more delicate but more branched plant: st. short: st., branches, petioles, and peduncles much longer, translucent, and pale rose (not green): lvs. heart-shaped at base. Upper Amazon, Brazil. I. H. 16:598.

P. brevipes, A. Dietr. (P. magnoioliolof, A. Dietr.).—Lvs. alternate, subovate, acutish, narrowed at base, 2-3 in. long, base obtuse, nerves more than 9-nerved; st. short: st., branches, petioles, and peduncles much less concave. Not advertised, but has been unnecessarily confused with P. Sandersii.

maculosa, A. Dietr. Lvs. alternate(?), ovato-lanceolate, bright shining green, very fleshy; petioles beautifully spotted with purple. Santo Domingo.—Monocarpic (annual or biennial).

marmorata, Hook. St. short, much-branched, nearly 3 in. thick; lvs. opposite, ovato-cordate, deeply 2-lobed at the base, the lobes rounded and very fleshy, nerves subopposite; petiole 1 in. long, keeled beneath: st. rooting below. Santo Domingo.—Monocarpic (annual or biennial).

latifolia, Miq. St. 10 in. high, decumbent: lvs. obovate or oblong ovate, 5-7-nerved, opposite or in whorls of 3, base acute, glabrous above, pubescent beneath; petiole 7-8 times limes long. Hawaii.—Monocarpic (annual or biennial).

AA. Plants for hanging-baskets, drooping.

nummularifolia, HIBK. Delicate creeper, with long, thread-like, rooting stems and small orbicular lvs., puberulous or glabrate; lvs. alternate, ciliate, obscurely palmately 3-nerved, 3-4 lines diam. Trop. Amer.—The above description is from Grisebach. Five other species in the W. Indies have the same habit. P. prostrata, Hort., is probably a synonym. It is a stove basket-plant figured in G.C. II. 11:717 and F. 1881, p. 103, with a good-sized petiole. The lvs. are very small for the genus, and are said not to exceed 5 in. Lvs. bordered and nerved with greenish white. Annual. Nicholson refers P. prostrata to P. brevipes, and keeps P. nummularifolia separate. P. brevipes, C. DC., has lvs. alternate, orbiculate, younger ones hirsute, older ones glabrate, ciliate, 1-nerved; style none: berry with a very short stipe. Trop. Amer.
In some collections is a plant known as *P. cressiflora* (which is probably *P. cressiflora*, Baker of Trop. Afr.). It is a very distinct species with dark green, ovate, fleshy lvs. 3 x ½ in., becoming very hard when old; sts. branched and upright in habit, 4 foot in height; fls. in mass-cast coat. It is a very good plant and deserves to be more generally known.—*P. pubiflora*, Veitch. Perennial creeping unknown habits, suitable for hanging-basket. Lvs. small, ovate, marked with a central gray bar.—*P. quadriflora*, André, intro. in 1893. was "found in all stones" 2 years later and said to be "a plant for the million." It differs from all the above in being a flowering plant rather than a foliage plant, for the lvs. are seed-hooded light green and the flowered green as shown by those of a mignonette, each one 3-4 lines long, and 100 or so in a raceme. St. 1½ ft. high, red, forked; lvs. broadly ovate, coriaceae. Colomb. B.M. 6619.

**PEPEROMIA** (Greek, melon, gourd). *Cucurbitaceae*. Climbing or sprawling plants, little known in horticulture.

Perennial herbs, prostrate or scendent, often villous, with fibrous roots; lvs. lobed or rarely entire, dentate: fls. large, yellow or whitish, monocious, the males solitary or racemose; corolla-lubes 5, obovate; stamens 3; female fls. solitary: fr. large or medium, fleshy, oblong or cylindrical; seeds many, black, flattened.—Species about a dozen in Trop. and S. Afr. Because of an earlier genus of the same name, Engler has proposed the name Peponium for this group.

**Mackennii**, Naudin. Lvs. broadly ovate-cordate, 5-lobed to the middle: male fls. solitary; calyx-tube subglabrous, narrowed from apex to base. It is hardly scendent, densely villous and the st. grows ½-6 ft. long: lvs. 4 in. long; petals over 1 in. long; fr. oblong-obviod, about the size of a hen's egg, green at first, then marbled with white, finally red; pulp orange-colored, insipid. Natal.—Once intro. in S. Calif., but now apparently lost; probably not of much value as an ornamental.

**PEPPER**. With American horticulturists "pepper" usually means the red pepper (*Capsicum*, which see) of which the green pepper is merely the unripe stage. The black and white pepper of commerce are treated under *Piper*.

The red pepper (*Capsicum*) is doubtless native of the New World, as there is no record of its having been known prior to the discovery of America. According to Irving's "Life of Columbus," this plant was first mentioned by Martyr in 1493, who says Columbus brought home "pepper more pungent than that from Caucasus," evidently comparing it with the black pepper of commerce from the oriental countries. It was cultivated by the natives in tropical and southern America before this time, and about a century later Gerarde speaks of its being brought into European gardens from Africa and southern Asia. The ease with which the plant spreads in warm latitudes, together with the increased commercial trade immediately following the discovery of America, doubtless caused a rapid dissemination through tropical Asia and Africa, where it was supposed by many to be indigenous and from there introduced into European gardens.

The first record of the use of pepper is apparently by Chaucer, physician to the fleet of Columbus, who in 1494 alludes to it as a condiment. Writers about a century later considered it valuable as an aid to digestion and also mentioned its use in dressing meats, drying, and other purposes. Medicinally it was much used for various ailments, such as dropsy, colic, aqre, and toothache, and when mixed with honey and applied externally was used as a remedy for quinsy. At a later date preparations were given for black vomit and various tropical fevers, and for a tonic also for gout, paralytic, and other diseases. Its modern use is largely as a condiment, forming a seasoning in almost every dish eaten by the inhabitants of warm countries. The smaller varieties are mostly used for this purpose. The cayenne pepper of commerce consists of the small pungent fruits reduced to a powder. The unground fruit is also made into pepper sauce of various brands by preserving in brine or strong vinegar. The Tabasco variety furnishes the well-known Tabasco pepper sauce and Tabasco catsup. "Chilli con carne" consists of the small pungent varieties finely ground and mixed with meat. These hot varieties are often eaten raw by native Mexicans, as are radishes, and also form an important ingredient of tomatos so common in that country and fairly well known in the southern United States. The thickly-fleshed sweet varieties are desired more by persons farther north, who use them in various ways, served like tomatoes in either ripe or green state, with vinegar and salt, or made into man­goes by cutting one side, removing seeds and filling with chow-chow pickles. The parts are then tied together, placed in jars with vinegar and kept until wanted. The fruit is often used in stuffing pitted olives after being cooked in olive oil. In Spain some are canned after being thus cooked and eaten with French salad dressing.

Paprika is a well-known Hungarian and Spanish condiment made from the long, and more or less pointed type of peppers. The Spanish paprika is much milder in flavor than the Hungarian, it being made from a less pungent pepper and doubtless in its preparation more of the seeds and placenta are removed, which process makes a milder condiment. The seed of peppers is more or less used as a bird food, and the plants of some varieties, like Little Gem and Celestial, are grown more especially for ornamental purposes.

Some thirty varieties are recorded by American seedsmen. They differ from one another mainly in the form and pungency of fruit and habit of growth. There are endless forms among peppers, but certain types are well fixed, as indicated by the botanical varieties under *Capsicum*. Pungency is to be found in all peppers and while located in the placenta, other parts may acquire it by contact. Most of the smaller sorts, like Coral Gem, Tabasco, Chilli, Cayenne, and Cherry contain more of the pungent properties than the large kinds, like Ruby King (Fig. 2866), Squash, Bell, Sweet Mountain, and Golden Queen. Some medium-sized varieties,
like Long Red, Celestial, and Oxheart, are hot; others, like County Fair and Kaleidoscope, are mild.

Peppers are classed as one of the minor vegetables in the South, but they have not been grown in large quantities in any one locality and the aggregate production is smaller than the so-called truck crops, such as tomatoes, cucumbers, and the like. Most gardens near large cities in the central and southern states have been growing a few to supply the local markets. During the last decade there has been a decided increase in acreage. The census report for 1900 gives no report of production of peppers, but for 1910 there were recorded for the United States, 1,641 farms containing 3,483 acres, valued at $408,741, an average of $117.47 an acre.

Four states with the largest acreage are:

<table>
<thead>
<tr>
<th>State</th>
<th>No. of farms</th>
<th>Acres a farm</th>
<th>Aver. value an acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Jersey</td>
<td>323</td>
<td>1,902</td>
<td>$140.43</td>
</tr>
<tr>
<td>California</td>
<td>289</td>
<td>1,800</td>
<td>$109.05</td>
</tr>
<tr>
<td>Florida</td>
<td>145</td>
<td>296</td>
<td>$94.26</td>
</tr>
<tr>
<td>New Mexico</td>
<td>266</td>
<td>260</td>
<td>77.26</td>
</tr>
</tbody>
</table>

This record ignores quantities of less than an acre with the evident exception of New Mexico, which averages .03 less than 1 acre to a farm.

It is estimated that approximately 4,000,000 pounds of paprika were imported each year during the last three or four years. The United States Department of Agriculture has endeavored to ascertain whether this product can be profitably produced in the South, but if the consumption is limited to the above figure the acreage must continue to be very limited.

In growing peppers, the seed is usually planted under glass in February or March, and the young plants transplanted to pots or boxes when of sufficient size to handle. From twelve to twenty days are required for the seed to germinate, the time varying according to the age of the seed, the manner in which it has been kept. Its germinating power is said to last four years, and if kept in pots until sown will grow when six or seven years old. A light soil, heavily charged with humus and one that will not quickly dry out, appears to be the best. In May or June, or after all danger of frost is past, the plants (Fig. 2867) are set in the field in rows about 2½ feet apart and 18 inches apart in the rows. The ground is kept thoroughly cultivated, not only to keep down weeds but to maintain an even but not excessive moisture at all times, which is very essential for best results in growing this plant. By keeping the soil well worked up around the plants, they stand up much better against the winds and weight of their own fruit. Pruning or pinching the tip ends after the fruit begins to mature is occasionally recommended, but is rarely practiced except when specimens of especially fine fruit are desired, in which case the fruit is thinned, leaving only a few on each plant of the larger sorts. In gathering, the fruit should not be torn off but cut with a knife or scissors, leaving at least 1 inch of stem. The usual vegetable crate is used for packing and marketing the crop.

Insects rarely injure peppers growing in the field. The red spider (Tetranychus erineus) has done some damage to crops in the South. It is said to be easily kept in control by gathering and destroying infested pods. Tomato-vom, bollworm, white-fly and Colorado potato-beetle sometimes attack the plant, but seldom do noticeable injury. Red-spider and green-fly (aphis) frequently attack plants growing under glass. The red-spider may be kept in check by repeatedly syringing with water, and the green-fly may be killed by fumigating with tobacco dust. Two fungous diseases frequently occur on the larger varieties growing outdoors. One is a pink anthracnose (Glomerospotum piperatum), which causes the fruit to rot about the time it begins to ripen; the other is a dark anthracnose (Colletotrichum nigrum).

In preparing peppers for table use, handle them with gloves to prevent burning the fingers. Neither soap nor water will soothe the hands burned by peppers, but milk will.

H. C. Irish.

PEPPER-GRASS: Lepidium.


PEPPER-ROOT: Dentaria diphylla.

PERAPHYLLUM (from Greek, perra, excessively, and phyllon, alluding to the crowded lvs.). Roseaceae, sub-fam. Pomeae. A much-branched rigid shrub, with deciduous alternate rather small and narrow partly fasicled lvs., white fls. similar to apple-blossoms in few-fl.d. upright umbel-like racemes, white or slightly tinged pink, with rose-colored disk, % in. across: petals obovate, spreading: styles 2-3, free; ovary 2- or incompletely 4-celled: fr. pendulous, globose, yellow with brownish cheek, about % in. across. May. Ore. to Calif. and Colo. B.M. 7120.

ALFRED REHDER.

PERENNIALS tend to live from year to year, as opposed to annuals and biennials, which die root and branch after flowering and fruiting. Annuals live only one year, biennials two years. Perennials include trees, shrubs and herbs, the two former being woody, the latter not.

"Perennials," as commonly used by gardeners, is a convenient shortening of the phrase "hardy herbaceous perennials" which includes peony, phlox and other non-woody plants whose roots live over the winter while their tops may die to the ground. The phrase "hardy herbaceous perennials" is also shortened in common speech to "herbaceous plants;" or one speaks of the "hardy border." See Herbs and Border; also Annuals and Biennials.

A popular fallacy about perennials lies in the common statement that "they die down every year and come up again in the spring." Many of them never come up after two or three years of flowering; that is, perennials are not necessarily perpetual. Peonies may be as long-lived as shrubbery, and a clump of fraxinella seems to possess only little ornamental value. It is of very slow growth and blooms only when rather old. It grows in well-drained soil and in sunny position, and is best suited to be planted on rocky slopes of southern aspect. Prop. by seeds and layers and by grafting on amelanchier or crataegus. It is closely allied to Amelanchier, but distinguished by its umbelliferous fls., cylindrical calyx-tube, the petals white, and also by its narrow lvs. The only species is P. ramosissimum, Nutt., a rigid shrub 2-6 ft. high: lvs. oblong to oblanceolate, almost sessile, entire or sparingly serrulate, silky pubescent when young, ½-2 in. long: fls. in few-fl.d. erect umbel-like racemes, white or slightly tinged pink, with rose-colored disk, % in. across; petals obovate, spreading: styles 2-3, free; ovary 2- or incompletely 4-celled: fr. pendulous, globose, yellow with brownish cheek, about % in. across. May. Ore. to Calif. and Colo. B.M. 7120.

ALFRED REHDER.
LXXXVII. A branch of Pereskia aculeata, one of the leaf-bearing cacti.
PERENNIALS

furnish the flowers, and, unless lifted and divided, the stock becomes straggling and unattractive. Another very good reason for lifting and dividing the perennials is that, being mostly strong-rooted plants, they deplete the soil; when shifted, they are likely to be set in a new place.

PERÉSKIA (named for Nicolas Claude Fabry de Persee). Also written Pereskea, Pereskia, and Peresia. Cactaceae. Shrub or climbing vines, grown for ornament, and also for the edible fruit.

Spines in the axils of the leaves: leaves alternate, broad and flat, resembling those of ordinary flowering plants: fls. wheel-shaped, more or less clustered; ovary naked or leafy: fr. juicy, sometimes edible; seeds black, thin-shelled.—Some 40 names have been given in Pereskia for species in this and related genera, but only 13 are now recognized. Only two species are very common in collections, although P. cubensis, P. anamopla, and the true P. Bloe have recently been intro.


grandifolia, Haw. (P. Bloe of authors, not Cactus Bloe, HBK.). Usually tall shrubs, but sometimes growing as half-clambering: lvs. often large, some 5 in. long: spines form large clusters on the old wood, usually solitary on young branches, straight: fls. in small clusters, purple, 1/2-2 in. broad: fr. 2 in. long, pear-shaped, Brazil, and now grown in many warm countries. B.M. 5473. G.C. III. 20:452.

P. subulata, and P. spatulata are to be excluded from Pereskia. Schumann in his Monograph of the Cactaceae referred them to the genus Opuntia, but they more properly belong to the genus Pereskiospis, Brit. & Rose, which see.


Trees and shrubs: sts. and branches cylindrical: lvs. large, flat, and persistent: areoles bearing spines and glochids: fr. usually red: seeds covered with matted hairs. This genus, lately segregated from Opuntia, is here treated as a distinct genus, differing from Opuntia in many ways, and resembling more closely in habit and foliage the genus Pereskia, although it is very different in fr. and seeds from that genus.—Eighteen species have been recognized, of which 9 are now known in Washington and in the New York Botanical Garden, although none is known in the trade.


subulata, Brit. & Rose (Pereskia subulata, Muehl.). Sts. 2 ft. or less high, below half wood, above fleshly and branching: lvs. persisting a few years, dark green, shiny, as thick as a pencil, about 3 in. long, half-cylindrical and ending in a spine: areoles felled, in the young plant with a few hair-bristles, later with 2-4 straight, pale yellow spines 3-4 in. long. Mex.—Can be used as stock for euphlymus.

spatulata, Brit. & Rose (Pereskia spatulata, Otto). Sts. upright, with few horizontal, spatulate, shiny green lvs.: the diffuse areoles at first somewhat woolly, later felled, above with a bunch of short bristles, below with 1-2 yellowish white, straight spines. Mex. J. N. Rose.

PERFUMERY-GARDENING

The growing of plants commercially as a source for perfume-making.

The perfumes of the market are derived in part from animal secretions (musk, civet), in part from artificial chemical compounds, and in part, chiefly, from the class of vegetable products loosely called essential oils. “Synthetic” or chemical perfumery materials are the more or less perfect artificial reproductions of organic compounds used in perfumery. If it were possible in all cases and with perfect success to compound these substances, the perfumery of the artificial perfumes would soon be at an end, as the chemical process would be sure to be cheaper than the horticultural. But nature knows how to add some touches which the chemist’s art cannot imitate, and even when synthetic manufacture is possible, the result is in general regarded as a cheaper substitute. At the same time, sentimental reasons count considerably in favor of the natural perfume, and considering, further, that some perfumes cannot well be imitated chemically, there is no present cause to apprehend the extinction, or, in view of increasing demand, even the decline, of the industry of producing natural perfumery oils.

The essential oils used in perfumery are secreted in different parts of the plant. The flowers are naturally thought of first, being the seat of the fragrance of the rose, violet, cassis, jasmine, tuberose, the orange in part, and numberless other plants whose perfume is extracted. The skins or rinds of the citrus fruits. Several herbaceous roots also furnish oils, as orris-root, Canada snakeroot, and sweet flag. The rinds of the orange and other citrus fruits contain important perfumery oils, and the oil of bitter almonds comes from the fermented kernels of the nut.

The standard methods of extracting essential oils are four, namely, the use of mechanical means (chiefly expression), distillation, enfleurage or infowering, and maceration. Each is to be applied to different parts of the plant. The rinds of the citrus fruits. These are placed under pressure in a screw press, or sections turned wrong side out are squeezed in the fingers, the oil being taken up with a sponge, or the fruit is rubbed in a cup lined with spikes (ecuelle à piquer), the oil collecting in a hollow handle. An ecuelle on a larger scale in the shape of a hollow drum has also been used.

In distillation, the oil-bearing material is heated with water or subjected to hot steam, and the oil, being volatile, passes off with the steam. The oil would be lost if the vapor were not condensed, and this is accomplished by passing it through a coil or equivalent arrangement of pipe kept cool by a flow of water. The condensed steam and oil fall into a “Florentine recipient,” a vessel with a spout coming out at the base but rising to the level of the top, so that the heavier liquid, sometimes oil, sometimes water, alone will enter the recipient and off separately. After the water and oil have mainly separated, the water will still contain enough oil to make it highly fragrant, and in this state it goes to market as rose-water, orange-flower water, and the like, or is returned to the still to be redistilled with the next charge.

The remaining two methods depend on the fact that grease has the power of absorbing essential oils. In enfleurage the grease, without heating, is spread over both surfaces of panes of glass which are set in frames (chaisia), so that they can be piled one over another with spaces between. In these spaces are placed the
flowers, the charge being renewed daily until the grease is sufficiently impregnated, when it constitutes a "pomade." "Extracts" are made by digesting the pomade in alcohol, which has a still stronger attraction for the perfume than has the grease. The alcohol must first be decomposed, to save preserving the floral perfume, and is then known as "Cologne spirit." The grease used in this and the next process, moreover, must be freed from all corruptible matter by a special process. Tallow and lard, commonly mixed, and sometimes the fat of the deer and other animals, are employed.

In maceration, the pomade is produced by immersing repeated charges of the flowers in melted grease or fine olive oil.

In recent times, various chemical processes for extracting perfumery have been tried, apparently with some practical success; but they have not yet supplanted the old methods. Carbon bisulphide and petroleum ether are among the solvents employed. These methods will be less easily practised by beginners and amateurs than the ordinary ones.

The art of distilling is not only not difficult to learn, but is already in practice in this country in the case of: orange, sweet, bergamot, lemon, and citron waters, the like. More care and better apparatus would be required for distilling roses and other flowers, but the process is essentially the same. Nor do the grease processes involve any difficulties which may not be overcome by the initiation of the localities of the industry.

Among the particular plants to be noticed, the citrus fruits deserve a leading place. Nearly, or quite all of the trees of this group, including the sweet, the bitter or Seville, and the bergamot oranges, the sweet and sour limes, the lemon, the citron, and the shaddock, contain valuable perfumes either in the peel of their fruit, or in their flowers, or in their leaves, or in more than one of these. Of the fruit-oils, that of lemon is imported into this country in largest quantity, followed by oil of bergamot, oil of orange—bitter and sweet, oil of limes and "cedrat" or citron oil, the last two in very small quantities, but the cedrat at a very high price. Nevertheless, these oils are extracted by expression, the distilled being inferior, though it is asserted that when the "rag," or inner soft layer, is removed, the distilled oil equals that of the oil of the bitter orange in quality. The oil of the bitter orange is superior to that of the sweet; the oil of bergamot is far more valuable than either, but can rarely be had in an unadulterated state. The flowers of the orange treated by distillation yield "neroli." The scent of neroli, however, is not that of the flowers, an alteration taking place during the distillation. Orange-flower water, consisting of the condensed vapor of water with a little unchanged oil adhering, affords the true odor of the flowers. By maceration, likewise, the true floral fragrance is obtained. The abortive flowers which fall from the trees are available for perfumery use, but the flowers are also sometimes picked, presumably with a better result. Besides the product of fruit and flowers, the leaves and young shoots of the sweet and bitter oranges yield to distillation the oil of "petit grain," of considerable though minor value. There is no reason to doubt the perfumery capacity of American orange groves. Indeed it has been asserted that the orange flowers of Louisiana excel in sweetness those of foreign parts. In Los Angeles, California, something has been done toward utilizing the peel, and in Florida a beginning has been made with both peel and flowers, but for the most part these resources are at present suffered to go to waste.

The lemon verbena, *Lippia citriodora* (Fig. 2868), may be mentioned in passing as furnishing an attractive perfume of the citron order, and as available at least in Florida and California.

The perfumery products of the rose and its allies merit next attention. The value of the importation of attar of roses—to say nothing of rose perfume in other forms—exceeds that of any single citrus perfume, and at the same time the capacity of this country for producing this and the other rose perfumes can scarcely be called in question. The present supply of the European and American markets is derived chiefly from Turkey and from the perfumery region of the south of France. The attar or oil of roses is produced most largely in Bulgaria and parts of other Balkan states as well as in Asiatic Turkey, principally from the damask rose, which may be taken as a form of *Rosa gallica*. A white-flowered rose, *R. alba*, is much grown in the more exposed situations, as it is considered harder than the red-flowered damask rose. It is very free in bloom and productive of oil, which is, however, inferior in quality. The attar is obtained by distillation, which is there conducted in a crude manner. In the Grasse district (southern France), the rose-water, obtained as explained above, is considered to yield more profit than the attar, which is rather regarded as a by-product of the distillation.

But the best rose perfumes in France are extracted by maceration, finishing with *enfeuillage*, processes that secure the true rose odor, which is not altogether represented by attar or rose-water. Rose pomade and its alcoholic extract are perhaps the finest of rose products. Among the same, the attar, or variety of *Rosa centifolia*, the type to which the cabbage or hundred-leaf rose of old gardens and the moss roses belong, is almost exclusively used in France and also in Germany, where a limited quantity of very fine attar is produced.

The centifolia and gallica varieties of perfume roses, as well as a hybrid of *Rosa rugosa* under the name of *Rosa Parfum de L'Hay*, have been tried in this country with encouraging results as far as facility of culture, quantity, and quality of perfume-content are concerned, but the economic possibilities of rose-culture here for this purpose are far from being worked out at this time. These varieties are all quite hardy and may, without doubt, successfully be grown over a vast extent of country, although the products of them are not known to be so rich in perfumery-content, and there is a suspicion that the cool logs of the coast and the hot aridity of the interior...
valleys of the Pacific States do not favor perfume production, however stimulating local conditions may be to vegetative growth; but direct experiments in this connection appear to be lacking.

The centifolia and gallica roses have practically but one season of bloom in this country. They are covered with flowers in May or June, according to the latitude in which they are grown, producing only occasional blooms in the fall, the gallicas being most free in this respect; but the hybrid with *R. rugosa* has a long blooming season, with repeated crops coming on in late summer and autumn. This peculiarity might be of advantage in localities where labor is scarce, as a smaller force of workers could care for the same amount of bloom developing over a longer season. The perfume of the hybrid rugosa is of the most exquisite quality and the yield somewhat greater than of the older types of perfume roses, but there is greater difficulty of propagation, as rugosa varieties are increased only by budding or grafting, while the centifolias and gallicas are freely propagated by means of layers or cuttings.

The type of rose bloom best suited for perfume purposes is semi-double, with large, thick petals that can easily be collected, rather than the showy varieties with full disks of shorter petals so crowded that they hide the pistils. Many of the latter varieties possess exquisite fragrance and possibly a satisfactory oil-content, but are seldom sufficiently vigorous or free in bloom to offset the added difficulty of manipulation. In a field trial of "Princess Bonnie," one of the most fragrant of American-raised hybrid tea roses, the only variety of this kind of bloom developed over a longer season. The perfume of this rose is semi-double, with large, thick petals that can be easily collected.

The production of high-quality rose water, rather than attar, appears likely to be more profitable in this country, as the latter requires repeated distillations, or washing out by ether and subsequent evaporation of the menstruum, and realizes a relatively low price in market on account of competition with adulterated imported oils and synthetic imitations.

The oil distilled from the green parts of the common rose geraniums, *Pelargonium capitatum* (?) and *P. Radula*, resembles in fragrance the oil of roses and is largely used as a substitute for it. Although generally not sold at retail under its own name, it is in itself a legitimate perfume, and its production should be undertaken in this country—only, however, in the South, where the long season admits of three crops of leaves and where the stumps with the soil heaped around them will survive the winter. The largest crop is to be had on rich lowland, but the finest quality is produced on drier and less fertile ground. In France, it is now grown mainly on irrigated land, but the product has to be aromatized by the admixture of oil from drier locations. The rose geranium is largely grown in Algeria, and in Spain, Sicily, and so on, as well as in France.

Geranium oil, in turn, has its substitutes, among which the oil of lemon-grass from India is conspicuous.

The European sweet violet, *Viola odorata*, affords the finest example of a favorite type of odors quite different from the citrus and the rose. The oil of the violet itself is necessarily so expensive as to be little used. The large amount of flowers required and the amount of hand labor necessary for gathering such small flowers, each growing on a separate stem, are apparently insurmountable obstacles to the extensive use of true oil of violet. Still it may be presumed that there will permanently be a class of buyers willing to pay the necessary cost of so choice a perfume. The violet yields the full fragrance only southward, but it must be grown in partial shade. When labor conditions admit, true violet perfume may be produced in California and in the South. An expert grower of violets has even thought that they might be grown under glass for this purpose.

Of the same general type and in some wise a substitute for violet perfume, is that of *Acanthus Parnesiana*, the "cassie" of the French, known in the South as "opopanax." The small yellow balls of flowers are treated by the greese processes, particularly maceration. While not ranked so high as violet, the perfume is in entirely good standing and produced in large quantities, but the oil is not sold at retail under its own name, it is in itself a legitimate perfume, and its production should be undertaken in this country—only, however, in the South, where the long season admits of three crops of leaves and where the stumps with the soil heaped around them will survive the winter. The largest crop is to be had on rich lowland, but the finest quality is produced on drier and less fertile ground. In France, it is now grown mainly on irrigated land, but the product has to be aromatized by the admixture of oil from drier locations. The rose geranium is largely grown in Algeria, and in Spain, Sicily, and so on, as well as in France.

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wild northerly, fennel has established itself on the lower family, including anise, caraway, and fennel. Not only Potomac, and fennel could doubtless be able group of odorous plants belonging to the parsley ingredient in Cologne water. Both of these could quite possibly be grown in the process of fermenting the cake of the kernels from which the fixed oil has been expressed. Its production should be considered in our almond-growing regions, especially California.

Several tropical grasses of the genus Cymbopogon, including Cymbopogon Schamanthus, which yields the previously mentioned lemon-grass oil, are of easy culture in Florida and the Gulf States generally, and doubtless will be largely used in the future for the production of fragrant oils. The plant itself is sometimes used as a garden ornament. Rosemary, Lilium (Schizocodon), C. Nardus and the true lemon grass, C. citrinus, not possessing the geranium-like odor found in C. Schamanthus. With the exception of vetiver, which contains the fragrant principle in the roots, the leaves and flowering parts of the Cymbopogon grasses are used for distillation.

Of our native grasses there are some which are already utilized as the source of scenting materials. The root of sassafras is or has been distilled in Pennsylvania, Maryland, and Virginia, and in other northern states, and sparingly southward. "Wintergreen, Gaultheria procumbens, is distilled in small quantity in several eastern states, but has very largely given place to sweet or cherry birch, Betula lenta, which yields a similar oil with less expense. The wood of the red cedar, Juniperus virginiana, has long been distilled in Germany, and latterly in this country. It furnishes a finer cedar-oil of Lebanon perfume than the cedar of Lebanon itself.

Three native plants representing respectively the thyme-like and citrus odors,—widely known as weeds but amenable to cultivation over a great extent of country,—are wild cherry, Betula cumbens, and mint, Mentha, and the latter contains a high percentage of limonene that may largely displace turpentine in the manufacture of agreeable varnishes for inside uses.

The root of the wild ginger or Canada snakeroot, Asarum canadense, yields a fragrant oil quoted in market reports, and said to be used especially for strengthening other perfumes. The sweet goldenrod, Solidago odora, furnishes an oil which has a market standing. The rich odor of the yellow jessamine of the South has been successfully extracted in Florida. The common market perfume of magnolia is doubtless mostly or entirely an imitation, and the same is probably true of Clethra alnolfa perfume. The great magnolia, Magnolia grandiflora, abounds in the South, but its flowers might be difficult to secure. Clethra is abundant enough in the Atlantic Coast region, but some difficulty might be experienced with it owing to the fact that only a part of the flowers in the raceme open at one time. The flowers of the swamp magnolia, or sweet bay, Magnolia virginiana or M. glauca (Fig. 2299, Vol. IV), should be tried. The spice bush, Benzoin circinale, affords several scents. The sweet
and copious bloom of Rhododendron arboreum in the southern mountains has been suggested for treatment. It is to be feared that the delicious odor of the native crab-apples would be too expensive, considering the difficulty of collecting enough petals. The bloom of the wild grape might well be thought of. Many of our plants—these are only examples—will eventually be tried and a few will be found steadily valuable. It is useless to expect commercial success with small and semipremium plants like Euphorbia regens, however pleasing in their natural state.

The production of perfumery oils may be conducted on large farms by capitalists; or a central establishment may contract with individuals for flowers, and other materials; or the business may be conducted cooperatively; or individuals may operate on a small scale in connection with other lines of farming. Some competent women to whom other avenues are closed may find this work available and congenial.

Intending experimenters should seek further information in one or more of the books which are before the public. With regard to methods of extraction, Askinson’s “Perfumes and Their Preparation” may be considered the purest and least general. Sawyer’s (especially the first series) is valuable both to the extractor and the grower. Pioche’s “Art of Perfumery” will also be found useful on both sides of the subject. Gildebrecht and Hoffman’s “Volatile Oils” is also very valuable. Also consult E. S. Steele’s “Perfumery—Gardening” in the Yearbook of the United States Department of Agriculture for 1898. Vol. XXII, part 2, of the Journal of the Royal Horticultural Society (London, 1898) contains a list of perfumes and plants that yield them, and also a list of books on perfumes.

E. S. Steele. W. Van Fleet.
as an isolated decorative garden feature. For such location and use there is the garden shelter, the tea-house, the pavilion, the seat, and various exedra, far more suitable.

As is generally the case with all decorative garden motifs, the design and material of the pergola should be in strict harmony with its more important and controlling architectural surroundings. This does not mean, nor does it necessarily follow, that the material of the pergola should be like that of the house, garden wall, or other more or less important adjacent architectural features; but it does mean that its architectural character or style, design, and scale, must be determined and dominated by that common to the entire problem, and its material be in harmony or at least reflective.

The designer or builder is safest when he considers not only his pergola but all of the architectural features of the garden as details, the character of which are largely determined by, or closely interrelated with, the architectural treatment of the garden and its environment as a whole. Materials and minor methods of expression may vary with personal taste, but architectural period and style cannot, for with a lack of appreciation of the proper architectural relation between the interrelated parts of a garden comes a breaking down of one of the most important principles of garden or other composition, namely unity of idea.

While, of course, there can be no rule giving the dimensions of pergolas, the relation of width to height is most important, as is the relation of height to length. The scale may be either human or relative. The width of a pergola or arbor, however, is seemingly best when slightly greater than its height, for if less it will appear stilted and in poor proportion. From diagrams A to E in Fig. 2869, it will readily be seen that (A), showing a proportion of 4 to 3 is less pleasing than (B), 4 to 4, or even (C), 4 to 5. When the width increases noticeably over the height, as in (D) 4 to 6, or (E) 4 to 7, there is a resultant weakening in proportion. As for length, this of course is determined by the individual problem, but in no case should the length be merely equal to, or less than, the width or height.

In summary, the dimension of the pergola should produce a form of sufficiently dominant and pleasing horizontal and perpendicular dimensions to produce a satisfactory feeling of stability and repose.

In regard to plant materials used in connection with pergolas, the effect sought is that the pergola shall count as a support for vines; the variety and kind of growth, however, must naturally be determined by the exigencies of the particular case. Vines of fine and delicate foliage, flower, and fruit are better suited to the delicate arbor or treillage, and the larger-leaved, more heavily fruited vines to the architecturally stronger and coarser pergola. Also, vines with coarse and woody stems, such as the wisteria, the grape, the bittersweet and the like, are better adapted to the true use of the pergola, as a rack upon which vines lie, not a treillage or support up which they climb or against which they are trained.

BRYANT FLEMING.

PERICOME (from the Greek for around, and tuft, from the tuft of hairs around the achene). Composite. A small group of hardy perennials grown for their golden yellow conspicuous flowers. Strong-scented much-branched herbs with long-acuminate lvs. and numerous heads in a terminal corymbiform cyme; involucral bracts slightly connected by their edges.

2869. Pergolas—Various architectural forms; also diagrams of proportions in A to E.
thus forming a bell-shaped cup: disk-fls. sticky, seers much exerted; achenes villosous and bullate.- The only 2 known species, both of W. N. Amer. The genus is of little horticultural importance and is offered only by dealers in western native plants. The showy golden yellow fls. are not unattractive.

caudata, Gray. Lvs. opposite, long-petioled, triangular-hastate with crenate or entire margins, the apex and sometimes the basal lobes long, caudate-acuminate; heads many, the fls. conspicuously longer than the involucre. Rocky canyons in the mountains, Colo. to New Mex. and Ariz.—Useful in dry or exposed places.

PERILLA (said to be a native name in India; by others, a Greek and Latin proper name). Lobate, Herbs, one of which is sometimes grown for the colored foliage.

Erect, with opposite lvs. and small fls. in whorls of 2 that are aggregated into axillary and terminal simple or panicled racemes: calyx bell-shaped, 5-toothed, much enlarged and gibbous in fr.; corolla short-tubed, the tube not exceeding calyx, limb oblique and somewhat unequally 5-lobed; stamina 5, erect and separate; disk represented by a large gland; style 2-parted.—Two or 3 species, Himalaya region to China and Japan. The plant known in gardens as P. nankinensis is distinct by the color of its foliage. The lvs. are a dark wine-purple, with a bronzy luster; rarely glabrous: lvs. dark purple-brown, with a bronzy luster; rarely glabrous: lvs. dark purple-brown, with a bronzy luster. These colors are more or less toned with green, especially in young plants. It is an annual herb, growing about 1 1/2 ft. high. It is considerably used in subtropical beds and for the back of the ribbon borders. It is sometimes planted next to a dusty walk or other white-flved plants for the sake of contrast. The foliage has an odor suggesting cinnamon. In Japan the perilla is of economic importance for the production of oil.

The flowers are inconspicuous and produced in autumn. Avoid planting too closely; leggy specimens are unattractive. Annual: Lvs. opposite, rarely speckled with brownish purple, only slightly wrinkled, base wedge-shaped (rounded in strong-growing annuals. Sow the seeds thinly and cover nearly an inch.

Before the introduction of the coleus, this plant was considerably used in subtropical beds and for the back of the ribbon borders. It is sometimes planted next to a dusty walk or other white-flved plants for the sake of contrast. The foliage has an odor suggesting cinnamon. In Japan the perilla is of economic importance for the production of oil.

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spikes tall, erect or hanging; fls. nearly globular or cup-shaped, of a waxy texture, with broad concave segments. The genus is distinguished from the related genera Acineta, Lecanora, Gongora, and the like, by the curious shape of the labellum and column. The base of the labellum (hypochil) is united with the column by broad wings (pleuridia). The upper part of the labellum (epichil) is movable joined to the hypochil. 

Five species, of which 2 are commonly cult. 

The chief factors in growing peristerias are moisture during the growing period, the ideal location being in proximity to water, in a temperature of 65° to 70° F., and a decided rest when growth is completed. The growing medium should consist of two-thirds fibrous sod soil and one-third peat and sand, an addition of dried cow-manure being beneficial. The pots should be well supplied with drainage. When the plant is growing freely, water occasionally with organic fertilizer until the growth is completed. Then reduce the water-supply to induce flowering when the young growth appears. An excellent specimen of P. elata in the Missouri Botanical Garden recently produced a flower-spike 3 feet 6 inches high and produced twenty well-formed flowers. From the first appearance of the spike until the last flower opened, covered a period of three and a half months. This noteworthy specimen was grown over a tank of water, in a house of miscellaneous warmhouse plants, and organic manure was given freely during growth. The plant was then transferred to the encausa house to rest, enough water was given to prevent shriveling of the pseudobulb, until the young growth appeared bearing a well-formed flower-spike; it was again transferred to its former position and watered freely to develop the spike. (G. H. Pring.)


Fig. 2871. Pseudobulbs 4-5 in. high, bearing lanceolate, strongly veined lvs.; scape pendulous, from the base of the pseudobulb, bearing as many as 20 fls.; fls. globular in outline, 1½ in. across, fragrant, greenish white outside, tinged with rose and thickly dotted with purple within; sepals roundish concave, united at base; petals rather smaller; labellum fleshy, curiously shaped, inclosed within the fl. Guiana. B.M. 3479. G.C. II. 25: 116. -Requires tropical treatment, but rarely flowers in cult. 

cérina, Lindl. Pseudobulbs oblong-ovoid, up to 3 in. long, 3-4-lvd.: lvs. oblong-lanceolate, up to 1 ft. long; scape pendulous, short, bearing a dense raceme of 6-10 fls.; fls. about 1 in. across, pale lemon-yellow, waxy; sepals and petals broadly ovate, concave; lip 3-lobed, the acute lateral lobes ovate, the middle lobe emarginate, inflexed, the margin crisped. Cont. Amer. B.R. 1853. 

GEORGE V. NASH. 

PERISTROPH (Greek, peri, around, and strophi, belt; alluding to the involucre). Acanthaceae. Greenhouse plants, grown for the bloom. 

Erect, branched or loosely creeping herbs or half-shrubby: lvs. entire; fls. solitary or in clusters of 2-3 surrounded by an involucre, in loose cymes or cymose panicles, or distant on slender branches; bracts of the involucre narrow; calyx deep 5-parted, shorter than the bracts, scarious or hyaline; corolla-tube long, slender, slightly enlarged above, limbs deeply bilabiate, the posterior lip narrow, erect, concave, entire or emarginate, lower lip spreading, apex 3-parted; stamina 2, a little shorter than the corolla-lips; anthers 2-celled; style and stamens none; style filiform: caps. oblong, contracted into a solid stalk. —About 15 species, ranging from Trop. Afr. and India to the Malay Isls., Philippines, and Austral. 

The plants are cultivated like jacobinias or justicias, of the same family. Cutting is made any time when the wood is soft will root in a warm bed in three to four weeks, after which the potted plants may be removed to a house of lower temperature. They require a rich loam mixed with some leaf-mold, and plenty of air. 

speciosa, Nees (Justicea speciosa, Roxb.). Fig. 2872. The plant erect, spreading, or loosely creeping, becoming 2-3 ft. high: lvs. opposite, petioled, ovate-acuminate, smooth; fls. in clusters of 2-3 on slender branches, violet-purple, 1½ in. long. Blooms for a long period in winter. India. B. M. 2722. L.B.C. 20:1915. B. 2:74. 

Gn. 73, p. 116.-Requires tropical treatment, but rarely flowers in cult. 

angustifolia, Nees. Plant low, erect, very much branched: 

Fig. 2872. Peristrophe speciosa. (× 1)
branches nearly horizontal, pubescent above; lvs. lanceolate, pointed at both ends; fls. sparse, in terminal cymes, rose-colored. Flowers freely. Java. Var. *aborea variegata*, Hort., has the center of the lvs. variegated with yellow. Useful for various arrangements.

**PERPINNELIA**

HEINRICH HASSELBRENG.

**PERNÉTTYA** (after A. J. Pernetty, 1716–1801; he accompanied Bougainville on his voyage and wrote 'A Voyage around the World', 1777). Pacific Coast and some of the islands of the Solomons. Fleshy, succulent plants grown chiefly for their attractive variously colored and profusely produced berries, also for their neat evergreen foliage and white or pinkish flowers. Evergreen shrubs: lvs. alternate, short-petioled, small, usually serrate; fls. axillary, usually solitary on slender nodding pedicels, rarely in racemes; calyx 5-parted; corolla urceolate, with short 5-lobed limb; stamens 10, the anthers 4-awned at the apex; fr. a 5-celled many-seeded berry.—About 25 species from Mex. to the Magellan region, mostly in the mountains, and 1 species in Tasmania and New Zealand. Allied to Gaultheria, but the calyx not enlarged and rarely fleecy after flowering. The pernettyas are low much-branched shrubs with dense and small evergreen leaves and small nodding flowers, followed by very decorative berries varying in color from white to purplish black or bluish black and retaining only 50 in *Persea*. Mez, in his monograph on the American Lauraceae (Jahrb. Königl. Bot. Gart. 1889, 5:10, and Ill. 28:465), describes 47 American species. Among them are 5-celled many-seeded berries.-About 100 species, but Meissner (DC. Prodr. 15, pt. 1, 43) distributes some of the species in other genera and genera. The species are of ornamental value, and some of them are of economic importance. Others are of ornamental value, and some of them are of economic importance. Others are of ornamental value, and some of them are of economic importance. Others are of ornamental value, and some of them are of economic importance.

ALFRED REHDER.

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A. Outer calyx-lobes distinctly shorter than the inner.

B. Ornithonia, Spreng. (P. carolinensis, Nees). Red Bay.

C. Bull Bay. Tree, reaching 40 ft., with smooth branches: lvs. 2-3 in. long, oblong to lanceolate-oblong, glabrous and deep green above, glabrous beneath: fls. pubescent, the peduncles of the clusters shorter than the pediole: fr. a small blue drupe. Woods, N. C. to Fla.—A handsome evergreen, with wood useful for cabinet work and other purposes.

AA. Outer calyx-lobes equaling the inner, or very nearly so.

Indica, Spreng. Handsome tree, with elliptic-oblong or lanceolate-oblong attenuate-acute glabrous lvs., 3-8 in. long; panicle 3-6 in. long, the peduncles compressed, and the branches 3-5-fl., the lvs. white and ½ in. long; fr. scarcely fleshy. Canary Isls., Madeira, and the Azores.

Gratissima, Gaertn. f. (P. americana, Mill.). Avocado. Alligator Pear. Aguacate. Aguate. Avoçado. Abacate. Fig. 2873; Figs. 445, 446, Vol. I. A large tree, commonly with broad crown up to 60 ft.: lvs. oblong-lanceolate or elliptic-lanceolate to oval or obovate, 4-10 in. long, 2-6 in. broad, apex acute or shortly acuminate, sometimes almost blunt, the base acute to truncate, frequently rounded, surface glabrous above, usually somewhat glaucous with the venation prominent below; pediole ½-2 in. long, canaliculate above: fls. shortly pedicellate, in broad compact panicles at the ends of the young branchlets, about ¾ in. across, greenish, the calyx-lobes oblong-lanceolate, acute, slightly concave, finely pubescent; fertile stamens 9, in 3 series, each stamen of the inner series bearing just above its base 2 oval flattened orange-colored glands; filaments slender, finely hairy, the anthers oblong-ovate, dehiscing by 4 valves hinged distally, the 2 outer series dehiscing extrorsely, the inner series with the 2 distal valves extrorse and the proximal pair introrse; staminodes 3, flattened, orange-colored; ovary ovate-elliptic, the style slender, attenuate, finely pubescent: fr. a large fleshy drupe, commonly pyriform, ovate or spherical, 2-8 in. long, green, maroon or purple in color, the epicarp membranaceus to thick and woody, mesocarp soft, yellow, and buttery; seed 1, large, conical to oblate, inverted, exalbuminous, with 2 thin seed-coats often distinct, reticulate. Certainly indigenous in Mex. and Cent. Amer., extending perhaps to N. S. Amer.

The avocado is cultivated commercially in Florida and California, as well as in other parts of tropical America. See Avocado. Several distinct forms are known in cultivation, some of them having been considered botanical varieties by certain botanists. The horticultural varieties grown in the United States are generally grouped into three types, which may be distinguished as follows:

AA. Lvs. anise-scented: skin of fr. thin and soft

BB. Surface of fr. usually smooth; skin leathery, usually not more than 1/3 in. thick, usually not more than 1/3 in. thick, frequently distinct, the outer one adhering to wall of seed-cavity; cotyledons often rough

CC. West Indian type

D. Smooth-skinned species: skin offr. thick.

Occasional forms will be found which are difficult to classify by the above key. Especially is this true of the Guatemalan type, of which there are several varieties in California with the skin no thicker than in some varieties of the West Indian type, and nearly as smooth. These can usually be distinguished, however, by the character of the seed and its coats. Solano and Balkemay are mentioned as smooth-skinned examples of this class. Trees of the Guatemalan type usually have darker-colored foliage than those of the West Indian, and ripen their fruit from January to April, while the West Indian ripens from July to November. The Guatemalan type is considerably the hardier of the two. Both are greatly exceeded in hardiness by the Mexican type, which has been known to withstand temperatures of 18° to 20° without serious injury. Chappelow, Ganter, and Harman are varieties of this type well known in California, where they originated. This type is exceedingly common in northern Mexico; the Guatemalan type is found in southern Mexico (whence are derived many of the varieties cultivated in the United States, Guatemalas, and doubtless in other Central American states. The West Indian type is the commonest one in Florida, Cuba, and the West Indies in general, and on the eastern coast of South America. The well-known Florida varieties, Trapp and Pollock, are representatives of it.

Persica: Prunus.

Persicaria: Polygonum.

Persimmon. Interesting and valuable edible fruits.

Of edible persimmons, two distinct types are grown in this country,— Diospyros virginiana, the native species, and D. Kaki, the Chinese-Japanese species, known as the kaki. The latter is much the more improved, and is the source of the commercial persimmons. See Diospyros. Other species have been introduced, but are yet under experiment (cf. "Yearbook, United States Department of Agriculture," 1911, page 418).

The native persimmon.

The American persimmon (Diospyros virginiana) is found wild in most of the southern states and as far north as 38° latitude. It will thrive and ripen its fruit, however, as far north as Rhode Island and the Great Lakes. The fruit is little known except to those who live in localities in which it grows wild, and even then
Persimmon

but little attention has been given to its cultivation and improvement. The tree is usually of small size when grown in the open ground, reaching a height of 20 to 30 feet; when grown in the forest, it often reaches a height of 80 feet; and in the rich alluvial river bottoms, from 2 to 3 feet in diameter. In exceptional cases, it may attain still greater size, even to 7 feet in circumference and 125 to 130 feet high ("Journal Hereditas," November, 1915). The wood is hard and elastic, and very durable when well inside work but it will rot quickly when placed under ground.

The fruit is subglobose and ranges in size from 1/2 to 2 inches in diameter, depending largely on the number of seeds which it contains, although seedless varieties an inch in diameter are sometimes found. The fruit has a very disagreeable astringent quality when green, but this disappears in most varieties when it becomes fully ripe. The date of ripening in the central states varies from August 1 to December 20.

The native persimmon, Diospyros virginiana, is the species from which most of the following descriptions of varieties are taken. It is readily propagated from seeds, which should be procured in autumn or early winter and planted in the same way as peach pits; but as the seedlings, especially from cultivated varieties, cannot be relied upon to reproduce themselves, they should be budded or grafted when two or three years old. This should be done in the spring as soon as the bark will slip freely. Ordinary shield-budding works well; also annular- or ring-budding, patch-budding, and chip-budding. Large trees may be cleft-grafted, and small shoots or stocks may be whip-grafted.

This tree is more difficult to transplant successfully than almost any other kind of fruit. If too much of the long tap-root is cut off, the tree will be sure to die. Transplant in the autumn, cut back most of the top, and plant in the same way as peach pits; but as the roots must be kept low-headed so that the fruit can be picked by hand; in this case, they may stand 16 to 20 feet apart each way. If the fruit is not to be hand-picked but gathered as it falls and size and quality are not so important, the trees may stand at about one-half these distances. As the roots run deep, the plantation is adapted to other crops until the tree require the space.

Several chance seedlings of superior size or quality have received names. They are small fruits, yellow or reddish in color, about 1 1/2 to 2 inches in diameter. Some of the forms are shown in Figs. 2874 and 2875.

For a general horticultural account of the native persimmon, see W. F. Fletcher, Farmers' Bulletin No. 985, United States Department of Agriculture (1915), from which most of the following descriptions of varieties are taken.

Boone (Daniel Boone).—Origin Indiana, where it ripens during October and November; form roundish oblate, size medium, color yellow, with a dull blush in the sun; skin rather tough; seeds medium; flavor sweet and rich; quality very good.

Burrier.—Origin central Kentucky, where it ripens rather early; form oblong-ovate, size medium, color yellow; practically seedless; flesh soft; quality very good.

Delmas.—Origin Snanton, Mississippi, where it ripens during October and early November; form roundish oblate, size medium, color yellow; skin thin and tough; seeds numerous, flavor sweet and rich; quality very good.

Early Bears.—Introduced from Carterburg, Indiana, where it ripens early in October; form round-ovate, size medium, color dull yellow; quality good.

Early Golden.—Origin Illinois, where it ripens in September; form oblong, size medium to large, color yellow; skin thin; seeds few, flavor sweet; quality very good.

Golden Gem (Fig. 2875).—Introduced from Borden, Indiana, where it ripens from August to October; form roundish oblong, size medium to large, color dark orange to red; seeds few, flavor rich and sweet; quality good.

Hick.—Origin Washington County, Indiana, where it ripens in October; form roundish oblate, size medium, color bright yellow, changing to pale translucent; skin tough; seeds few, flavor sweet and rich; quality good.

Josephine (American Honey, Honey) (Fig. 2875).—Origin near Bluffton, Missouri, where it ripens in September; form roundish oblate, size medium to large, color dark red; skin thin and tender; seeds few, flavor rich; quality very good.

Kassas.—Introduced from Missouri, where it ripens in September; form roundish oblate, size rather large, color yellow splashed with red; flavor rich; quality very good.

Marion (Fig. 2875).—Original tree found near Fulton, Missouri, where the fruit ripens in October; form roundish oblate, size large, color dull red; skin rather tough; seeds few; quality good though less rich than some other kinds.

Miller (Fig. 2875).—Origin Jackson County, Missouri, where it ripens in September; form roundish oblate, size large, color reddish yellow, translucent; skin tough; seeds rather numerous; flavor sweet; quality good.

Ruby (Little's Ruby) (Fig. 2875).—Introduced from Carterburg, Indiana, where it ripens during September and for some time later; roundish oblate, small to medium, yellowish red, shaded to deep red; skin tender; seeds few, flavor sweet; quality very good.

Skoko.—Introduced from Danville, Indiana, where it ripens during October; form oblong-ovate, size large, color dull yellow, blushed in the sun; skin rather tough; seeds few; quality very good.

Speck.—Introduced from Pennsylvania, where it ripens during October and November; form roundish oblate, size medium, color dull yellow, splashed with red; flavor rich and sweet; very good.

The kaki.

The Japanese persimmon (Diospyros Kaki) is considered by the Japanese as their best native pomological product. Although cultivated in the south of France for more than ninety years, there is no record of its successful introduction into the United States previous to about 1870. Trees were first sent to California and subsequently to Augusta, Georgia, but owing to defective roots and long delay in transit, the first and second shipments proved a failure, and not until 1870 came the first successful introduction into the United States.
tations of trees grown in Japan consisted of trees of small size with long tap-roots and no laterals; and probably the stocks on which they were grafted were not adaptable to this country. American enterprise, however, remedied this, as nurseries were established near Yokohama and well-grown trees of the best varieties were exported to the United States. Experiments were made in the South by grafting upon native stocks. This proved successful when the graft was inserted upon the collar of the root, 3 to 4 inches below the surface of the soil. The United States Department of Agriculture received a large quantity of trees from Japan about 1875 or 1879, and fearing that the winter of Washington might prove too cold the trees were sent to Norfolk, Virginia, where many bore fruit the following year. The first fruiting of which there is any record was at Augusta, Georgia, in 1870, upon trees grafted upon native seedlings growing in the forest.

The kaki, or Japanese persimmon, is a fruit for the cotton-belt. However, as regards the hardness of the seeds imported from Japan. Inasmuch as the native stock is used, the range of adaptation to soils and similar conditions is very great. As a stock, Diospyros lotus is adapted to the drier parts of the West, where D. virginiana does not succeed. D. chinensis will probably be a good stock, but has not yet been tested in this country. The best method of propagating Japan persimmons is by collar-grafting upon seedlings of the native species (Diospyros virginiana), which are grown either by planting the seed in nursery rows or transplanting the young seedlings from seed-beds early in the spring. The seedlings can be budded in summer, and in favorable seasons a fair proportion of the buds will succeed. Thus propagated, the trees seem to be longer-lived than

2875. Native persimmons: a, Josephine; b, Marion; c, Golden Gem; d, Miller; e, Ruby. (X 1/2)

Japanese persimmons, experience demonstrates that some varieties are more resistant to excessive cold than others; but few can withstand a temperature of zero; and as a rule they are more successful below the 32d degree of latitude than farther north. Many seedlings have been produced that seem to have increased frost-resisting powers. Instances are reported in which some of these trees have withstood the winters of east Tennessee. By successive sowing of seeds from these hardier seedlings we may look for a race of trees that will be adapted to the middle sections of the United States. There is a probability, also, that importations from the north of Japan and China may considerably extend the range northward in this country. Some varieties have succeeded in central Virginia and Kentucky. Attempts to cross with the native species have so far been unsuccessful.

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Kaki, or Japanese persimmon, in various forms as grown in Florida. 1, Tamopan; 2, Hyakume; 3, Fuyugaki; 4, Triumph; 5, Scutariik (said to be Diospyros chinensis); 6, Gallov; 7, Tsuru; 8, Tane-Nashi. (X about 3)
There is a great difference also in the habit of growth and foliage of the varieties. All have broad and shiny simple leaves. Some varieties make a growth of 5 to 7 feet the first year from graft, and at ten years form a trunk of 3 to 4 feet. Others, from a dwarf espalier, habit and seldom grow above 5 to 6 feet in height; this class is more precocious in reaching the bearing age than the taller-growing sorts, and is also likely to overbear. It is not uncommon for a three-year-old tree to yield several hundred perfect fruits. Thinning the fruit as soon as set in early summer will prevent an early failure of the tree.

Trees thrive in any soil in which the native species grows, but usually fail in wet soils. They respond well to an enriched soil, especially to the addition of compost. All have broad and shiny simple leaves. Some varieties make a growth of 5 to 7 feet the first year from graft, and at ten years form a trunk of 3 to 4 feet. Others, from a dwarf espalier, habit and seldom grow above 5 to 6 feet in height; this class is more precocious in reaching the bearing age than the taller-growing sorts, and is also likely to overbear. It is not uncommon for a three-year-old tree to yield several hundred perfect fruits. Thinning the fruit as soon as set in early summer will prevent an early failure of the tree.

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PESCTORIA

Leaves equitant, tufted, without pseudobulbs; fls. solitary on sts. 3–6 in. long, from the axils of the lvs., mostly large and showy and fragrant; sepal and petals broad, concave, spreading, the lateral sepals forming a mentum; labellum clawed, lateral lobes small, middle lobe rounded, spreading; crest thick, consisting of a number of keels arranged in a semi-circle near the base of the lip; column slender, not boat-shaped.—About 12 species. For cult., see Zygoptetalum.

Klabochrum, Reichb. f. Lvs. strap-shaped, 1 ft. or more long; fls. 3–3½ in. across, variable in color; sepals oblong, obtuse; petals shorter, all with white-echiote-purple points; labellum 3-lobed, yellowish or white, and having many purple-tipped hairs; calyx sulphur-colored, with brown keels. June, July. Ecuador. Gn. 22:24.

Dayana, Reichb. f. Lvs. tufted, 6–10 in. long: fls. on short scapes; sepals oblong-obovate, acute, white, with green tips; petals rhomboid-rotund; labellum ovate, yellow, with a thick semi-circular crest. Chiniqua. B. M. 5598 (as Huntleya cerina). F.S. 17: 1815 (as Zygoptetalum cerinum).—Flowers at various seasons, the fls. lasting a long time.

Petalostemum (Greek for petal and stamen, alluding to the way in which these organs are joined). Sometimes spelled Petalostemon. By some authors, the species have been referred to Kuhntatera. Leguminosae. American herbs, mostly western, with long or deep perennial roots, sometimes planted for ornament.

Leaves glabrous, alternate; blades unequally pinnately compound; fls. perfect, in short or elongated spikes; calyx-teeth nearly equal, rather broad, shorter than the tube; corolla white, pink, purple, or violet; petals on long slender claws; standard oblong or obcordate; wings and keel-petal similar, their claws adnate to the tube, acute; corolla white, 2–3 lines long; wings and keel ovate; standard erect, not boat-shaped; calyx-teeth and pod slightly pubescent. Tenn. to Minn., La., and Texas. B.B. 2 (ed. 2):369.

AA. Fls. rosy purple or violet.

1. Pubescence of the calyx of short close-set appressed hairs.

decumbens, Nutt. Plants sparingly pubescent above or glabrous: sts. solitary or cespitose, ascending or

2. Fls. white.

candidum, Michx. (Dalea candida, Wild.). White Prairie Clover. Plants glabrous: sts. erect or rarely prostrate, simple or sparingly branched, 1–2 ft. tall:

fls. 5–9, the blades linear, oblong or oblancoate, ½–1½ in. long, acute, or mucronulate, glandular beneath, more or less cuneate at base, very short-stalked: peduncles terminal, elongated, bracteate; spikes cylindric, 1–4 in. long, about ½ in. thick; bracts aculate, longer than the calyx; corolla white, 2–3 lines long; wings and keel ovate; standard cordate; calyx-teeth and pod slightly pubescent. Tenn. to Minn., La., and Texas. B.B. 2 (ed. 2):369.

BB. Pubescence of the calyx villous or silky-villous.

c. Bracts glabrous or merely puberulent tips.

purpureum, Rydb. (Dalea purpurea, Vent. F. violacea, Michx.). Violet Prairie Clover. Glabrous or slightly pubescent, erect, 1½–3 ft. high, branching above: lvs. short-petioled; fls. 3–5, narrowly linear, ¼–3½ in. long, acute or mucronate at the apex, narrowed at the base, short-stalked: spikes peduncled, oblong to cylindric, ½–2 in. long, about ⅝–1½ in. thick; bracts above mucronate, nearly glabrous, nearly equaling the pubescent calyx; corolla violet to purple, about 2 lines long; standard cordate, wings and keel oblong. Ind. to Sask. and Texas. B.M. 1707. B.B. 2 (ed. 2):370.

cc. Bracts with silky-pubescent tips.

tenuifolium, Gray. Silky Prairie Clover. Erect, somewhat pubescent, branching, 1–2 ft. high; lvs. short-petioled; fls. 3–5, linear, obtuse, glandular-dotted, margin somewhat involute, ¼–1½ in. long, nearly sessile; spikes cylindric, ⅜–1½ in. long, about ¾ in. thick; racis pubescent; fls. rose-purple, about ⅜–1½ in. long; bracts ovate-pointed, pubescent, equaling the calyx; standard somewhat orbicular to cordate. Kans. to New Mex. B.B. 2 (ed. 2):370.

P. L. RICKER.
PETSÍTÉS (Greek, a broad-brimmed hat; referring to the large broad leaves). *Compositae.* Hardy perennial herbs much like the common coltsfoot (*Tussilago Farfara*), having large leaves of the same general shape, but the flowers range from purple to white, not yellow, and are borne in corymbs instead of singly. They are rather coarse and weedy, but the big fleshy lvs., appearing after the very early leafless scapes, make a good cover for rough or unoccupied places.

The genus is widely distributed in north temperate and subarctic regions. The number of species is about 20; the essential character of the genus (as distinguished from *Tussilago*) is that the heads are nearly or quite discoid, and rayless or with very short and mostly not showy rays; also the fact that the scapes usually have many heads instead of one. The lvs. are orbicular or reniform, always with a deep heart-shaped base and the scapes are covered with scales like a coltsfoot, but sometimes the lower ones are more leafy.

**japonícus**, F. Schmidt. Lvs. large, 3½–4 ft. across, radical; peduncle with 2 or 3 linear bracts; fl.-heads in a fastigate thyrse. Isl. of Sachalin. B.M. 8032. Var. gigantíus, Hort. Lvs. orbicular, margin wavy: fl.-heads densely clustered. Gn.M. 10:180.—The stalks are eaten as a vegetable after being boiled, and are also preserved in salt. The fl.-buds, which appear in Feb., are used as a condiment, as they have a slightly bitter but agreeable flavor. The plant has been advertised in Amer. since 1900 by several dealers. Grows as high as a man, and is useful for bold effects in the subtropical garden.

**frágans**, Presl. WINTER HÉLIÓTROPE. SWEET COLTSFOOT. Height 8 in.: lvs. appearing during or after anthesis, orbicular, margined with small cartilaginous teeth, glabrous above, pubescent and green below: heads fragrant, the marginal fls. of the female heads in the form of short rays; fls. small, varying from pale lilac to purple. Mediterr. region. Gn. 23, p. 113; 53, p. 328; 62, p. 58.—Has the merit of blooming in winter and its fls. have a delightful vanilla-like odor. A few sprays are desirable for cutting during winter. The plant also differs from the common coltsfoot in having darker colored and evergreen foliage. It is suitable for carpeting shrubbery and for dry banks of stiff clay where choicer subjects will not thrive. Like most others of the genus, it spreads rapidly by underground runners.

**palmátus**, Gray (*Nardosínia palmáta*, Hook.). Height 6–24 in.: lvs. orbicular or somewhat kidney-shaped, deeply 7–11-cleft beyond the middle, and the lobes sharply dentate, green and glabrous above, densely white-tomentose beneath: heads fragrant, 4–6 ft. across, the marginal fls. of the female heads in the form of short rays, whitish. E. Asia, N. Amer. B.B. 3:469.—Blooms from April to June, its fls. varying from nearly white to pale blue or purplish. It is found in rich dark soils, where choicer subjects will not thrive. Like most others of the genus, it spreads rapidly by underground runners.

**officínális**, Moench (*P. vulgaris*, Desf.). Height 16 in.: lvs. 3 in. to 3 ft. diam., reniform or orbicularly corate, white-hairy below: fls. purplish, appearing before the lvs. in March–May, borne in cylinder panicles. Eu., N. Asia. W. L. H. B. 1

PETÍVÉRIA (named after James Petiver, 1665–1718, an apothecary and botanist of London). *Phytolacáceae.* Shrubby herbs: lvs. alternate: fls. small, in axillary and terminal racemes, solitary or in 2's; pedicels herbaceous, conical at base, 4-parted, segmas subequal, lanceolate, spreading; stamens inserted at the base of the perianth on a hypogynous disk, either 4 alternate with the segmas. of the perianth or 5–5 placed without order; ovary 2-celled.—About 2 species, S. Fl. to Paraguay. The genus has been recently monographed by Hans Walter in Engler’s Pflanzenreich, hft. 39 (IV. 83). P. allíceá, Linn. (*P. octándra*, Linn. P. allíceá var. octándra, Moq.). *GUíNEA-HEN WEED.* Hall-shrubby, perennial: sts. 2–3 ft. high: lvs. alternate, ovate, entire, mesophyllaceous, attenuate at both ends, pellucid-dotted: infl. erect in a lax raceme; fls. rose or white. Mex. to Brazil. An ornamental stove plant probably not now in cult.

PETRÉA (Robert James, Lord Petr é, 1710–1742, a patron of botany who had the finest collection of exotic plants in Europe). Sometimes spelled *Petreá.* *Verbenáceae.* Tropical American woody plants, one of which is a choice blue- or purple-flowered climber.

Twining or arborescent shrubs: lvs. opposite, leathery, pinnate-veined: fls. violet, purple or bluish, in long terminal racemes; calyx with 5 scales in the throat; calyx-lobes colored during anthesis but often becoming green and rigid in fr.; corolla usually a little more intensely colored; limb 5-cut, oblique, the tube short and cylindrical; stamens 4, didynamous; ovary imperfectly 2-loculed; locules 1-ovuled; fr. included in calyx, indescendent, 2-celled and 2-seeded or 1-seeded by abortion.—Species about a dozen, Mex., W. Indies to Brazil.

Petrea is adapted to be grown with other stove climbers. The plants do well when trained to a balloon-shaped or flat wire frame, to pillars, or carried near the roof, where they add greatly to the beauty of the house. When it is intended to plant them out in the border, the first point to be considered is the drainage in the pot. This is best effected by placing a layer of brick rubbish of about 4 to 5 inches. This will keep the compost from becoming sour or stagnant in the pot. For a compost, use turfy loam four parts, turfy peat one part, well-decayed cow-manure one part, with admixture of a liberal quantity of sand or gritty sand. By the end of January the temperature may be increased to about 62° for night with 10° to 15° higher by day. Just as soon as they show renewed vigor they will not stand to become dry at the roots. They will want a good syringing over and under the foliage every morning on bright days. Give enough ventilation to keep the air pure and sweet. In midsummer they need some shade if only during the most powerful sunshine. When they are well established, they will be benefited by liquid manure once a week. For midsummer the temperature may be allowed to run up 80° or 85° with sun, and a night temperature of 70°. They are easily propagated from shoot-cuttings placed in a brisk bottom heat and...
subjected to the usual condition of moisture and shade required for other plants. When they are wanted to grow in pots, keep shifting until they are in 8- or 10-inch pots. The compost may be renewed in the spring. (J. M. Farrell.)

volutellas, Jacq. **Purple Wreath**. Fig. 2878. Twining: lvs. 3–4 in. long, short-stalked, ovate, elliptic or oblong, acuminate or obtuse, entire or wavy: fls. blue, in terminal elongated racemes (7–8 in. long); calyx with a tube one-fourth to one-half as long as the pedicel, and in fr. one-third to one-fourth as long as the narrow lobes; corolla included in the calyx. Cuba to Brazil; a showy plant. B.M. 628. G.C. III. 39:24, 25; 45:252; 51:287. J.H. III. 54:390. G. 29:192. H.F. 8:50. F.E. 23:582. F.C. 3:108. Gn. 12:40.—The purple wreath is one of the most distinct and beautiful of tender climbers. The fls. are like a 5-pointed star of lilac with a violet in the middle. The fls. begin to open at the base of the raceme and the showy 5-pointed star is the calyx, whose sepals are colored like petals. The calyx spreads open while the corolla remains after the corolla has fallen, so that the vine, at first glance, seems to bear two kinds of fls. The blooms appear in March and April. It does not bloom freely in small plants; it probably has other drawbacks, for it has always been a rare plant in Eu., though enthusiastically recommended. Offered in S. Calif. The fls. seem to vary considerably in color.

WILHELM MILLER.
L. H. B.†

**PETROCÁLIS** (Greek, rock beauty). **Crucifera**. This genus has been commonly included in Draba but differs from it in technical botanical characters as follows: silique oval with swollen reticulate valves having 1–2 seeds in a cell with the funiculus adnate to the septum. One species in the Pyrenees, *P. pyrenaica*, R. Br. Height 2–3 ft.; lvs. wedge-shaped, 3-lobed at apex; fls. white at first, changing to rosy pink. May. Mountains, S. Eu. B.M. 713.—Also found under *Draba pyrenaica*, page 1065; grown as a little rock-plant in choice collections.

**PETROCÓPTIS** (Greek, equivalent to the Latin Saxifraga, —to break or cleat the rock: rooting in the clasts of rocks). **Caryophylláceae**. Two or 3 perennial from the Pyrenees, sometimes used in alpine- and rock-gardening. Allied to Lychins and sometimes united with it, differing in imbricated rather than convolute cymes of small size with uncut petals and woolly seeds. Petalina of small size with uncult petals and corolla-crown, the lvs. mostly tufted or in a rosette: st.-lvs. opposite. *P. pyrenaica*, A. Br. (Lychins pyrenaica, Berger). Three to 4 in. high from a fusiform root: lvs. glaucous-green, spatulate, those on the st. cordate and sessile: fls. pale flesh-color or rose-color, about 3⁄4 in. across, in forked clusters, the slender pedicels 1-fid.; petals shortly notched at top, bearing 2 erect serrate scales. B.M. 3269. Var. alba, Hort., is listed as a beautiful and easily grown alpine, late blooming. P. Lagausé, Willk. (Lychins Lagausé, Hook. f.). Low and tufted, glabrous and glaucous, 2–4 in. high: st. densely disjunctive, leafy below: lower lvs. linear and obtuse, middle ones ovate-lanceolate, subacute; fls. pale rose with white center, about 3⁄4 in. across, with 2 white acute scales at base, slightly notched at apex. B.M. 5746.—A charming plant. L. H. B.

**PETRÓPHYSES**: Monanthes, *P. muralis*, Webb=Monanthes muralis, Hook. f., which equals *M. atlantica*.

**PETRÓPTÝM** (*petros, rock, and phyton, plant; aluding to its habitat*). Rosette of small, grass-like, cespitose undershrubs with prostrate branches in W. N. Amer., allied to Spiresa, but differing in its follicles being dehiscent on both sutures and in its habitat: lvs. crowned, spatulate or oblancoate, entire: fls. in terminal racemes; sepals and petals 5; stamens 20; pistils 3–5, hairy, style slender, glabrous except at the base: follicles leathery, with few linear seeds. Only the following species has been intro. into cult. and is offered by several European nurseries. It is perfectly hardy and grows best in a rockery in a sunny and well-drained position between rocks; it demands limestone soil. Prop. is by division or by seeds treated like those of *spirea*, but the young seedlings are particularly impatient of too much moisture. *P. cespitosa*, Rydb. (Spiréa cespitosa, Nutt. Ericogine cespitosa, Wats. Lythke cespitosa, Kunzte). Densely cespitose, forming flat patches: lvs. oblancoate, obtuse or mucronate, 1-ribbed, densely silky, 1⁄2–1⁄4 in. long; fls. small, white, in dense spikes 1⁄2–1⁄4 in. long on upright stalks 1–4 in. long; petals spatulate, obtuse; stamens exerted. July, Aug. S. D. and Mont. to Calif. and New Mex. M.D.G. 1907:85.

ALFRED REHDER.

**PETROSELÍNUM** (Greek, rock parsley). **Umbellifera**. About a half-dozen European chiefly biennial herbs, one of which is cult. for its ornamental and edible foliage. Closely allied to *Carum and Anaphalis*, the former of which it is often united and from which it is chiefly distinguished by the greenish yellow fls. and broader incised fr.-segsms. Lvs. ternately pinnate-compound, the segments toothed and serrate; fls. in compound umbels with few parts to the involucre and several or many parts to the involucelles, the petals with incurved points: fr. ovate and compressed, glabrous. *P. hortense*, Hoffm. (P. sativum, Hoffm. *Curum Petroselínum*, Benth. & Hook. f.). PARSLEY (which see). Erect, 1–3 ft.: lvs. ternate-pinnate, the lfts. ovate and 3-echt (much in the "curled" garden varieties), the upper ones narrower and nearly entire: fls. yellowish. Old World.—Much cult., and sometimes runs wild about plantations.

L. H. B.

**PETTERÍA** (after Franz Potter, a Dalmatian botanist; died 1855). **Leguminosae**. One species, a shrub, very similar in habit to *Laburnum*, but with the yellow fls. in upright dense racemes, terminal on leafy branches. It is but rarely cult., since it is less showy in bloom than *Laburnum* or many species of *Cytisus*. It is hardy as far north as Mass., and requires the same cult. as *Laburnum*, which see. If grafted, laburnum with the form of which it is often united and from which it is chiefly distinguished by the greenish yellow fls. and broader incised fr.-segsms. *Lycium*, which see, is said to be used as a stock. This monotypic genus differs from *Laburnum* in its upright racemes, in the tubular calyx, the wings and keel at the base adnate to the stamens, and in the sessile ovary. It is said to possess the same poisonous properties as that genus.


ALFRED REHDER.

**PETUNIA** (Petun, South American aboriginal name, said to have been applied to tobacco). **Solándaceae**. Petunia. Small herbs, grown for their showy bloom as garden annuals. Annual or perennial, branching, viscid-pubescent, of weak or straggling growth: lvs. alternate, or opposite above, soft, entire: fls. white or purple, or in shades of red, on solitary, terminal or axillary pedicels; calyx deeply 5-pahted; fls. to 2 in. across, with 2 white acute scales at base, incurved points: fr. ovate and compressed, glabrous. It is not bloom freely in small plants; it probably has other drawbacks, for it has always been a rare plant in Eu., though enthusiastically Recommended. Offered in S. Calif. The fls. seem to vary considerably in color.

WILHELM MILLER.
L. H. B.†
PETUNIA

oblique and in some species obscurely 2-lipped; stamens 5, attached in the tube, one of them sometimes sterile; ovary small, 2-celled, the style slender, the stigma dilated and sometimes obscurely 2-lobed.—There are 12 or more species of Petunia, mostly natives of the southern part of S. Amer. One or two grow in Mex., and another (P. parviflora) is naturalized in the southern parts of the U. S., and is found frequently on ballast about seaports.

Garden petunias are small soft plants of straggling or decumbent habit, pubescent and usually more or less sticky, with large showy flowers. The colors are white to light purple, not blue, clear red, nor yellow. They are properly perennial, but are treated as annuals in cultivation. The common kinds are rather weedy in habit, but their great profusion of bloom under all conditions makes them useful and popular. They are particularly useful for massing against shrubbery, for they make a florid undergrowth with almost no care. Some of the modern improved named varieties are very choice plants. Petunias emit a powerful fragrance at nightfall, and sphinx-moths visit them.

Petunias thrive on both ordinary and rich soil, blooming well on land too rich for other plants, and some of the bedding and small kinds doing well even on poor soil with plenty of moisture. They are sun-loving plants, although they bloom well in partial shade. The culture is simple and easy. Seeds may be sown directly in the open, or the plants may be started in flats or pots indoors for early results. The plants are tender and therefore should not be trusted in the open until settled weather comes. The high-bred types require more care in the growing. They would best be started indoors, and be given the choicest positions in the open garden. Extra care should be given to the germination, for every seed that is lost may mean the loss of a form unlike any other; for these high-class petunias are not fixed into definite seed-varieties to any extent. Usually the weakest plants in the lot of seedlings will produce the choicest results among the high-bred single and double strains, the strongest seedlings tending to make weedy plants. Transplanting is recommended for the high-bred fringed and double strains, as well as for early bloom. The seeds are small and should be covered lightly in well-pulverized soil. On ordinary soil, petunias may be thinned or transplanted to 10 or 12"
PETUNIA

INCHES APART EACH WAY; BUT ON FERTILE SOIL, AND PARTICULARLY WITH THE LARGER-GROWING FORMS, THE DISTANCE MAY BE AS MUCH AS 15 TO 18 INCHES. YOUNG PETUNIA PLANTS ARE VERY SUSCEPTIBLE TO FROST. IT IS WELL TO HOLD OUT SOME OF THE LEAST DESIRABLE PLANTS AS THEY GROW AND BEGUN TO CROWD. THE STRONGER COMMON STRAINS OF PETUNIA ARE LIKELY TO SELF-SOW OR VOLUNTEER (COME UP THEMSELVES IN THE SPRING FROM SEED). FANCY KINDS ARE SOMETIMES PROPAGATED BY CUTTINGS OR SLIPS FROM PLANTS CARRIED OVER WINTER, AFTER THE MANNER OF GERANIUMS. THE BEST DOUBLE STRAINS PARTICULARLY ARE OFTEN PERPETUATED BY CUTTINGS. THERE ARE NO SPECIAL INSECTS OR DISEASES ATTACKING THE PETUNIA.

WINTER BLOOM IS EASY TO SECURE FROM PETUNIAS UNDER GLASS. BEST, OR AT LEAST QUICKTEST, RESULTS ARE SECURED FROM CUTTINGS; THESE MAY BE TAKEN FROM GOOD SHOOTS IN LATE SEPTEMBER OR EARLY OCTOBER FROM SELECTED OUTDOOR PLANTS, AND BLOOM SHOULD BE SECURED BY FEBRUARY 1. IF PLANTS ARE GROWN FROM SEEDS, THE SOWING SHOULD TAKE PLACE IN LATE SUMMER, FOR SEEDS GROW SLOWLY IN THE SHORT DAYS OF FALL AND WINTER; THE SEEDLEDS SHOULD BE HANDLED IN POTS. SOME OLD PLANTS THAT ARE NOT SPENT ARE LIFTED IN THE FALL AND CUT BACK, AND THE NEW GROWTH WILL GIVE GOOD WINTER BLOOM. PETUNIAS UNDER GLASS REQUIRE COOL TREATMENT, A NIGHT TEMPERATURE OF 45° TO 50° SUITING THEM WELL. A SOMEWHAT WARMER TREATMENT THAN THAT OF GARDENS MAY BE EXPECTED TO PRODUCE SATISFACTORY RESULTS.

violaecae, Lindl. VIOLET-FLOWERED PETUNIA. Slighter; its ovary stalked: its smaller, broad-tubed (the tube twice or less the length of the linear calyx-lobes), rose-red or violet, the limb relatively short. Argentina. B.M. 1626. B.M. 3113 (as Salpiglossis integrifolia).—This species, or its garden derivatives, are often run wild from gardens.

hybridis, Hort. Figs. 2880-2882. Common petunia, probably a hybrid derivative of the two preceding. For history, see Bailey. "Survival of the Unlikable." PM. 2: 173 (as P. nagatana violacea). B.M. 3556. — This type is remarkably variable, but it differs markedly from either parent; from P. axillaris in its broader tube and many colors; from P. violacea in its longer tube, wider limb, and many colors; from both in its much larger and multiform fls. and more stocky growth. In some of the strains, the fl is very broad and open, measuring 4 or 5 in. across. There are types with the fls. deeply fringed; others with star-like markings radiating from the throat and extending nearly or quite to the margin of the limb; others with full double fls. The colors range from white to deep red-purple, and variously striped and barred. There are forms of very dwarf and compact habit.

L. H. B.

PEUCEDANUM

PEUCÉDANUM (ancient Greek name). Umbelliferae. There are many views as to the limits of the genus Peucedanum, which is equivalent to saying that it has no natural limits. Bentham & Hooker made it a most complex group, comprising about one hundred Old World and New World species, and including such genera as Petroselinum, Anethum, Imperatoria, Polyserutis, Tomassina, Pastinaca, Tiedmannia, Lomatium. Coulter & Rose, American monographers ("Monograph of the North American Umbelliferae," United States Department of Agriculture, 1900), remove the American species and accept Rafinesque's genus Lomatium, where these species may be found (page 1903, Vol. IV). The paraspin has been included in this genus as P. sativum, Bentham & Hooker, but is here kept distinct under Pastinaca. Various species of Peucedanum may be transferred to grounds in Europe, or the countries where they grow, but they are not known as horticultural subjects.

PEUMUS (Chilean name). SYN., Bolda, Bolda, Rutea, Monimaceae. The Chilean bolda, a small tree of considerable economic interest. Evergreen tree or large shrub of 1 species, P. Boldus, Molina (P. frugans, Pers. Rutea frugans, Ruiz & Pav. Bolda frugans, Gay): dioecious; male fls, with 10-12 perianth-lobes, overlapping in 2-3 series, the outer ones herbaceous or membranous, the inner ones more petal-like; stamens numerous; female fls, smaller, the fls, more unequal, after anthesis circumscissile above the disk-bearing base and deciduous; drupes 2-3 or rarely solitary, stipitate on the receptacle; seeds pendent: the tree attains a height of 20 ft., with lvs. opposite, leathery, very rough and warty, ovate or ovate-elliptic, short-petioled, obtuse, Chile. B.R. 31: 57. The tree has exceedingly hard wood, which is used for making many kinds of implements; it also makes a charcoal said to be prized by smiths above all others. The bark is used in tanning and dyeing. The lvs. are used in medicine. The fls. are edible; they are small berries, sweet and aromatic. Finally it has some ornamental value, being evergreen and fragrant throughout. The fls., which are not very showy, are white, with 4 in. across, and borne in small panicles, each branch of which is parted into three. It has been advertised in S. Calif.
PFAFFIA (C. H. Pfaff, 1774–1852, German chemist). 
Amaranthaceae. Slender perennial herbs from Trop. and extra-Trop. S. Amer., tomentose or villous, rarely gla-
brate. Lvs. opposite, sessile or nearly so, entire; hairs or spines densely fidi.; bracts and bractlets transparent; 
fls. usually in solitary long-peduncled heads, bracteate and with 2 bractlets; perianth 5-parted; stamina tube 
long, 5-cleft to the middle, the anther-bearing teeth ciliate at the margin; stigma discoid or head-like, entire 
or 2-lobed.—Species about 20, one of which is known more or less in gardens, although it is not certain 
whether the plants that have been in the trade are properly named.

Microgenetes, Cosmanthus, and others. The flowers are 
American, mostly from W. N. Amer. The plants are 
commonly narrow, often enlarged upward, especially 
the form of 5 or 10 vertical folds or projections, adnate 
compound lvs. and infl. in more or less scorpioid cymes 
or spikes: corolla deciduous as the caps. enlarges, in 
various shades of blue, purple, or white; tube with or 
to or free from the bases of the filaments; calyx-lobes 
nearly 1 in. long, little more than half as much wide: 
crowded flower-clusters of the first described species).

R.

R. Cyclo. Amer. Hort.

fis. regular, rose-colored, small: ovary and fro spiny; 
mostly 4-angled: areoles bearing small acicular spines: 
plants, at first erect but branches usually hanging, 
outdoor perennial. WILHELM MILLER.

PFEIFFERA (named for Ludwig Pfeiffer, a dis-
tinguished student of cactus). Cadexa. 
Epiphytic plants, at first erect but branches usually hanging, 
mostly 4-angled: areoles bearing small acicular spines; 
fls. regular, rose-colored, small: ovary and fr. spiny; 
seeds black. This genus was included in Rhipsalis in 
Cyclo. Amer. Hort.

Ianthothéle, Web. (Rhípsalis ianthothéle, Web. 
Sts. pendent, 1–2 ft. long, branching, less than 1 in. 
diam., 4–rarely 3-angled: ribs tuberculate: areoles at 
summit of tubercles short-woolly, soon naked, bearing 
6–7 short bristles: fls. with very short tube, but the fl. 
bell-shaped, purple-red without, pure white within, 
nearly 1 in. long, little more than half as much wide: 
fr. the size of a cherry, rose-red, with bristles like those 
of the st. Argentina. J. N. ROSE.

PHACÉLIA (Greek, cluster; on account of the 
crowded flower-clusters of the first described species). 
Hydrophyllaceae. Annual and sometimes perennial 
herbs, grown for the blue, purple, or white flowers.

Low or not tall plants, with alternate simple or 
compound lvs. and infl. in more or less scoriophiy cymes 
or spikes; corolla deciduous as the caps. enlarges, in 
various shades of blue, purple, or white; tube with or 
without interval appendages, these when present in 
the form of 5 or 10 vertical folds or projections, adnate 
to or free from the bases of the filaments; calyx-lobes 
commonly narrow, often enlarged upward, especially 
in fr.; style more or less 2-lobed; seed-coats reticulated 
or pitted.—Species 114, as defined by Brand in fyt. 59 
(IV. 251) of Engler’s “Das Pflanzenfamilien” (1913). 
American, mostly from W. N. Amer. The plants are 
airy, nearly smooth, or glandular in whole or in part. 
The herbage of some of the glandular-hairy species has 
an offensive odor.

The genus includes the old genera Whitlavia, Eutoca, 
Microgenetes, Cosmanthus, and others. The flowers are 
mainly of a handsome blue or violet, many species and 
varieties running through lighter shades to pure white; 
but not to yellow. The annuals are of easy cultivation, 
requiring, to bring them to perfection, a soil warm, 
sunny, and not too moist. Some species like, a sandy 
soil, others a firmer clay. Some are erect and give 
the best effects when plant, namely those planted in 
hill or otherwise, are much spreading and therefore require considerable space. In 
height they vary from only a few inches to 2 to 3 ft. 
The flowers are borne on more or less recurved racemes 
that straighten as the flowering proceeds. They vary 
from 1 inch long in some species to less than ¼ inch in 
others. In addition to those described below there are 
many other beautiful species of phacelia that should 
be in the trade. The species best known in cultivation is P. Whitlavia, a garden annual known as whitlavia.

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2883. Phacelia vicida. (x 1/2)

R. Whitlavia grandiflora, Harv.

Whitlavia. CALIFORNIA BLUEBELLS. Fig. 2884. An attractive and variable easily grown annual, about 
1–1½ ft. high, loosely branching, hirsute and glandular: lvs. ovate or oblong; corolla with yellow-

Appendages 5, small and truncate or emarginate and 
attached to the base of each filament.

4. Whitlavia, Gray (Whitlavia grandiflora, Harv.).
the length of the lobes; appendages to the filaments hairy. S. Calif. B.M. 4813. F.S. 11:1085. G.C. 1854: 679.—A beautiful species and much cult., with fls. an inch long and nearly as wide; sometimes escaped in Eu. Var. gloxinoidea, Voss (Whitlavia gloxinoidea, Hort.), has handsome white fls. with blue center. Var. alba, Hort. (Whitlavia alba, Hort.), is white-flowered.


6. campanulata, Gray. Annual, lower than the last: lvs. subcordate or cordate, less deeply dentate: tube of the truly campanulate corolla ½ in. long, expanded at throat, barely twice the length of the lobes; appendages to the filaments glabrous and smaller, otherwise much like No. 4 and almost as showy. S. Calif. B.M. 6735. G.C. II. 20:135; III. 55:173. F. 1883:145. Gn. 31, p. 554; 55:36.—P. campanulata, Hort., is presumably this plant.

7. linearis, Holz. (Hydrophyllum lineare, Pursh. Eutoca Menziesii, R. Br. P. Menziesii, Torr. Eutoca multiflora, Douglas.). Annual and perhaps perennial, 9-12 in. high, at length paniculate-branched, hispid or roughish hirsute, usually also minutely cuneous-pubescent: lvs. mostly sessile, linear or lanceolate, entire or a few of them deeply cleft, with few or single linear or lanceolate entire lobes: spikes or spike-like racemes thyrsid-paniculate, at length elongated and erect; corolla bright violet or sometimes white; ovules 12-16: caps. shorter than the calyx; seeds oblong, coarsely favoselreticulated. Calif. to Wash., and east to Mont. and Utah. B.R. 1180. B.M. 3762.—A beautiful species, and easily cult.

8. divaricata, Gray (Eutoca divaricata, Benth. E. mexicana, Hort.). Diffusely spreading annual, a span high, more or less hirsute and pubescent: lvs. ovate or oblong, mostly longer than the petiole, sometimes 1-2-toothed or lobed at base, the rims curving upward: spikes or racemes at length loose; the pedicels usually much shorter than the calyx; style 2-cleft at apex: ovules 12-20 on each placenta. Calif. B.M. 3706. B.R. 1784. Var. Wrangeliana, A. DC. Fig. 2885. Differs from the type in having the lvs. inclined to be lobed or 1-2-toothed. It is known to the trade as Eutoca Wrangeliana, Fisch. & Mey. P.M. 5:199.

9. humilis, Torr. & Gray. Annual, unbranched or branched from the base, 2-6 in. high, pubescent or infl. often hirsute: lvs. spatulate, oblong or oblancoate, generally obtuse, the lower rarely with 1-2 ascending lobes; spikes loosely paniculate or solitary; corolla indigo-blue, rather deeply lobed, surpassing the usually linear calyx-lobes; filaments moderately exerted, glabrous or sparingly bearded above. Calif. to Wash. —A pretty little plant.

10. bipinnatifida, Michx. Biennial, erect, branched, 1-2 ft., viscid above: lvs. with slender petioles, to 5 in. long, pinnatifid, with 3-7 ovate or oblong dentate or pinnatifid segms.: fls. violet or blue, ½ in. or more broad, in loose racemes which are little scirpioid; calyx-lobes linear; corolla rotate-campanulate with conspicuous ciliate appendages in pairs between the stamens. N. C. to Mo and south.

11. glandulosa, Nutt. (Eutoca glandulosa, Hook.). Viscid-pubescent and glandular annual, softly if at all hirsute, 9-12 in. or more high: lvs. irregularly and interruptedly 2-pinnatifid, or below divided; the numerous lobes oblong, small, somewhat incised, obtuse; calyx-lobes oblong or spatulate; corolla about 2 lines long, bluish, purplish or white, with lobes shorter than the tube; stamens 2-cleft style moderately or conspicuously exerted; seeds with the minute reticulations even. Texas to Ariz. and north to Mont.
12. **congesta**, Hook. (P. conferta, Don). Pubescent and commonly cincinnus erect annual, hardly viscid or glandular in the least, a foot or more high: lvs. pinnately 3-7-divided or -parted, and with a few interposed small lobes, the main divisions oblong or oval, incised pinacitied or irregularly lobed, the lower ones mostly petiolute and the upper confluent: calyx-lobes linear or somewhat spatulate; corolla blue, 3 lines long, the lobes as long as the tube; stamens more or less exerted; seeds reticulate, scarious, the fine sharp meshes being, as in the previous, Texas, New Mex. B.M. 3452. V. 5:154; 12:140.

13. **tanselioijs**, Benth. (P. tripinata, Hort.). Erect annual, often cult., roughish, hisurate or hispid, not glandular, or above slightly so, 1-3 ft. high: lvs. pinnately 9-17-divided into linear or oblong-linear once or twice pinnately parted or cleft divisions, all sessile or nearly so, the lobes mostly linear-oblong: spikes cymosely clustered, at length elongated: very short fruiting pedicels ascending or erect: calyx-lobes linear or linear-spatulate, not twice the length of the ellipsoidal caps.; stamens and perianth style conspicuously exerted: seeds with very narrow pits bounded by thick walls. Calif. B.M. 3703. B.R. 1696.—Said to be sometimes cult. as a bee-plant. According to Jepson, "Cows fed on it show a marked increase in yield of milk but will not eat it alone at first." Variable. Var. **Alba**, Hort., has been offered.

L. P. HENDERSON.

L. H. B.

**PLEDANINÁSSA** (Greek, gay queen, suggested by the beauty of the flowers). **Amaryllidaceae**. Tender mostly summer-blooming bulbs, with flowers that are tubular in appearance, borne in umbels, generally drooping and usually bright red or pink or purple.

Bulb tu-nicant; fls. on a peduncle or scape 10 in. to 2 or 3 ft. long; perianth subcylindrical; segms. 6, equal, regular, spreading only at the tip; stamens inserted at or below the throat of the tube; ovary 3-celled: ovules many, supposcd: caps. globose, loculicidally 3-valved; seeds many, small, black: lvs. petioted, oblong or lanceolate, produced after the fls. according to Baker, but this point is doubtful for all species.—Species 4 or 5, in the Andes at 7,000-12,000 ft., except **P. chloracra**, as it were, toothed at the junctions. Texas, New Mex. B.M. 8356, where it is said the plant requires complete rest after the lvs. die down. "The tall fl.-stalk precedes the lvs., which, however, develop while the plant is in flower."

WILHELM MILLER.

L. H. B.†

**PLEDÁRHÁTHUS** (Greek for, splendid or gay, and flower, alluding to the brilliantly colored flowers). **Bignoniaceae**. Ornamental vine grown for its very showy flowers and also for its handsome foliage.

Evergreen climbing shrub: lvs. opposite, with 1 pair of entire lfts., the terminal lft. usually replaced by a 3-parted or repeatedly 3-parted tendril: fls. 'in terminal racemes; calyx campanulate, 5-10-nerved, leathery, tomentose, with 5 unequal short teeth; corolla tubular-funnelform, curved; stamens slightly exerted; disk annular, raised; ovary ovoid, tomentose, with many ovules in several rows.—One species in Mex. Formerly usually referred to **Bignonia**, from which it differs chiefly in the slender Biflorum tendrils, the leathery tomentose calyx, the exerted stamens and tomentose ovary.—A very handsome strong-growing vine for subtropical regions or in the N. for the cool greenhouse; one of the most showy bignoniads on account of its large brilliantly colored fls. For cult. and prop., see **Bignonia**.


ALFRED REHDER.

**PHÄNÓCOMA** (shining hair, Greek, alluding to the involucres). **Compositae**. A South African little shrub, sometimes grown under glass for the showy flower-heads.

Of the Gnaphalium-Helipterum-Helichrysum relation, one species: heads heterogamous, very many-flld., showy because of the brilliant and elongated inner scales of the involucres; florets all tubular and 5-toothed, the marginal female and in a single row, the others male with abortive stigma; receptacle naked; pappus of many rough bristles in a single row, equalling the corolla, somewhat unlike as between the female and male fls. The stiff parts of the involucres make it useful as an everlasting, for which use it is a very showy subject.

These are handsome and distinct evergreen plants. They need a cool airy and shaded house during the summer. They should have plenty of ventilation in the spring and well into the autumn; this will tend greatly to solidify the growth, this causing the greater production of flowers. It is better to place the pots on screened coal-ashes, as this helps to keep the roots cool and moist. They are better if kept by themselves, as they should not be syringed. Watering should be a great importance at all seasons. They need some staking and tying so as to keep them in shape. When the weather is cool enough, they should have a temperature
of 45° to 50° at night, with about 10° rise with sunshine. In midwinter the temperature may drop to 40° at night. Any repotting may be done after they are through flowering. Compost used for potting these plants should be lean and fibrous peat in equal parts, left lumpy, and about one-third of silver sand added to the mixture. Give the pots thorough drainage.—They may be increased from cuttings made of the points of some of the moderately strong growths, leaving them about 6 in. long. Place them in a mixture of 5 parts of peat and 1 part of sand. Give them a temperature of about 55°, keeping them moderately close, shaded, and moist. When they show signs of root-formation they may be given light. When rooted, pot off into small pots using the compost mentioned above, and by shifting and the same culture they grow into good plants in two years. When they get into 8- or 10-inch pots, with plenty of roots, they may have liquid feeding which will help to retain their vigor. These plants are not much seen in this country, but should be more grown. (J. J. M. Farrell.)

prolifera, Don (Xeranthemum proliferaum, Linn. Hidchrisium proliferaum, Willld.). An old cult. plant, now little grown; st. woody, 1–2 ft. high, much branched, short side-branchnets tomentose and with minute closely imbricated scale-like lvs., on the main st. lvs. acuminate, rigid, and decumbent: heads terminal, solitary, 1–1 ½ in. across; involucres with many rows of woolly-based scales, the inner ones being rosy purple as if rays and laneculate-acute. Mountains in the Cape region. B.M. 2385. B.R. 21. Var. Börnert, Hort., has heads of deep crimson.

L. H. B.

PHLEOMÉRIA (Greek, dark and part). Zingiberáceae. Perennial herbs from a thick rhizome, grown in the hothouse for their foliage and fls. Flowering sts. separate from the leafy ones; the latter not rarely tall, sometimes gigantic and forming very dense seed-like thistles; the former everywhere smaller although sometimes about 3 ft.; lvs. distichous, often numerous, rather large, provided in a commonly leafy ligule; fls. sessile, in spikes or heads, often large or very large, either broad-pyramidal or subglobosely concave at the top, crowned commonly by a rather large involucrum composed of colored bracts, the flowering bracts smaller and less intensely colored; calyx tubular or subulate, often deeply split on one side, or very short-acute or not at all lobulate at the top; corolla-tube narrowly cylindrical, dilated toward the top; the lobes narrow, subapatulate, subequal: caps. or rather berries massed together somewhat resembling a pincushion. About 16 species. A. J. H. to New Guinea.

PHAIUS (Greek, dark; referring to the color of the flowers). Ochridáceae. Very large orchids with ample foliage and tall clustered stems terminating in racemes of showy flowers. Sepals and petals similar, spreading or half-splaying; labellum large, with the lateral lobes enclosing the column, usually fimbriate or spurred behind; column slender; pollinia 8. Distinguished from Calanthe by the free labellum; from Thunia by the leafless bracted scapes which does not terminate the leafy axis.—About 20 species, natives of Trop. Asia, Afr., Austral., China, Japan, and the South Sea Is.

The genus Phaius includes both epiphytic and terrestrial representatives. The noteworthy epiphytic types are native of Madagascar, including P. tuberculatus, P. simulans, and P. Humboldtii. However they are not frequently represented in orchid collections. They enjoy a warm moist atmosphere as for vanda. The potting medium should include chopped peat and moss in equal proportion. When potting, small rafts of the potting medium packed around or sections of fern stems, the latter being preferable, should be placed in the center of the pot or basket. The terrestrial species, especially P. grandifolius, are well known, being one of the first orchids put under cultivation. It dates far back as 1778, when it was imported from China. Various species are native to low-lying swampy places of tropical Asia and Australia, and have also become naturalized in the West Indies. They are of easy culture and will grow in an ordinary greenhouse associated with palms. They delight in moisture throughout the year, in a growing medium of sandy fibrous sod-soil, with plenty of organic fertilizer in a dried state mixed with the soil and also in liquid form when in full growth. The main factor to bear in mind is perfect drainage. Plants are increased readily by the division of the dormant pseudobulbs. Upward of thirty garden hybrids are under cultivation at the present time, including some interesting bigeneric forms. (G. H. Fring.)

a. Fls. yellow to brown.

maculatus, Lindl. Pseudobulbs ovate, 2–5 in. high; lvs. 3–4, broadly lanceolate, pilate, 1 ½–2 ft. long, variegated with numerous yellowish spots; fls. about 2 ft. high, bearing a raceme of 10–15 yellow fls. each 2–3 in. diam.; sepals and petals half spreading, oblong, obtuse; labellum erect, with the apex recurved; streaked with orange, wavy and crenate, sides convolute over the column, and the base prolonged into a spur half as long as the ovary. Spring. N. India and Japan. B.M. 2719 (as Blatta Woodfordii); 3060. L.B.C. 19:1803—A good spring bloomer.
Wållichii, Lindl. (P. bicolor, Lindl. P. grandiflorus, Lindl., not Lour. P. grandiflorus, Reichb. f.). Fig. 2886. Tall: lvs. broadly elliptic-lanceolate, 3-4 ft. long; fls. erect, 3-5 ft. high, clothed with scales: fls. 4 in. across, varying in color from chocolate-brown to primrose-yellow; sepals and petals spreading, lanceolate, long-acuminate; labellum with an ample elongate tube; limb oblong, acute or acuminate, recurved, margin crisp; spur slender, incurved. The labellum is less variable in color than the sepals and petals. The base of the tube is yellow, dull reddish beyond, with the throat purple with yellow or red edges on the disk; apex white. Feb.-May. Trop. India, northward to the Himalaya. Malayas. B. M. 1891:204.


P. grandiflorus, Blume. Fls. white, with some veining on the lip. Malaya.—P. Ashworthianus, Sander. A garden hybrid (P. Mannii X P. maculatus). Fls. large; sepals and petals clear old gold; labellum large, of the same color, with many radiating chocolate lines, outer surface clear yellow. G. M. 40:551.—P. ciliatus, Lindl. (Geodium plumatum, Voigt). Resembling P. grandiflorus in habit; sepals and petals dull reddish brown; lip white with tinge of pink, dark purple spot beneath, with yellow on the 2-lipped spur. Malaya.—P. Chang-mensi= P. Humblotii X P. bicolor. G. M. 46:593.—P. Cooksonia (P. grandiflorus X P. Humblotii). Sepals and petals nanean-green, the labellum with lip white at the base with purple-brown markings, the front lobe rose. J. H. III. 46:593.—P. Cooksoni= P. maculata; P. Wallichii; P. Cooksoni; P. Rolfe. Sepals and petals bright red-brown in front, pale yellow behind, about 2 in. long; lip funnel-shaped, white at first, soon changing to yellow.—P. fragrans, Hort. Belonging to same group as P. tuberculatus, but fls. smaller and more numerous, in color resembling P. Humblotii.—P. Martix (P. Blumei).—P. similans, Hort. Fls. narrow-yellow, the base of the lip with rose markings and veined light yellow, the front lobe tinged pink. G. T. 53:1530. R. B. 29:27.—P. Vermaes (P. Sanderianus X P. tuberculatus). Sepals and petals cream to pink, luteus, the lip with a reddish purple base, veined yellow and with 3 yellow keels, the midlobe rose, blotched purple and tipped white.—P. cooksonoides = P. Cooksoni X P. Humblotii. G. C. III. 28:559.—P. Opolei (P. Wallichii X P. Hum­ blotii).—P. Sanderianus, Hort. Fls. 6 in. wide or more, the fls. have smaller sepals and petals copper-red, the lip with a yellow base, crimson center, and white midlobe.—P. ochraceum= P. grandiflorus X P. asamia.—P. similans, Rolfe. "The epiphytal species known in gardens under the name of P. tuberculatus is not the original plant, and has been renamed P. similans in allusion to the remarkable resemblance which its fls. bear to those of the original species."—

GEORGE V. NASH.

PHALÉNOPHÉSIS (Greek, moth-like; suggested by the large white flowers of some species). Orchidaceae. This genus, called by Lindley "the grandest of all orchids," contains some of the most useful species to be found in the orchid family; warmhouse.

Of monopodial growth, having short stts. which increase slowly in length: lvs. few, thick, leathery, often mottled: infl. a raceme or panicle, large, or not longer than the lvs.; sepals spreading, the lateral ones more or less united with the base of the column; petals about as large as the sepals or very much broader; labellum variably shaped but united with the base of the column. About 50 species natives of the hot regions of India and the Malay Archipelago, growing on trunks of trees and sides of rocks under conditions of high temperature and great moisture. The fls. are remarkably beautiful in form and color. Those of the larger species are borne in graceful drooping panicles on which they usually all face in one direction.

As all phalanoporphis are natives of the most tropical regions of the globe, it is essential that they be well supplied with heat and moisture, particularly during the growing season, from March to October. Care should be taken to avoid direct draught on the plants, but air should be admitted on all possible occasions. This is absolutely necessary to keep the plants in perfect condition. During bright sunshine the plants should be shaded, but given all the light possible to insure good tough rige foliage by autumn, and large branching flower-spike are may be expected in the flowering season. A close moist atmosphere will grow large soft foliage by autumn, and large branch-
blocks or rafts. They are somewhat whimsical, and once a house is found in which they succeed, they should not be moved. During the growing season the temperature should be kept as uniformly as possible between 70° and 75° F., allowing a rise of 10° with sun heat. The minimum night temperature, in winter, should be 60° to 65° F. Good and ample drainage is absolutely necessary, clean potsherds and lumps of charcoal being the best material, and only sufficient peat fiber and sphagnum in equal proportions should be used to keep the plant firmly in position, as the roots will eventually cover the receptacle in which they are growing. When potting, always give the plant its natural inclination, which is invariably sufficient to prevent water remaining in the axils of the leaves, a condition which should be carefully guarded against, either from watering or from drip. Always keep the plant well raised, when potting, to insure quick and perfect drainage. Sponging the leaves occasionally will keep the plants clean and prevent the attack of thrip and red-spider. The propagation of phalaenopsis is a very slow process, as sometimes young plants form on the old flower-stems, and these should be left until they make root, at which stage they may be removed, potted, and carefully watered until root-action begins in the new material.

(Alfred J. Loveless.)

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**A.** Petals much broader than the sepals.

**b.** Labellum with apical appendages; rostellum short.

**c.** Apical appendages cirrhous.

**d.** Middle lobe of the labellum heart-shaped; petals much broader than the sepals. 1. amabilis

**DD.** Middle lobe of the labellum trowel-shaped. 2. Aphrodite

**DD.** Middle lobe of the labellum round. 3. intermedius

**DD.** Labellum not crested, but provided with a fleshy callus. 4. Parishii

1. **amabilis**, Blume, not Lindl. (P. grandiflora, Lindl.) Fig. 2887. Lvs. long, pale green: fls. variable in size, sometimes about 5 in. across, pure white with stains of deep yellow and a few purple spots on the labellum and on the column; dorsal sepals ovate to oblong, lateral sepals lanceolate; petals rounded-fan-shaped; lateral lobes of the labellum obliquely cuneate, incurved, middle lobe very narrow with yellow cirrhi. Autumn. Malay Archipelago. B.M. 4297. G.C. III. 2:9. Gn. 38:156. J.H. 12:237. P. Harrietsee, Rolfe, is a garden hybrid between P. amabilis and P. violacea. Fig. 2889B. Fls. intermediate between the parents, 3½ in. across; sepals and petals pale yellowish white, suffused and dotted with amethyst-purple toward the base; labellum crimson with an orange crest; cirrhi slightly developed. G.C. 111. 2:9. Gn. 38:156. J.H. 14:237.


12. sumatrana, Korth. & Reichb. f. Lvs. pointed, about 6 in. long; infl. about as long as the lvs., 6-10-fl.; sepals oblong, pointed, 1 in. or more in length; petals more cuneate; all yellowish white barred, with bands of reddish brown; labellum short, clawed; lateral lobes erect, meeting and each having a short curved tooth pointing backward; middle lobe oblong, fleshy, white, streaked with violet, very hairy in front. Sumatra and Borneo. B.M.5527. F.S.16:1644. G.C.1865:507.

13. Lueddemanniiina, Reichb. f. A small plant, with thick, oblong fleshy lvs. 6-8 in. long; infl. about as long as the lvs., with few handsome fls. near the top; fls. 2-3 in. across; sepals and petals oblong-acute, white, marked with transverse bars, those at the base being amethyst, while the upper ones are brown; labellum deep violet, with yellow blotches on the side lobes; middle lobe oblong; side lobes erect, ligulate, deeply 2-toothed. Feb., March. Philippines. B.M.5523. F.S. 16:1636. R.H.1872:390. F. 1865:257 ... G.C. III. 39:259. R.B.26:169.-The old fl.-sts. of this plant produce young plants by which the species may be easily increased. Var. ochracea, Reichb. f. A form with yellowish lvs. and ochre-colored bars. R.H. 1872:390.

14. Párishi, Reichb. f. Dwarf! lvs. oblong-lanceolate, acute, 2-4 in. long; fls. in 6-10-fl. raceme scarcely longer than the lvs., crowded; dorsal sepals oblong, lateral broadly ovate, white; petals obovate-spatulate, white; lateral lobes of the labellum small, horn-like, yellow, with purple spots, middle lobe broadly triangular, red-purple, often white on the disk; crest semi-lunar, broken up into subulate filaments in front; the disk has a peculiar appendage ending in 4 long subulate filaments. Burmas and Mouleines. B.M. 8815.


P. Réelli. Natural hybrid resembling P. annulalis, which is one of its parents.—P. guajii, f. J. Smith. Habit like that of P. annulalis, but lvs. larger and thicker: fls. in a raceme, white, with numerous crown spots. Borneo. G.C. III. 45:305.—P. Kühleri, Hook. f. Lvs. up to 3 in. long and 1 in. broad, bright green; raceme loosely 2-6-fl., pendulous; fls. about 2 in. across; sepals and petals similar, spreading, linear to oblong-obovate, yellow, the upper surface marked with brown; lip small, white, streaked with red. Forsk. B.M. 7885.—P. Lateri, of doubtful authenticity.—P. Mounier, Reichb. f. Fls. about 3 in. across; sepals and petals yellow, blotched and barred with brown, linear-oblong, acute; lip light yellow, the front lobe anchor-shaped, sessate at base; near the side lobes is a 2-horned, slender upright plate and a purplish tooth. Assam. J.H. III. 47:97.—P. Schilleriana-Stuartiana, see P. Wigram.—P. Valentinii, Reichb. f. Plant with habit of P. violaceum: sepals purple, cuneate-oblong, the lateral ones white at base; petals like lateral sepals or purple-barred; lip short, clawed, mauve, white and yellow. Malayas.—P. Wigram=P. Schilleriana x P. Stuartiana. G.C. III. 27:83. G.M. 43:63.

HEINRICH HASSELBRING.

GEORGE V. NASH.
2574: PHALARIS

Var. 'picta, Linn. (var. variegata, Hort.). RIBBON-GRASS. GARDENER'S GARTERS. Fig. 2800. Lvs. longitudinally striped with white. Commonly cult. for ornament and sometimes run wild about old places.

The name "P. commutata, or TOOWOOMBA CANARY-GRASS," has appeared in recent agricultural literature, as an intro. from Austral. The grass has been identified as P. bulbosa, Linn. (See Kew Bull., Misc. Not. 1909:289).

A. S. HITCHCOCK.

PHALOCALLIS (Greek words referring to the delicacy of the cone formed by the crests). Iridce.< E. Referred by Baker and others to Cypella. The plant offered as P. plumbea, Herb., by Dutch bulb-growers is Cypella plumbea, Lindl., a South Brazilian species described in Volume II, page 940. B.M. 3710 (flowers chiefly lilac); 14:1466 (flora striato, veined and flushed with rich purple shades on a white ground).

PHASÉOLUS (ancient Latin name, somewhat altered, of a bean). Leguminos<E. The common garden and field beans, and also some species grown for ornament.

Annual or perennial mostly twining herbs, or some of them woody at the base: lvs. mostly pinnately 3-foliolate, stipellate: peduncles axillary, bearing clusters of white, yellow, red, or purplish papilionaceous fls. and more or less compressed (flat-sided) several- to many-seeded 2-valved pods. From its allied genera, Phaseolus is separated by minute characters of calyx, style, and keel. In Phaseolus, the style is bearded along the inner side and the stigma is oblique or lateral, rather than capitate on the end of the style; the keel is coiled into a spiral body, including the 10 diadelphous (9 and 1) stamens.—Many species have been described, mostly of warm countries (P. polystachyus is native in U. S., but not cult.), but probably not more than 150 that can be clearly separated as species.

The cultivated species of Phaseolus are all tropical or subtropical in nativity. Therefore they must not be subjected to frosts. Most of them are garden annuals which are planted after the danger of freezing weather has passed and the ground is well warmed. For the culture of the domesticated forms of Phaseolus, see the article on Bean. See, also Canavalia, Glycine, Mucuna, Soybean, Stizolobium, Vicia, and Vigna.

Eleven species of Phaseolus are now known to be cultivated to a greater or less extent in various parts of the world. Further explorations in Mexico, Central and South America and in eastern Asia will very probably show that a number of other distinct species not here enumerated have been domesticated locally.

The eleven species here treated fall into two groups, the one perennial, the other annual, at least in the United States.

PHASEOLUS

INDEX.

2891. Phaseolus acutifolius var. latifolius.

2892. Phaseolus multiflorus. (X1/2)

I. Perennial Beans.

This group includes three species, none of which is now commonly seen in cultivation.

a. Fls. tall-twinning, with large, fragrant, showy fls.: root not tuberous.

b. Fls. light purple to yellowish, in axillary racemes.

1. Caracalla, Linn. Caracol. Snail-Flower. Corkscrew-Flower. Ifs. broadly rhombic-ovate, pointed or acuminate: fls. large and fleshy, very fragrant, the large keel coiled like a snail-shell. Tropics, probably of the Old World. B.R. 341. V. 2, p. 370.—Naturalized in parts of Calif., where it grows 20 or more ft. high, sometimes becoming a nuisance. It is an old-fashioned glasshouse plant in cold climates, but is now rarely seen. P. Bertonii, Hort., recently intro. from Paraguay, although a close relative, is probably specifically distinct from P. Caracalla.

bb. Fls. red or light blue, in axillary dense capitulate clusters.

2. adenanthus, Mey. (P. ambus, Soland. P. truxillens, HBK. P. cirihius, HBK.). Foliage much
like that of the last, the lfts. ovate and somewhat acute: lfts. very showy, red (or light blue?), fragrant: pod 4–6 in. long, usually curved. Tropics.

AA. Plant low, spreading or trailing, annual above the ground: root tuberous: lfts. small, in loose axillary, interrupted racemes.

3. retusus, Benth. METCALF BEAN. Root very large and fleshy, running deep into the ground: st. roughish: lfts. rhombic to oblong, mostly obtuse and often retuse, rough on both sides, with prominent veins, especially beneath: lfts. reddish purple: pod flat, short, broadly oblong, somewhat curved. Texas, west and south.—Lately recommended as a forage plant in the dry regions of the S. W. Not promising in Ariz. at elevations less than 4,000 ft. The lvs. are thick and heavy and adapted to dry, hot climates. Sts. grow 8–10 ft. or more long on the mountains where it is a favorite food for deer.

II. ANNUAL GARDEN BEANS.

The species of this group are all annuals with the exception that P. multiflorus and P. lunatus are perennial in tropical countries. The somewhat thickened roots of the former sometimes live over in the South, but both species are strictly annual in the northern and middle states.

a. Fls. yellow.

b. Lfts. distinctly lobed.

c. The lfts. 3–5-cut for one-fourth to one-half their length.

4. aconitifolius, Jacq. MOTHA BEAN. A diffuse trailing plant, 1–2 ft. long with slender sts. loosely covered with rather stiff, brown hairs: lfts. 3–5-lobed at the apex for one-fourth to one-half their length, the lobes narrow; stipules small, narrow, and pointed: lfts. very small, yellowish, in heads on the ends of hairy axillary peduncles: pod becoming 2 in. long, nearly cylindrical, glabrous; seeds clay-colored, cylindrical, distinctly elongated, average weight about .03 gram.; hilum less than 1 in. (2 mm.) long. India, where it is cult. for human food and Japan, where it is eaten boiled with soups or mixed with rice.

bb. Lfts. entire.

c. One wing rolled completely over keel: bases of primary lvs. cordate, their petioles 3 in. long or longer.

6. calcarius, Roxbg. RICE BEAN. Annual, erect, 1–2 ft. high, in habit much resembling the preceding species: lfts. broadly ovate: lfts. yellow, in 2’s or 3’s in short axillary peduncles: seed varying in color from reddish brown to pale opaque, small, average weight about .05 gram, strongly elongated, ratio length to thickness (hilum to back) 1.75:1 to 2:1, hilum 3 in. (2 mm.) long or longer; primary lvs. narrowly lanceolate. Asia.—Cult. sparingly in China and India, where it is used boiled in soups and with rice.

cc One wing pressed against but not rolled completely over the keel: bases of primary lvs. rounded or tapering, their petioles less than 3 in. (7 mm.) long.

7. aureus, Roxbg. MUNG BEAN. Erect or slightly twining (some varieties strongly twining on rich ground), 1–3 ft. high, with furred sts. clothed with long brown hairs: lfts. broadly ovate or nearly rhomboid, orbicular, usually entire, thin, short-acute; stipules large, ovate: lfts. rather small, yellowish, in clusters of 5–6 on the end of stout hairy peduncles; keel spurred: pod 3 in. or less long, nearly cylindrical, somewhat curved, bearing 10–15 beans; seeds green or golden, small, nearly round; average weight about .05 gram; hilum less than 1 in. (2 mm.) long. Asia.—Cult. in China; where it is used for bean sprouts, vermicelli and gelatine, and extensively in India, also in Persia, Philippines, Japan. The slender pod is hairy at first, but the hairs are deciduous. P. Mungo, Linn. (THE URD), a related species, is distinguished by more procumbent habit, long hairy pods, and oblong blackish seeds.
2897. Long-podded forms of Phaseolus vulgaris.

dry land, under more favorable growth-conditions. 

2892. Leaves of Phaseolus lunatus. Two upper ones, Willow Leaf, a very narrow-leaved form of the Sierra type; middle one, Potato Lima; lowest one, Large White Lima, the two latter being var. macrocarpus.

2899. Pods of Sieva, Large Lima, Potato Lima. The last two are forms of P. lunatus var. macrocarpus. (×3/4)

twining and slender, minutely pubescent: lvs. large; lfts. thin, terminal lfts. often 3 in. or more wide, rhombic-ovate and acute, scabrous-pubescent: fls. rather large and showy, on long naked racemes, in the Scarlet Runner type red, in the Dutch Case-Knife white, the keel not distinctly projecting; pods long (3-8 in.), with curved slender tip; seeds large (½ in. long or longer), much flattened or nearly cylindrical, less than twice as long as broad, not usually reniform, no conspicuous lines radiating from the hilum, color red or mahogany, and black in the Scarlet Runner, white in many other forms: primary lvs. ovate or cordate, the base deeply auriculate, petioles 1 in. or more long. S. Amer. or Mex., but now widely spread.—The Scarlet Runner form is popular as an ornamental vine for arbors and to cover windows, sometimes being known as Flowering Bean or Painted Lady. The Dutch Case-Knife is a vegetable-garden plant, grown for its beans. Various forms of the plant are grown for food by the Mexicans and these sometimes appear in our western country. Here belong the Aztec or prehistoric beans, now grown sparingly in N. Ariz., which are said to have originated from seed found in caches among the prehistoric cliff-dwellings. Melde's Perennial and Irvine's Hybrid beans are apparently white-flowered forms. The color of fl. and seed seems always to be associated in this species. A dwarf or bush form, probably of P. multiflorus, was intro. a few years ago as Bartels's Dwarf Lima (see Bull. No. 87, Cornell Exp. Sta.). It is not unlikely that more than one species is passing as P. multiflorus, some of the Mexican forms being imperfectly understood.

cc. Cotyledons raised above the ground in the seedling stage.

b. Fl.-bracts large, conspicuous, oval.

d. Petioles of primary lvs. less than ½ in. (7 mm.) long; glabrous to puberulent: lvs. smooth above with slightly prominent veins beneath; glabrous throughout or slightly puberulent below: lfts. entire, ovate to broadly lanceolate, ½-2 in. wide (average width 1⅔ in.), acuminate, stipulate; stipules lanceolate, ½ in. long, striate, appressed; petioles slender, 1-4 in. long; peduncles shorter than the lvs., 2-5-fd.; bracts small, deciduous: fls. medium-sized, pedicellate, white or pale violet, few at the pedicel, 2-5-fld. at or near the apex: fls. small, white, yellowish or blue-purple: pod slender, somewhat curved, provided with a straight or curved tip, fleshy when young and either green or light yellowish wax-color; length of mature seed less than ½ in., average weight more than 20 gram. 2895-2897. Erect or twining (on poor or dry soil many varieties are erect which are twining in more moist or fertile land; some varieties, however, retain the bush form under the most favorable conditions): mature plants more or less pubescent: lfts. rhombic-ovate or ovate, acuminate: peduncles shorter than the petioles, few-fd. at or near the apex: fls. small, white, yellowish or blue-purple: pod slender, somewhat curved, provided with a straight or curved tip, flaky when young and either green or light yellowish wax-color; length of mature seed less than ½ in., average weight more than 20 gram. No conspicuous lines radiating from the hilum: primary lvs. entire, cordate, deeply auriculate, dull green, slightly rough from fine scattered hispid pubescence, their petioles distinctly pubescent.—Both seed and plant characters very variable. There are probably about 200 distinct types, which include between 400 and 500 named commercial varieties. Here are included all of both bush and running forms of which the pods are used as green snap beans as well as the dry shell-bean type like the Navy, Boston Pea, or California Tree bean. The seven species of common beans (P. vulgaris, Savi, P. compressus, Mart., P. gonospermus, Savi, P. carinatus, Mart., P. oblongus, Savi, P. ellipticus, Mart., P. sphæricus, Mart.) which were separated by George von Martens (Die Garten­bohmen, 1860) according to the shape and size of
PHASEOLUS

2900. Henderson Dwarf Lima, a form of Phaseolus lunatus. (X:10)

white, brown or mottled, conspicuous lines radiating from the hilum, more than ½ in. long; primary lvs. not lobed, in form ovate or cordate, bases deeply auriculate, upper surfaces smooth and somewhat shiny, their petioles almost perfectly glabrous. Trop. Amer.—Wide leaf, in warm countries, and prized for its early maturing and prolificacy. It gives rise to dwarf or bush forms, as the Dwarf Carolina, Henderson Bush Lima. Common in American gardens. Var. macrocarpus, Benth. (F. inamrenus, Linn. P. lumnatis, P. sachardtus, P. fasciculatus, P. luteolus, P. pubescens, P. variflorus, HBK. P. Xuarteti, Zuc.). LIMA BEAN. Figs. 2895, 2899. Distinguished from the Sievas by tall, robust growth and late ripening; lfts. large and thick, ovate-lanceolate, acuminate at both ends, nearly entire; calyx hairy, 2 anticous segms., linear-ligulate; corolla white or purplish, tube funnel-shaped at the top; ovary glabrous. Trop. and S. Afr., Mascarenne Isls. and India. B. M. 2433 (as P. longifolia).

PHELLODENDRON

2577


Fl.-bracts small, inconspicuous, lanceolate.

11. lunatus, Linn. Sieva or CIVET BEAN. Figs. 2808-2901. Small and slender, usually not climbing very high; lfts. thin, short and broad, oval pointed (except in special forms as the Willow-leaf): lvs. of medium size, wings and keel white or whitish, banner greenish, containing chlorophyll, of different texture from the wings and Keel, in axillary racemes; pods small and papery, 2-3 in. long, much curved on the back and provided with a long tip, splitting open when ripe and the valves twisting; beans small and flat, not climbing very high: lfts. large and thick, ovate-lanceolate, acuminate at both ends, nearly entire; calyx hairy, 2 anticous segms., linear-ligulate; corolla white or purplish, tube funnel-shaped at the top; ovary glabrous. Trop. and S. Afr., Mascarenne Isls. and India. B. M. 2433 (as P. longifolia).

PHEGÓPTERIS (Greek, beech-fern). Polypodiaceae. BEECH, OAK or SUN FERN. A group of ferns like Dryopteris in habit and latterly usually included in that genus, but with no indusia, the sori being entirely naked. There are numerous Trop. American and Sandwich Island species worthy of cult. in warmhouses. There are 3 native hardy species sometimes offered in the trade, the first, second, and fourth in the following list. For cult., see Ferns.

A. Lvs. small or medium-sized, at most tripinnatid. (Native hardy species.)

B. The lvs. tripinnatid, broadly triangular.

dd. Fl.-bracts small, inconspicuous, lanceolate.

hexagonoptera, Fée (Polypodium hexagonopterum, Michx.). Lvs. 9-15 in. long, usually broader than long, pale green; lower pair of pinnae deflexed and set forward; sori marginal. E. U. S.—Suitable for shaded banks with good soil and fair moisture.

polypodioides, Fée. Lvs. 5-9 in. long, longer than broad, dark green, slightly hairy beneath; sori nearer the margin than the midrib. Eu. and N. E. N. Amer. G. M. 58:297 (as Polypondium phegopteris).—Likepreceding in cultural requirements.

BB. The lvs. ternately tripinnatid.

Dryopteris, Fée. OAK FERN. Lvs. triangular, 3-9 in. long, the lowest pinnae nearly equal to the terminal, giving the lf. a ternate appearance. Eu. and N. Amer.—Grows in damp places in nearly pure leaf-mold.

AA. Lvs. several feet long, decoumpound.

Keraudreniána, Mann. Lvs. several feet long, compound, with light brownish polished stalks and straw-colored rachides; sori on the margins of the segms. Sandwich Isls.—A greenhouse species. This species has also been advertised under the name of Polypondium.

L. Underwood. R. C. Besch.+

PHELLODÉNDRON (Greek, for cork, and trea, alluding to the cork bark). Rutáceae. Core Tree. Ornamental trees, grown for their handsome foliage. Deciduous: winter buds naked, enclosed by the base of the petiole: lvs. opposite, petioled, without stipules, odd-pinnate, with opposite crenate lfts.: ffs. dioecious, in terminal panicles, or the stamine ffs. nearly corymbose; sepals and petals 5-8, ovate-lanceolate; stamens 5-6, longer than petals; ovary 5-celled, with a short thick style: fr. a black drupe with 5 small 1-seeded stones.—Five or 6 closely related species in E. Asia.
The cork trees are usually medium-sized trees with rather stout spreading branches, forming a rounded, broad head, with large leaves of aromatic odor when bruised and turning yellow in autumn, and with inconspicuous greenish flowers followed by black berry-like fruits remaining on the tree a long time after the leaves have fallen. *P. amurense* and *P. sachalinense* are hardy North, while the other species seem somewhat tenderer but have proved hardy as far north as Massachusetts. They are of rapid growth when young and seem to grow in almost any kind of soil. The first-named species has been recommended as a street tree for western cities, as it resists drought and heat in summer and seems not to be attacked by insects. Propagation is by seeds, which are produced freely when both sexes are planted, and by root cuttings dug up and transplanted during the winter in moist sand or sphagnum; cuttings taken from the tree in July with a "heel" of older wood will root in gentle heat.

**A.** *Lev. glabrous beneath or with a few scattered hairs on the midrib, glaucous or glaucous-green.*

**amurense**, Rupr. *Amoor Cork Tree*. Tree, to 50 ft.: bark of the trunk light gray, corky, densely pubescent. 1-year-old branchlets orange-yellow or yellowish gray, thinly puberulous, to 5-13 cm. long, narrowed or rounded at the base, long-acuminate, minutely crenulate and ciliate, dark green and lustrous above, glaucous and glaucous beneath or with a few scattered hairs near the base of the midrib, 2-4 in. long: inf. puberulous: fr. globose, black, about 7-12 mm. across, with a strong turpentine-like odor when bruised, in broad panicles, 2-3½ in. across. June. N. China, Amuriland, Japan. S.T.S. 1:93. S.I.F. 2:35. Var. *albo-variegatum*, Schwerin. Lvs. variegated with large white blotches.—A hybrid between this species and *P. japonicum* has been observed in the Botanic Garden at Lund, Sweden.

**sachalinense**, Sarg. *Tree*, to 50 ft.: bark of the trunk dark brown, slightly fissured and broken into thin plates, not corky: 1-year-old branchlets reddish brown: Hts. 7-11, ovate to ovate-oblong, acuminate, cuneate or rounded at the base, minutely crenulate and glabrous or sparingly ciliate on the margin, dull green above, glaucous beneath and glaucous beneath or with a few scattered hairs near the base of the midrib, 2-4 in. long: inf. puberulous: fr. globose, black, about 7-12 mm. across, or slightly more, in broad panicles 2-3½ in. across. June. Saghain, Korea, N. Japan, W. China. S.T.S. 1:94.—This is the most satisfactory and hardest species in cult.; it forms a tall trunk with a broad crown.

**B.** *Lev. pubescent beneath, at least on the veins, and pale green or grayish green.*

**Lavalléei**, Dode. *Tree*, to 30 or occasionally to 50 ft.: bark, corky; 1-year-old branchlets reddish brown: Hts. 5-13, elliptic-ovate to oblong-lanceolate, acuminate, cuneate at the base, minutely crenulate and ciliate, dull yellow-green above, pubescent beneath while young, at maturity often only on the veins, 2-4 in. long: inf. puberulous: fr. black, ½ in. across, in rather loose broad panicles 2½-4 in. across. June. Cent. Japan. I.T. 5:171 (as *P. amurense*).—Often confused with *P. japonicum* in cult. under that name.


**PHENOLGY**

(contraction of *phenomenology*; that is, the science of phenomena) is the study of the relationships between the climate of any place and the annual periods of plants and animals. Plants vegetate, bloom, and ripen fruit at more or less definite seasons, each after its kind; animals mate, bear young, migrate and hibernate each also after its kind; but these recurring events are related to the climate in which these things live: with these inter-relationships phenology has to do. The most complete means of comparing the climate of one year with that of another are the life-events of the animals and plants of the year. Thermometrical readings are the customary measures, but the thermometers record only temperature, whereas local climate is modified by conditions of humidity, cloudiness, the sequence of atmospheric changes, and many subtle agencies which cannot be measured by means of instruments. Living things are the agents that really measure climate. A record of the life-events of living things, therefore, even though imperfect, should contribute to the science of climatology; and incidentally it should contribute much to the science of biology. Records of plant-events are more comparable than those of animal-events, because plants are stationary and have no volition to adapt themselves to ineradicables by means of change of position, diet, or otherwise; therefore, plants emphatically express climatal influences. A record of the first blooming of a given apple tree, for example, during a series of years would give comparable measures of the lateness or earliness of the different seasons. Most so-called phenological observations in this country have been mere records of dates of blooming, leafing, migration of birds, peeping of frogs, and the like, without cumulative data respecting the local climate, and therefore of relatively little consequence to science. In this country the literature of phenology is meager. See Bailey, Essay 17, "Survival of the Unlike," and "Weather Review," Sept. 1896, U. S. Weather Bureau. L. H. B.

Popular ornamental deciduous or rarely half-evergreen shrubs.

Leaves opposite, entire to variously toothed, occasionally slightly revolute, and almost invariably ciliate: fls. often very fragrant, mostly white, a few cream or with purple or rosy spots at or near the base of the petals, in racemes, or solitary or in cymose groups of 1–3; calyx-lobes, petals, and styles usually 4; stamens numerous: fr. a dehiscent commonly 2-parted 4-valved many-seeded caps.—About 30–35 species have been described. The genus is essentially Asiatic and American. P. coronarius is certainly a native of Armenia and the Caucasus, and several varieties of it extend the range to Japan, and it is wild in Eu., but whether or where it is native is uncertain, because it has undoubtedly sometimes escaped from cult. The genus has 3 roughly defined areas of distribution,—N. Asia and Japan, W. Amer. from Brit. Col. to Calif., S. Atlantic States, and Mex. It has no well-marked characters which may be used to separate the species, which therefore often resemble each other closely and are sometimes connected by intermediate forms. The latest treatment of the genus is in Schneider's illustriertes Handbuch der Laubholzkunde, vol. 1, p. 362 (1905). On account of the great confusion of names in the genus, rather more synonymy than usual is given, but the selection is nevertheless of the names more likely to be met with or to cause confusion. The complete synonymy is far larger.

Syringa, the common name of Philadelphia, is identical with the generic name of the lilac. This arises from the use of Syringa by the old herbalists. Thus, in 1597, John Gerard in his "Herball" gives Syringa alba, white pipe, S. cerulea, blue pipe, and S. arabica, Arabian pipe, the first being Philadelphia coronarius, the second Syringa vulgaris (lilac), and the third Jasminum Stamm. Tournefort, in 1700, selected Syringa for the first, but Linnaeus, whom we follow, chose to use it for the second. However, Tournefort's usage prevailed in English speech, while the Germans call Philadelphia either Pfeifenstrauch (=pipe-shrub, like the herbalists' "pipe," above) or Jasmin, perpetuating the third element in the original heterogeneous syringa. The French also use syringa as the common name of Philadelphia, but in the form seringat.

Philadelphia generally blossoms in June: in fact, it is remarkable for the uniformity of the blossoming period, both in cultivation and in its native haunts, throughout the world. Most of the members of the genus are hardy North, except P. Coulteri, P. mexicanus, and the other Mexican species. They seem well adapted to shrubberies and mostly do not grow very high, the tallest being P. pubescens, attaining a height of about 20 ft.; others, as P. coronarius, P. Zeyheri, and P. inodorus, grow nearly as high, while P. microphylla hardly exceeds 3 ft. If pruning is needed it should be done after flowering, since the flowers appear on the wood formed the previous year. Usually propagation is by hardwood cuttings, or by suckers and Greenwood cuttings under glass; also by layers and by seeds, but when several species are growing together they are likely to hybridize.

INDEX.

For a few vernacular names, sometimes popularly written without a preceding specific name, see P. Lemoinei, of which they are really varieties.


a. Fls. in simple or rarely compound racemes (Nos. 1–20).

b. Calyx glabrous without, or with some scattered hairs (except in P. sericanthus and P. inodorus).

c. Pistils little or not at all exceeding the stamens.

d. Styles separating less than half way down (except in P. sericanteus) (Nos. 1–12).

e. Less, some, generally most, of the mature ones more than 1½ times in long.

f. The lvs. of young succulent shoots and suckers not approaching a circular outline, usually moderately toothed, if at all.

g. The calyx especially glabrous without.

1. nepalensis, Koehne. Upright shrub to about 5 ft.: lvs. at maturity about 1½ in. long, ovate-lanceolate, acuminate, evenly and distantly mucronate-denticulate, with white or yellowish tufts of hairs in the axis of the lateral veins, especially on lvs. of young succulent shoots and suckers: fls. practically scentless; cup of the calyx and caps. plainly acute to long acuminate, evenly and distantly mucronate-denticulate, with white or yellowish tufts of hairs in the axils of lateral veins, especially on lvs. of young succulent shoots and suckers: lvs. of young succulent shoots and suckers, which are more coarsely toothed, and not so long-pointed: caps. not seen, but probably more rounded at base. June. G.M. 55:554. G.W. 17, p. 103.

2. Voie Lactée. Hybrid between P. nepalensis and P. microphylla. Similar to the preceding and superior to it, most readily distinguished by the lvs. of the young succulent shoots and suckers, which are more coarsely toothed, and not so long-pointed: caps. not seen, but probably more rounded at base. June. N. E. Himalayas.

3. pekinensis, Rupr. (P. coronarius var. pekinensis, Maxim.). Erect shrub to about 5 ft., closely resembling P. nepalensis, but without the characteristic tufts of hairs on lower if.-surfaces, and usually with purplish petioles. May, June. Mongolia, N. China.

PHENOMENAL BERRY: See article on Loganberry, page 1900.
4. Zétheri (P. Kochianus, Koehne. P. coronarius Zétheri, Schrad.). Hybrid of uncertain origin, probably between P. coronarius and P. inodorus. Lower than P. coronarius: Lvs. variable, ovate to ovate-lanceolate, acute to acuminate, with hard-tipped teeth, glabrous or nearly so, or hairy along the veins beneath, those of young succulent shoots and suckers ovate-lanceolate to broadly ovate, sometimes with tufts of hairs on the youngest, as in P. nepalensis: fls. white; slightly fragrant or scentless. —A puzzling shrub, at times confusingly similar to P. coronarius. June.


6. coronarius, Linn. (P. pallidus, Hayek. P. coronarius nivalis, Hort.). Figs. 2902, 2903. Shrub, to 10 ft.: lvs. ovate-lanceolate (rarely ovate), generally acuminate, usually rather evenly mucronate-denticulate, sometimes ovate almost entire, rarely slightly subacute, thickish at maturity, about 1½-4 in. long, ¾-2¾ in. broad, slightly hairy beneath: fls. in rather dense racemes, white or more often with a slight creamy tone, very fragrant. May, June. Caucasus, Armenia, and probably S. E. Eu. B.B. 2-196. F.E. 39:75 (habit). J.H. III. 70:471.—This is the common syringa, or mock orange, with less attractive foliage than some, but the delicious fragrance unsurpassed. The following horticultural and 2 wild varieties are cult. Var. salicifolius, P. Kochianus, Hoek. Lvs. lanceolate, distantly toothed, those of the young succulent shoots and suckers: fls. in racemes of about 5, about 2 in. across, slightly fragrant. June.

7. sericanthus, Koehne. Lvs. lanceolate, distantly blunt-toothed or entire, mature ones about 1½-4 in. long, ¾-2 in. wide, glabrous beneath, or with few scattered hairs: fls. about ¾ in. across. June. Hupch Province, China.—Larger-lvd. specimens have been distinguished as var. Rehderianus, Koehne.

8. incanus, Koehne. Lvs. ovate, more or less abruptly acuminate, dentate, with 5 principal veins, mature ones 1½-4 in. long, ½ in. across. June. Hupch and Szechuan provinces. China.

9. floribundus (P. verrucosus floribundus, P. grandiflorus floribundus, Hort.). Hybrid of uncertain origin, probably with P. coronarius as one parent. Shrub resembling P. coronarius in P. floribundus, but more candelabrous in P. coronarius, and with characteristic-ly very large, ovate-lanceolate to more often orbicular, generally coarsely toothed lvs. on young succulent shoots and suckers: fls. in racemes of about 5, about 2 in. across, slightly fragrant. June.

11. **Phantasia** (P. Lemoeini Fantasia). Hybrid between P. Coulteri and an unknown variety of P. Lemoeini. Fls. fragrant, white, tinted with pale rose at the center of the fl.; petals fringed at the edge. June. Var. purpureo-maculatus, Hort. Derivative of P. phantasia. Lvs. essentially as in P. Lemoeini, but proportionately somewhat broader, with numerous, short, stiff hairs beneath: fls. large, about 1½-2 in. across, exquisitely fragrant, with a purple spot at base of each petal; calyx with a few short, silky hairs. B.M. 8193.

12. **Étoile Rose**. Hybrid between P. phantasia and P. purpureo-maculatus. Lvs. small: delicatescantly fragrant, in rounded panicle-like racemes; petals elongate, rose-purple at base, the color diminishing toward the center of the fl. June.

**dd. Styles separated almost or entirely to the base, especially after flowering.**

13. **Conquete**. Hybrid of unknown origin. Lvs. lanceolate to narrowly ovate-lanceolate, glabrous, about 2-3 in. long, ½-1 in. wide, entire, or with a few small teeth, on young succulent shoots and suckers larger, long-acuminate, coarsely toothed; fls. in a more or less compact but not head-like cluster, very large, to 2½ in. across, sweet-scented; the slender thread-like styles almost to the base, especially after flowering, stigma generally short and small; calyx glabrous without. May, June. G.W. 17, p. 102.

14. **Nuée Blanche**. Hybrid between P. microphyllus and P. nepalensis. Lvs. ovate to ovate-lanceolate, glabrous, about 1½-2½ in. long, ½-1½ in. wide, entire or nearly so, on young succulent shoots and suckers ovate, acuminate, conspicuously toothed; fls. not over 1½ in. across, sweet-scented; styles moderately slender, gradually broadening into the stigma; calyx glabrous without. May, June.

15. **Rosace**. Hybrid of unknown origin. Lvs. lanceolate, glabrous, about 1½-3½ in. long, ½ to about 1 in. wide, entire, on young succulent shoots and suckers ovate toothed: fls. very large, 1½-2½ in. across, sweet-scented; calyx glabrous without. May, June.

16. **Perle Blanche**. Shrub, to about 4½ ft.: lvs. ovate, medium-sized, toothed, with small stiff scattered hairs beneath: fls. partly double, in head-like clusters, sweet-scented; calyx rather hairy without. May, June.

**cc. Pistils far exceeding the stamens.**

17. **Falconeri**, Sarg. Fig. 2904. Shrub, to 8 ft., with slender, arching branches; lvs. ovate-lanceolate, 1½-3 in. long, ½-1 in. wide, acuminate, entire or very minutely mucronate-denticulate; fls. in loose racemes of 1-6, fragrant, about 1½ in. across; calyx-lobes very acuminate; petals rather narrow; pistils much longer than the stamens; styles separated as long slender filaments; stigma scarcely broader than the styles. June. Origin unknown, probably Japanese. G.F. 8:497 (adapted in Fig. 2904). M.D.G. 1899:231. Gng. 8:340.

**bb. Calyx distinctly hairy or glabrate.**

18. **pubescens**, Loisel. (P. latifolius, Schrad. P. grandiflorus, P. Wats., under which name it is often met with, has a name commonly also applied to varieties of P. coronarius and of P. inodorus, P. nivalis, and many other species or supposed species; it is also wrongly called P. Gordonianus). Shrub, to 20 ft.: bark of old branches grayish, either cracking when old and not peeling, or peeling in little flakes, so that shreds do not remain, of younger branches generally yellowish or greenish yellow: lvs. ovate to broadly elliptic or ovate-lanceolate, 1½-2½ in. long, ½-3 in. wide (those of young succulent shoots and suckers attain dimensions of 7¼ × 6½ in.), acute to acuminate, almost entire to more or less markedly mucronate-denticulate; fls. in long leafy racemes of 5-10, usually distant, somewhat fragrant. June, July, Tenn., Ala. (last, according to Rydberg). Souvenir de Billiard (also cult. under the names P. Billiardii and P. insignis) is a horticultural variety, with ovate lvs. on the average smaller than in the species, about 1½-2½ in. long, erroneously described as a native species. Var. intectus, A. H. Moore (P. inodorus, Beadle). A natural variety with an externally wholly glabrous calyx, and with lvs. glabrous or nearly so. Tenn.

19. **verrucosus**, Schrad. A plant of uncertain origin: if hybrid, the parentage cannot be surmised. Similar to preceding, but bark of old branches purplish red or chestnut-brown, often peeling in shreds, of the younger generally brownish or reddish June, July. Var. pendulifolius is a horticultural variety with slightly drooping branchlets.

20. **Magdalæna**, Koehne. Rather lower, spreading shrub, to about 5½ ft.; the calyx generally with fewer short stiff hairs; otherwise closely resembling the preceding, lvs. inclined to be smaller.

**aa. Fls. borne singly or in clusters of 1-6 at the tips of the branchlets, not in racemes, except occasionally in P. mexicanum.**

21. **inodorus**, Linn. (P. coronarius var. inodorus, Martyn. Delitzia corymbosa, Hort.). Shrub, to about 1 ft., much resembling P. coronarius in general appearance: lvs. ovate to ovate-lanceolate, about 1-6 in. long, ½-1½ in. broad, entire or with very few, usually very small, distant teeth. May, June. N. C. and Tenn. to Ga. and Miss. B.M. 1478. Usually hardy N. Long in cult.; inferior to P. coronarius. Var. grandiflorus, Gray (P. grandiflorus, Wild. P. iázus, Lindl., also of Lodd. P. iázus var. grandiflorus, Loud.). Lvs. generally more elongate, more coarsely toothed, especially on young succulent shoots and suckers. N. C. to Ga. and Fla., (last according to Rydberg), naturalized at Bushkill, Pa.

2095. Philadelphia Coulteri. (X34)

The following variety is of greater merit. Var. brachytronus, Koehne. With purple calyx and pedicel. B.M. 8324 (as P. Deboutrys, Koehne). Of uncertain botanical standing, allied to P. coronarius. Value unknown. Name P. inodorus also variously applied—P. Lemoinei erectus, P. semperV1rens, Schrenkii, Hort., a var. more or less densely covered with silky hairs beneath, not of horticultural merit. P. semperV1rens, Hort., offered in Calif., is a var. with dark purple calyx and petals, rare in the American trade.

29. microphyllus, Gray. Erect, to 6 ft. (usually not so tall), or in its native habitat sometimes sprawling, with spreading slender or rigid branches: lvs. oblong-ovate, 1/2 to 1 in. long, 3/4 to 1 in. wide, acute or subacute (rarely obtuse), entire, scarcely or not at all revolute more or less densely covered with silky hairs beneath, glabrous or with short hairs above: fls. >1/4 in. across, white, fragrant: petals fringed, often marked with purple on the back. R.H. 1905 p. 12. Var. mexicanus, Schlecht. Of uncertain botanical standing, allied to P. coronarius. Value unknown. Name P. inodorus also variously applied—P. Lemoinei erectus, P. semperV1rens, Schrenkii, Hort., a var. more or less densely covered with silky hairs beneath, not of horticultural merit. P. semperV1rens, Hort., offered in Calif., is a var. with dark purple calyx and petals, rare in the American trade.

28. Coulteri, Wats. (P. mexicanus var. Coulteri, Burb.) Fig. 2905. Shrub, to about 10 ft.: lvs. ovate to oblong-ovate, 1/2 to 1 1/2 in. long, 3/4 to 1 1/2 in. wide, acute to short-acuminate, distantly blunt-toothed, glabrous or sparingly hairy above, scabrous beneath with short hairs, densely appressed hairs, in general pointing toward the apex of the lvs.; occasionally in short leafy racemes (a detail not shown in the illustration). The following variety is of greater merit. Var. brachytronus, Koehne. With purple calyx and pedicel. B.M. 8324 (as P. Deboutrys, Koehne). Of uncertain botanical standing, allied to P. coronarius. Value unknown. Name P. inodorus also variously applied—P. Lemoinei erectus, P. semperV1rens, Schrenkii, Hort., a var. more or less densely covered with silky hairs beneath, not of horticultural merit. P. semperV1rens, Hort., offered in Calif., is a var. with dark purple calyx and petals, rare in the American trade.

27. Coulteri, Wats. (P. mexicanus var. Coulteri, Burb.) Fig. 2905. Shrub, to about 10 ft.: lvs. ovate to oblong-ovate, 1/2 to 1 1/2 in. long, 3/4 to 1 1/2 in. wide, obtusely to sharply pointed, on young succulent shoots and suckers, larger toothed, those of both young and old covered with rough hairs above and very white-tomentose beneath, the whole like a rough piece of felt; fls. white, very fragrant; petals with red spot at the base; calyx covered with silvery white silky hair: caps. unusually large, about 1 1/2 in. long. States of Nuevo Leon and Hidalgo, Mex. G.F.P. 1:233 (adapted in Fig. 2905). B.R. 14:5—Very distinct, desirable for southern latitudes, and one of the most pleasing of the genus. P. argenteus, Rydb. Low shrublike shrub, with handsome silvery calyx and lvs., silvery beneath. Fort Huachuca, Ariz. Rare plant for southern rockeries or borders. Because of the petaloid, only one plant, or preferably seeds, should be got, to prevent extinction. P. longiflorus, Koehne (P. longiflorus var. branchytronus, Koehne). Of uncertain standing, allied to P. coronarius. The following variety is of greater merit. Var. denudatus, Koehne. On the whole a good plant, and stands the heat better than the type. Related to var. acuminatus, differing in greater pubescence, especially on the veins of the lower lvs., and the calyx and petals, silvery beneath. Fort Huachuca, Ariz. Rare plant for southern rockeries or borders. Because of the petaloid, only one plant, or preferably seeds, should be got, to prevent extinction. P. longiflorus, Koehne (P. longiflorus var. branchytronus, Koehne). Of uncertain standing, allied to P. coronarius. The following variety is of greater merit. Var. denudatus, Koehne. On the whole a good plant, and stands the heat better than the type. Related to var. acuminatus, differing in greater pubescence.
PHILESIA

PHILIBERTIA (after G. C. Philibert). Incl. Sarcochlamys and Philibertia. Aseapectaidea. Climbing shrubs or half-shrubs, white-pubescent or glabrous, sometimes grown under glass or for S. for ornament: lvs. opposite: infl. umbelliform cymes, pedunculate in one axil or rarely sessile; fls. variable in size; often greenish white; calyx 5-parted, minutely 5-lobed within, lobes acute; corolla very broadly campanulate or subrotate, divided slightly to the middle or deeply 5-cleft, with the lobes twisted and narrowly overlapping to the right; exterior crown membranaceous, ring-like, adnate to the base of the corolla, free from the stamen-tube or more or less connate with the median wings of the opposite anther, interior 5 crown-scales adnate with the base of staminal tube, with a variable lamina; stamens 5 or more: ovary sessile or subsessile obpyramidal body, the pistillate fls. with a 2-10-loculed ovary and some staminodia, the berries inclosed in a berry-like purple-black fruits. The species are hardy only South, but P. decorata, the handsomest of all the species, is probably hardy in sheltered positions as far north as Massachusetts. They may be used in the southern states and California for evergreen shrubberies in drier and more exposed localities. They grow in almost any soil and prefer sunny positions; but P. decorata seems to grow better if partly shaded. Propagation is by seeds sown after maturity and by cuttings of half-ripened wood under glass in summer or by layers; they are sometimes grafted on Ligustrum ovalifoillum.

a. Lvs. 3–5 in. long; fr. small.

b. Shape of lvs. roundish oval to oblong-lanceolate, usually serrate.

 PHILODENDRON 2583

PHILÉRE (its ancient Greek name). Olotaceae. Ornamental woody plants, grown for their handsome evergreen foliage.

Evergreen shrubs or small trees: lvs. opposite, short-petiolate, entire or serrate, quite glabrous; fls. small, in axillary short racemes, dienceous; calyx 4-toothed; corolla 4-lobed, with short tube; stamens 2, with very short filaments; style shorter than tube; ovary 2-celled; fr. 1-seeded black drupe.—Five species in the Medit. region. The name is sometimes misspelled Filaria.

The phillyreas have small, or in one species rather large leaves, and small white flowers, followed by small berry-like purplish black fruits. The species are hardy only South, but P. decorata, the handsomest of all the species, is probably hardy in sheltered positions as far north as Massachusetts. They may be used in the southern states and California for evergreen shrubberies in drier and more exposed localities. They grow in almost any soil and prefer sunny positions; but P. decorata seems to grow better if partly shaded. Propagation is by seeds sown after maturity and by cuttings of half-ripened wood under glass in summer or by layers; they are also sometimes grafted on Ligustrum ovalifoillum.

a. Lvs. 3–5 in. long; fr. small.

b. Shape of lvs. lanceolate to linear-lanceolate.


ALFRED REHDER

PHILÉDÔNDRON (Greek compound for tree-loving). Aracaceae. Shrubby or tree-like ornamental plants, usually climbing, rather arborescent. Internodes more or less elongated: lvs. from entire to bipinnatifid; fls. monocious, on spacers, with no perianth, the steric with 2-6 stamens united into a sessile obpyramidal body, the pistillate fls. with a 2–10-loculed ovary and some staminodia, the berries inclosed in the involute spathe.—The species are all Trop.
American. They are monographed by Engler in Das Pflanzenreich, hft. 60 (IV. 23 Dd) 1913, who accepts 222 species. Some of them are prominent in tropical plantings.

Only a few philodendrons can be grown to have an ornamental appearance in a small state. One which goes under the name of P. elegantissimum, with finely cut leaves, makes a good pot specimen, although it will reach considerable height when suitable opportunities are afforded. The same may be said of P. Selloum, a beautiful species with pinnatifid leaves. The arborescent kinds should have a very porous rooting medium and copious supplies of water while in active growth. When climbing, they must have provision made for the roots, which are produced along the stems. Some of the species do well climbing up the stems of tall palms, such as arenga and livistona' otherwise dead trunks of tree ferns make admirable rooting substances for the roots to penetrate and cling to. Propagation is by division of the climbing stems. P. elegantissimum is an unidentified trade name.

**speciﬁdum**, Schott. St. tall, arborescent; petioles terete at the base, conecavo-convex above, twice as long as the midrib; blade triangular-oblong-ovate, bright green, acuminate, deeply sagittate, the basal lobes rhomboidal, obtuse, abruptly narrowed on the inner side above the middle; spathe thick, green with purple margins; spadix finger-shaped, shorter than the spathe. S. Brazil.

**2906. Philodendron aureum.**

A. Lvs. bipinnate.

b. Terminal If.-segms. 3-lobed, the lobes unequal.

Selloum, C. Koch (P. Selloum, Hort.). Blade pinnatisect, the segms. again pinnate or lobed; terminal segms. 3-lobed, the cuspidate middle lobe about longer than the lateral ones.

bipinnatifidum, Schott. Blade pinnatisect, the segms. again pinnate or lobed; terminal segms. 3-5-lobed, the middle lobe much longer than the lateral ones.

P. bipinnatifidum by the very numerous parallel transverse bullar spots, which are visible on both sides of the leaf and are often recurrent on the margin. Brazil to Paraguay. B.M. 6773. G.W. 10, p. 211.

in. Terminal If.-segms. 5-8-lobed, the middle lobe much longer than the lateral ones.

**bipinnatifidum**, Schott. Blade pinnatisect, the segms. again pinnate or lobed; terminal segms. 3-5-lobed, the cuspidate middle lobe above the ovate hooded blade, green without, white within. Distinguished from P. bipinnatifidum by the very numerous parallel transverse bullar spots, which are visible on both sides of the leaf and are often recurrent on the margin. Brazil to Paraguay. B.M. 6773. G.W. 10, p. 211.

AA. Lvs. simple.

b. Lvs. linear or lanceolate.

**crassinervum**, Lindl. Climbing: lvs. linear to lanceolate-acuminate, the midvein very thick and inflated; spathe obtuse and hooded, apicate at the tip, Brazil. B.R. 1955.—P. nobile, Bull, is like this but larger: lvs. long-ob lanceolate, large, coriaceous, and shining, obtuse or short-acuminate, narrowed at base; tube of spathe rosy crimson inside and outside, the limb white inside and spotted outside. Guiana.

**spectabile**, Lindl. Large, of vigorous habit: lvs. 12-15 in. long, nearly as broad, silky or velvety green.

**Andréanum**, Devans. Lvs. rather large, cordate-ovate, with short basal lobes, brownish green. Colombia. R.B. 1.860-36. R.B. 13, ag. 30.—Sparingly grown. Looks like a narrow-lvd. anthurium. P. colophilum, Brongn. (P. nobile, Bull, in part). Lvs. tufted, 2-3 ft. long, 5-6 in. broad at middle, linear-oblong, acuminate, shining above, the costa very thick at base, with linear depressions; spathe pale yellowish green outside, inside bright crimson with white margins. N. Brazil. B.M. 7327.—P. aureum, Mart. Lvs. thick, coriaceous, oblong, shining above, the costa semi-terete; spathe cymbiform, green outside, purple, green and white inside. Brazil.—P. Foronduum, Korth. Lvs. 1.4-2 ft. long, 1-2 in. broad, shortly pinnatifid, deep green above, beneath purple with green veins; spathe with a purple-crimson spot, the limb bright green with red spots outside, the inside crimson with darker spots. Hybri. B.M. 6172.—P. Chausson, L. is a splendid species with rather small glossy green lvs. which, even to the petioles, are blood-red when young. Peru. I.H. 42: 45.— P. Dauterel, Hort. Lvs. broadly and deeply lobed. P. frota, P. erubescens, C. Koch. Climbing: lvs. elongate-ovate-triangular, 6-8 in. long, 4-6 in. wide; spathe blade-purple.—P. Chausson, Hook. L. is a clumping something like P. crassinervium; lvs. oblong-acute, deep green, 12-18 in. long, 3-5 in. broad; spathe open, yellowish,
2907. Phleum pratense.-Timothy. permanent pasture.

2906. Rootstocks thick, creeping on surface, densely covered with bright yellowish scales: lvs. 2-4 ft. long, spathe outside black-purple on the tube, yellowish on the limb. Guiana. B.M. 2943.

2908. Phleum pratense.-Timothy. (X5)

PHLOGACANTHUS (Greek for flame, and acanthus). Acanthideae. Glasshouse plants grown for the ornamental flowers.

Tall half-shrubby herbs with entire or somewhat toothed lvs.: fls. white, red or greenish in long terminal or short lateral spikes; calyx 5-parted; segments, linear, awnlike, acuminate; corolla-tube long, broad, limb 3-lobed, upper lip erect, connate or 2-lobed; lower lip 3-parted; perfect stamens 2, inserted on the lower part of the tube; anthers with 2 parallel cells; ovary many-ovuled: caps. round or obtusely 4-angled.

Species 12-15, India, Malayas, to New Guinea. Several of the species have been more or less cultivated at one time or another. Used like the others of the family as decorative pot-plants in the greenhouse. They require a rather warm, damp atmosphere and a soil rich in humus. Prop. by cuttings or seeds.

thrysiflorus, Nees (Justicia thrysiflora, Roxbg.). Shrub, 3-7 ft. high: lvs. 7 x 1 3/4 in., lanceolate, glabrous: fls. orange, in long, dense, terminal thyrsi; corolla 6 mm. wide, tubular, 2-lobed. India.—Cult. in S. Fla.

PHLOMIS (old Greek name used by Dioscorides). Labiatae. JERUSALEM SAGE. Stout mostly tall plants sometimes grown in the open for the dense axillary whorls of rather large yellow, purple or white flowers.

Plants more or less woolly, some of the species conspicuously white-woolly, shrubs or perennial herbs: lvs. all alike, or the uppermost reduced to bracts: whorls many-to few-fld.; fls. sessile; calyx united with the corolla, glabrous or pubescent; caps. round or obtusely 4-angled.

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Plants more or less woolly, some of the species conspicuously white-woolly, shrubs or perennial herbs: lvs. all alike, or the uppermost reduced to bracts: whorls many-to few-fld.; fls. sessile; calyx united with the corolla, glabrous or pubescent; caps. round or obtusely 4-angled.
oblong or ovate-oblong, obtuse at apex, narrowed at base, paler and almost hearty beneath, the lower ones long-stalked: fls. golden yellow, 1½ in. long, in a showy terminal whorl or head 4 in. across, with 2 pendulous floral lvs. beneath; bracts small, or orbiculate; calyx 3½ in. long, 10-ribbed; corolla with villous 2-keeled, galea, and large lower lip with 2 wings or lobes at end. Asia Minor. B.M. 7990.—A striking plant.

Lychitis, Linn. LAMP-WICK PLANT. Somewhat woody, 2 ft.; hairy; lvs. sessile and amplexiculm, oblong-linear, narrowed at both ends, white-tomentose beneath: whors 1½ ft., much shorter than the floral lvs.; bracts broad at base; fls. yellow, the calyx twice longer than calyx. S. Eu. B.M. 900.—The specific name Lycythus refers to the uses of the slender radical lvs. as lamp-wicks.

viscosa, Poir. (P. Russeliana, Benth.). Shrubby, glabrous, but viscid above, with elongated branches; lvs. ovate and oblong-lanceolate, the lower ones petioled and strongly cordate at base; floral lvs. ovate-lanceolate and acuminate, much surpassing the fls.; whors 1½ ft., remote, with lance-linear rigid bracts; corolla yellow, twice longer than calyx, the galea emarginate, lower lip with broad lobe. Asia Minor. B.M. 2542 (as P. lunaria var. Russeliana).

AA. Fls. purple, or pinkish, at least inside.

tuberosa, Linn. Herb. 3-6 ft. high, nearly smooth, with thickened root: lvs. deeply cordate, ovate, petiolate, crenate, the lower ones triangular-ovate and 6 in. or more long; floral lvs. 2½ ft. long, 6½ lines wide, oblong-lanceolate: whors 30–40 ft., bearing purple fls. that are white-bearded inside. S. Eu., E. and N. Asia. B.M. 1555.—Little planted; known mostly as a weedy naturalized species.

Herba-venti, Linn. Much-branched, 1–2 ft., hairy: lvs. oblong-lanceolate, or ovate-oblong, crenate, coriaceous, rounded at base, either canescent or green beneath: whors 10–20 ft., much surpassed by the long floral lvs.; fls. purplish, tomentose on outside; galea much arched; lower lip short. Medit. B.M. 2449. G. 35:712.—The name Herba-venti means "wind herb." It is recorded that "when exposed to wind and rain, the leaves are apt to lose their softer parts, leaving merely a network of fibers, pervious to the wind, whence the old name of Herba-venti."

cashmeriana, Royle. Sts. several, stout, terete, densely white-woolly, 2–3 ft. high: lvs. linear-oblong, obtuse, rugose and crenate, cordate at base, pubescent above the radical ones: whors many-ft., 1–½ in. diam.; bracts numerous, filiform, ciliate and tomentose; lvs. paler purple; galea very large, truncate but not fringed; lower lip very broad; calyx-teeth spine-like and half length of the tube. Afghanistan, Himalaya. B.R. 30:22. J.F. 3:284.


L. B.1

PHLOX (Greek for flame; once applied to species of Lychnis). Polemoniaceae. Showy and popular flower-garden herbs, perennial and annual.

Erect or diffuse, tall or low, mostly perennial, glabrous, pubescent or hairy, a few of them woody at base but mainly herbaceous throughout: lvs. mostly opposite or sometimes nearly campanulate, 5-ribbed and 5-cleft, the lobes sharp-pointed; corolla convolute in bud, salverform, with a very slender tube and a flat-spreading 5-lobed limb, the lobes obvate or broader and some-times notched; stamens 5, usually unequal in length or in point of attachment, usually included; ovary 3-celled, oblong or ovoid, the style slender: caps. 2-valved, the seeds 1 or few in each cell, usually 1.—There are defined by Brand in Engler's Das Pflanzenreich, lft. 27 (IV. 250), 1907, one of which is Siberian and the other N. American, in woods and thickets and on prairies and plains, some of them alpine and arctic.

From a horticultural point of view, the phloxes may be thrown into five groups: (1) the annual phloxes, P. Drummondii; (2) the highly decorative, perennial tall phloxes of nurseries and gardens, P. paniculata and P. maculata; (3) the moss pinks, P. subulata and its variants, useful as carpeters; (4) those useful in alpine and rock-gardening, although little employed for the purpose in America, represented by P. multiflora and the eschscholzia.

The annual phloxes, derivatives of Phlox Drummondii, of Texas, have risen to first place as garden annuals. This species has been much modified by domestication, so that the named garden varieties are numbered by dozens. These garden forms differ in stature, color, size and shape of flower. Some are semi-double. An effort has been made to produce a yellow flower, but apparently a true yellow has not yet been secured. The colors run to the cyanic series, in many interesting variations. Phlox Drummondii is of the easiest culture. This fact, together with the profusion and long season of its bloom, is an important reason for its popularity. It blooms all summer and until frost if the stock and conditions are good. It needs a warm sunny place. It will grow even in poor soil, but in order to develop to its highest perfection it must have good soil and the individual plants must be given room (say 1 foot apart each way). Seeds are usually sown in the spring for the purpose in America, amongst the most satisfactory of garden plants.

Their neat habit, bright-colored flowers, profuseness of bloom, and ease of culture make them favorites everywhere. Most of the domesticated kinds are summer bloomers, but P. subulata is spring-flowering. (1) the annual phloxes, P. Drummondii; (2) those useful in alpine and plains species not yet naturalized in grounds, as P. pilosa, P. divaricata, and others. As a group, phloxes are amongst the most satisfactory of garden plants.

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To attain this result most perfectly, the old flowe-
cluster should be removed; the plant is an end-bloomer, and when the terminal flower-cluster has matured, the other shoots continue the growth and thereby provide a succession of bloom. This phlox has now varied so much under domestication that packets of mixed seed are likely to give tall and dwarf, large-flowered and small-flowered forms, with very satisfactory results. If mixed colors are desired, pains should be taken to secure seed that will produce plants of similar height and season. Some of the cheap seed may produce very disappointing plants even under the best conditions.

The summer perennial phloxes of gardens are of several races. They are probably the issue of *P. paniculata* and *P. maculata*, although their origin and characteristics need to be worked over. This group of plants is amongst the most showy of garden herbs.

The terminal panicles have become 1 foot long in some forms, and as densely filled as a hydrangea. They are specially desirable when color display is sought in connection with formal or semi-formal designs, as on terraces and by balustrades. The colors are most frequent in reds, but there are many purple, white, salmon, and parti-colored varieties. The summer perennial phlox should have a rich and rather moist soil if it is to be grown about the old plant, causing the named variety to "run out." The modern varieties should not be reared, if one desires to propagate the variety as named, unless often renewed by dividing the clump. The stool should be reared, if one desires to propagate the variety as named, unless often renewed by dividing the clump. The stool is amongst the most showy of garden herbs.

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limb \( \frac{1}{2} \) in. broad, lobes broad-ovate and often abruptly pointed. *P. tenuis*, A. Nelson (var. *tenuis*, Gray) is small and slender, not villous, glabrous or slightly pubescent: lvs. mostly alternate, the blades thin and linear or linear-lanceolate: fls. lavender, small, the limb about \( \frac{1}{2} \) in. across, lobes rhombic-ovate and acute.

*P. aspera*, A. Nelson. With short rigid hairs: lvs. opposite, the blades thick, narrow-lanceolate to linear: calyx and pedicels glandular, the calyx-lobes awned; corolla violet, the tube glandular-pubescent; lobes cuneate-obovate, about \( \frac{1}{2} \) in. long, mucronate.

*P. Roemeriana*, Scheele. Glabrate or somewhat hirsute: lvs. mostly alternate, spatulate-oblong or lanceolate, sessile, usually acute or acuminate: fls. solitary or few, pink or rose-colored; corolla-tube not surpassing the calyx (in this differing from the other annual Texan phloxes); limb of corolla less than \( 1 \) in. across, the lobes roundish-obovate and entire: ovules 4 or 5 in each cell.

**AA. Species perennial, of various habit, either pubescent or glabrous.**

**B. Flowering st. erect and usually stiffish (Nos. 2-9).**

**c. Plant mostly glabrous, at least below (exceptions in variety of No. 5).**

**D. Infl. large and thyrse-like: plants tall.**

2. *paniculata*, Linn. *(P. decussata, Hort. P. acuminata, Pursh. P. cordata, Ell. P. undulata, Ait.). Summer Perennial Phlox of gardens, in many forms. Fig. 2911. Plant stout and erect, 2-4 or 6 ft., glabrous: lvs. thin, oblong-lanceolate and mostly tapering at the base, acute or acuminate: calyx-teeth awl-like. Woods, Pa., west and south. Summer. B.M. 1880.—The parent of the greater number of perennial phloxes of gardens, although some of these may be hybrids with the next. “Fls. pink-purple, varying to white,” according to Gray. In cult. varying much in color. This plant, in several forms, persists about old homesteads and sometimes becomes naturalized. *P. ampliflora*, Brit., with st. villous, glandular above, lvs. broader, ranging from Ind. to Tenn. and Mo., is considered by some to be a form of *P. paniculata*.


The foregoing treatment of the synonymy of the two species entering into the origin of the summer perennial phloxes is essentially that of Gray. Brand removes a number of these names into a separate category comprising a range of hybrids, and accounts for other old horticultural names, as follows:

3a. *paniculata × maculata*, Brand. *P. pyramidalis*, Smith; *P. decussata*, Lyon; *P. reflexa*, *P. excelsa*, P. Wheeleriana, P. Sheperdii, P. penduliflora, Sweet; *P. missourica*, Salm-Dyck; *P. penduliflora*, P. mimosifolia, P. *atrococcia*, P. *luciflora*, P. *pulchella*, P. *vernoniana*, Hort.; *P. *amphilora*, P. Coldryana, Walp. Several other old Latin names are also referable to this hybrid group.

**DD. Infl. small and loose or flat-topped: plants lower.**

4. *ovata*, Linn. *(P. carolina, Linn. P. *triflora*, Maud.). A foot or two tall, the st. erect from a short decumbent base, glabrous or very nearly so: lvs. narrow-ovate to oblong-lanceolate, the lower ones tapering to base and the upper ones somewhat clasping: fls. pink or light red, about 1 in. across, the straight or slightly curving tube twice or more longer than the rather short and broad calyx-teeth. Pa. to Ala., mostly in elevated regions. B.M. 528. Gn. M. 2:188.

5. *glaberrima*, Linn. Fig. 2912. Differs in somewhat taller growth, linear-lanceolate to narrow-lanceolate taper-pointed, firm nearly veinless lvs. which have revolute margins, and in the narrow very sharp-pointed calyx-teeth. Va. to Wis., and south to Fla.
PHLOX


2913. Phlox divaricata (x 3½).

cc. Plant distinctly hairy or pubescent (exceptions in No. 9).

d. Sterile, prostrate or running shoots arising from the base of the plant.

6. divaricata, Linn. (P. canadensis, Sweet). WILD SWEET WILLIAM. Fig. 2913. Sts. slender, pubescent, 10-18 in. tall: lvs. varying from linear-oblong to ovate-lanceolate, mostly acute: fls. in small cymes terminating short branches, 1 in. across, blue or pinkish blue, handsome and somewhat fragrant, the corolla-lobes ofter notched, the calyx-lobes narrow and subulate. Woods and copses, in lowish grounds. Que., west and south, to Fla. and La. B.M. 163. G.F. 7:256 (reduced in Fig. 2913). Gn. 60, p. 291; 76, p. 45. G.L. 18:335. G.W. 2:155. Gn.W. 23:175. G.N. 22:187. —A very attractive early spring fl., often coloring the floor of woods. Prefers rich soil. Var. Laphamii, Wood. Lvs. ovate: fls. bright blue; petals obtuse and entire. This name is listed abroad; plant said to be stronger-growing and with longer-blooming season than the species. G.M. 55:556. —P. divaricata has received considerable attention from cultivators abroad.

7. stolonifera, Sims (P. répiana, Michx.). Low and weak, the flowering sts. reaching 6-12 in., the sterile ones long and prostrate, the plant thinly glandular-hairy: lvs. short-ovate or obovate, more or less obtuse: fls. few in each cyme, purple or violet, the lobes mostly entire, the calyx-lobes narrow and subulate. Pa. and Ky. to Ga., mostly in the upper regions. B.M. 563.

9. pilosa, Linn. (P. aristata, Michx. P. cespitosa, Scheele). Sts. slender but erect, 2 ft. or less tall, pubescent or hairy (nearly glabrous forms occur): lvs. small, linear or linear-lanceolate, widest near the base, acuminate: fls. numerous in rather loose cymes, varying through purple, pink and white, the lobes entire, the calyx-lobes awn-like. Dry fields, woods, Ont. and Man. to Fla. and Texas, growing as far east as N. J. B.M. 1307. L.B.C. 1251, 1731. G.L. 27:117. Gn.W. 23:495. —Flowering sts. diffuse and branching, often creeping, sometimes cespitose: plants of more or less tufted habit.

cc. Corolla-lobes 2-3-parted or very strongly notched.

d. Peduncles usually bearing few to several slender-pedicelled fls.

10. bifida, Beck. Low, the sts. stiff and sometimes almost woody and often 1 ft. long and rising 3-8 in. from the ground, minutely pubescent: lvs. linear and rigid, 2 in. or less long: fls. scattered, violet-purple, the lobes 2- or 3-cleft as far as the middle or farther into narrow spreading segm. Prairies, Mich. to Mo. and Tenn.—Rarely cult.

11. Stellaria, Gray. Fig. 2914. Stellaria-like: glabrous: lvs. linear, sparingly ciliate toward the base: fls. scattered, usually long-peduncled, pale blue to whitish, the lobes cleft only at the apex into short oblong parts. Lexington, Ky., to S. Ill. and Tenn. G.F. 1:257 (adapted in Fig. 2914). —How much, if any, of the P. stellaria of the trade is this species and how much is forms of P. subulata, is to be determined.

cc. Corolla-lobes shallow-notched or entire.

d. Peduncles usually bearing few to several slender-pedicelled fls.

12. subulata, Linn. (P. setacea, Linn.). GROUND PINK. Moss PINK. Fig. 2915. Tufted or matted species, in many forms, the depressed sts. more or less
2916. Phlox adsurgens. (X)

2917. Phlox nana. (X)
nial; perhaps hybrid of P. paniculata and P. Drummondii. F.S. 8:606.—P. Lindenia, Hort., apparently of the P. subulata group, said to be a hybrid and useful for rockery and border.—P. navicula, Lind. The one Asian species, occurring also in Asia; a low loosely espicate species, 6-9 in. high, white-bdd., mostly villos-pubescent: lvs. narrow-linear: corolla-lobes ochraceous or emaragine.

PHENOCHOPHORIUM: Sterenoxia.

PHNIX (Theophrastus gave this name to the date palm, perhaps thinking of Phoenix, where the Greeks were supposed to have seen it, or of the Phoenician purpl, or of the fabled bird of Egypt). Palmaeae. A distinct and exceedingly useful genus of palms, planted for fruit, ornament and shade.

Palms with spiny, spineless (in many species the lower extra, are reduced to long stout spine-like processes), without trunks, or with stout or slender, short or long, erect or inclined trunks, often espicate, clothed above with the persistent bases of the lvs.: lvs. terminal, spreading, recurved, unequally pinnate; segms. somewhat fasciculate or almost equidistant, elongated lanceolate or oviform, acuminate, rigid, inserted by the wide base; margins entire or folded on their entire length; rachis laterally compressed, convex on the back; petiole plano-convex, usually spine, the very short, rigid pinnae; sheaths short, fibrous: spadices usually many, erect or nodding in fr., or pendent, appearing among the lvs.: peduncle strongly compressed: branches usually somewhat umbellate: spathes basilar, entire, long, compressed, 2-edged, coriaceous ventrally and at length dorsally divided; bracts usually obsolete; fls. small, in few to many, leathery, yellow: fr. a berry or drupe, elongated-oblong, orange, brown or black, the seed always globose.—Species 10-12, perhaps more, in Trop. and Subtrop. Asia and Afr.

The botanical monograph of the genus Phoenix by Beccari (in Malesia 3:345) admits only 10 species, although there are about 60 names. Such a "lumping" of species is very unwelcome to the horticulturist, and it is probable that nearly all the synonyms cited below represent forms that are abundantly distinct for horticultural purposes. The following account of the genus is adapted from the work of Beccari, especially the Asiatic species. A good horticultural appreciation of Phoenix is that by William Watson, of Kew, in G.O. III. 9:231, 298, from which liberal extracts are made below. Phoenixes differ from all other pinnate-Ivd. palms in having the lvs. folded back; petiole plano-convex, usually with the persistent bases of the lvs.: lvs. terminal, spreading, recurved, unequally pinnate; segms. somewhat fasciculate or almost equidistant, elongated lanceolate or oviform, acuminate, rigid, inserted by the wide base; margins entire or folded on their entire length; rachis laterally compressed, convex on the back; petiole plano-convex, usually spine, the very short, rigid pinnae; sheaths short, fibrous: spadices usually many, erect or nodding in fr., or pendent, appearing among the lvs.: peduncle strongly compressed: branches usually somewhat umbellate: spathes basilar, entire, long, compressed, 2-edged, coriaceous ventrally and at length dorsally divided; bracts usually obsolete; fls. small, in few to many, leathery, yellow: fr. a berry or drupe, elongated-oblong, orange, brown or black, the seed always globose.—Species 10-12, perhaps more, in Trop. and Subtrop. Asia and Afr.

An interesting novelty in Phoenix is the dwarf pinnate, which is native in the Laos region of Indo-China, where it was discovered by Mr. Roebelini, who went there regularly every year and exported the seed to Europe by way of Bangkok. It is specially abundant in the Nam Ou River Valley, and occurs also toward Puie Lay.

The botany of Phoenix is much confused, and no one knows what is planted in this country under the different names. The species hybridize freely, and it is probable that most of the cultivated forms are hybrids.
of various mixtures. While some of the garden names are considered by botanists to be synonyms, they may represent distinct plants to the horticulturist. Any treatment of Phoenix as represented in North America must now be tentative.

Cultivation of Phoenix.

In Florida.—In moist land no special care is necessary in setting out these palms. All they require is shade after the planting of small specimens, and a mulch of old grass or stable manure. They must be frequently tilled and fertilized. Always use a fertilizer rich in ammonia while they are making their growth. In autumn, a fertilizer containing 10 or 12 per cent of potash should be used, with a good addition of phosphoric acid. This will make the plants more hardy to endure occasional cold spells. On high dry pineland, holes 3 to 5 or 6 feet deep and wide should be dug for the large-growing species, and these holes should be filled with old stable manure, loam, muck, and clay. Plant in a saucer-like depression about a foot deep in the center, and apply a heavy mulch of old stable manure after the plant has been set out. If stable manure is not at hand, old leaves and grass may be used instead. Small plants should be well shaded for a year or so, and they also should be kept constantly moist during the dry season. All hardy palms should be set out in November, December, and January. One is not likely to be successful in transplanting them in the dry season from March to June.——In Florida, experience has been had with plants under the following names: P. canariensis is the most beautiful as well as the most massive of the tall-growing single-stemmed species. The trunk in young specimens is immense. It is a fast grower in rich moist soils, but very slow and unsatisfactory in high dry sandy lands. It is excellent

from the Canary Islands, if plants true to name are desired. P. tenax is only a more slender form of P. canariensis. It is easily distinguished by its greenish yellow leaf-stalks and spines. P. sylvestris is a very stately and beautiful palm with light bluish green leaves, growing well on high pineland but doing best on rich moist soils. There are hybrids between this species and P. canariensis.—The date palm, P. dactylifera, is common in many gardens, the product of seeds taken from the commercial dates bought in the shops. Most of the real date palms do not look beautiful. They are rather coarse, but a few of them show a dense crown of deep bluish green leaves. It often produces large bunches of orange-yellow juicy but rather bitter fruit. The mocking-birds are very fond of it. The foregoing three Phoenix, rather hardy as far north as Jacksonville. The remainder are all more tender.—

P. reclinata is a most beautiful palm with slender stem and a dense crown of reclining leaves. Great confusion exists concerning this fine palm, as quite a number of the species having more massive stems and much broader and more spiny leaves are labelled with this name. The true P. reclinata, as understood in Florida, has soft leaves, and the leaflets are scarcely spiny. Although it suckers, the offsets are not so abundant or so vigorous as in the plant known as P. canariensis. It is really a one-stemmed species. The trunk is very slender, scarcely more than 4 or 5 inches in diameter. It grows as well on high dry pineland as in moister and richer soil, but the growth is much more rapid in the latter soil.——P. spinosa, from a horticultural standpoint, is very distinct from the last. The leaves are very vigorous, deep green, and half leaflet terminates in a very sharp spine. The foliage is so extremely spiny that it is very difficult to trim the plants. This palm always grows in clumps of five or six or more stems, and it attains a height of 25 to 30 feet. The trunks are rather rough and massive, 9 or 10 inches in diameter, and the leaves are recurring, as in the last.—P. farinifera, or the palm grown in Florida under this name, is similar in growth to P. spinosa, but the leaves are lighter green with a slight glaucous hue, and the spines on the leaflets are even more formidable. The leaves, particularly at their lower end, are covered with a fine mealy substance.—P. zebrina is one of the most beautiful and distinct of all the Phoenixes, with the color of the Colorado blue spruce. If single stems are desired, the suckers should be removed as soon as they appear. This species thrives on rich and low land, as P. leonensis, by botanists referred to as R. reclinata, grows in large dense clumps 10 to 12 feet high, scarcely forming trunks. The leaves are deep green, rather soft to the touch and not spiny. Only the petioles are provided, as in all these palms, with formidable spines. It blooms in spring, and fruits abundantly in winter. It grows evidently best on high pineland.——P. paludosa forms large clumps, and massive trunks from 1 to 1½ feet in diameter and 15 to 25 feet high; a strong grower but rather coarse in appearance. It grows well on high and low lands.—P. acu/us does not form trunks. It is a low, very rigid little palm. The leaves are so spiny that it is difficult to walk among the clumps.—P. rupicola (P. ceyadifol/us) is the most elegant and beautiful of all the Phoenixes in central Florida. Specimens 6 to 7 feet high look extremely beautiful. The leaves are glossy green and very smooth, suggesting the foliage of some species of Cycles. They are elegantly curving to all sides, and as the leaflets are all arranged horizontally in one plane, well-grown specimens form objects of great beauty. It grows well only in rich moist soil and half shade.—P. Roebelenii is a dainty little Phoenix now represented in many Florida gardens, but it grows well only in rich moist soil and in half-shady spots. The leaves are so small in grace, elegance, and beauty. (H. Nehring.)

In California.—The number of species and varieties of Phoenix grown in California is a problem so complex

——2919. Phoenix Roebelenii of horticulturists, considered by some botanists to be a form of P. humilis.
that one dares not attempt a solution. The nursery trade recognizes the following names: *P. canariensis*, *P. cycadifolia*, *P. dactylifera*, *P. leonensis*, *P. Roebelmanni*, *P. reclinata*, *P. rupicola*, *P. sylvestris*, and *P. tenuis*. Occasionally other names are met with in private collections, but no others appear in California plant catalogues. All are considered hardy except the dwarf *P. Roebelmanni*. Specimens of *P. dactylifera* grow as high as 100 feet. Some specimens grown from seed saved from commercial dates have made 50 feet of trunk in thirty years, while others of the same seedling have made but 8 feet. Either there are numerous hybrids in California or else some species that no one knows. Specimens are known in all shades of green and glaucous-green, all habits of growth, stiff and upright, pendulous and soft, narrow leaves and broad ones, slim-folded and wide-spreading, the latter like an inverted leaf of *Jubaea spectabilis*. No one has attempted to straighten them out. The only species easily recognized everywhere and by everyone is *P. canariensis*, the gem of the genus. This is regarded by one eminent Californian nurseryman as a garden hybrid, but it always produces fertile seeds, and seedlings from it do not vary, which cannot be said of any other phoenix here. Next in popularity comes *P. reclinata*; the others are found only in collections. *P. canariensis* is most easily removed from the ground, and the best time is August and September, the hottest weather, as then they recuperate faster. The only other time to remove is in the early spring, before growth, and then if the weather turns cold it is dangerous. (Ernest Braunton.)

In the North.—Although phoenixes cannot be considered to be as decorative subjects as the loweas and chrysalidocarpus, they are among the hardiest of palms. For any unfavorable situation where any palm can be expected to thrive, recommend a phoenix. Outdoors they endure the hottest sunshine without losing a particle of color, whether placed in jars, vases, or beds. As house-plants they are unequalled for resistance to neglect. They also bear the tying and untying and the crowding and the wear and tear of public decorative work better than any other palms. The date palm is not quite so graceful as *P. rupicola*; *P. leonensis*, or *P. spinosa*, is slightly stiffer than *P. rupicola*, but very handsome. Other kinds useful to the florist are *P. canariensis*, *P. farinifera*, *P. pumila*, and *P. tenuis*. (This paragraph has been adapted from an article in Scott's "Florists Manual" which embodies the experience of Mr. Sc. 4 and of the undersigned. (W. H. Taplin.)

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(Various other names will be found in horticultural literature but the following comprise those known to use American trade.)

aa. **Texture of lfts.** faccicd.

b. **Arrangement of lfts.** 2-ranked.

c. **Form of lfts.** lanceolate.


25V3 25V3

aa. **Texture of lfts.** rigid.

b. **Arrangement of lfts.** 2-ranked.

c. **Form of lfts.** lanceolate.


c. **Form of lfts.** eniform, with filiform tips.

3. *paludosa*, Roxb. In groups in the wild state, almost tree-like; trunks 8-25 ft. high, 3-4 in. diam., often reclining, annulate: lvs. 8-10 ft.; lfts. 1-2 ft.

2020. **Phoenix palm.**—An unusually straight-trunked specimen of the *P. dactylifera* group.
PHORADENDRON

opposite and alternate, 2-ranked, ensiform, with filiform tips, whitish or mealy beneath; petioles 3-5 ft. long, slender, scurvy, with many long spines; sheath fibrous: fr. black-purple. Along rivers and bays. Trop. Asia; R.H. 1912, p. 425.

v. Arrangement of lfts. 2-4 or many-ranked.

b. Position of lfts. equidistant.

c. Color of lvs. dark green.

1. psulsa, Gaertn. (P. farinifera, Roxb.). Shrubby; caudex at most 4 ft., thickly clothed with old lft.-sheaths; petiole with 1 pair of spines; lfts. subopposite, 4-ranked, ensiform, rigid, purplish green: fr. black.

2. Ceylon. S. India.—The caudex is said to have a farinaceous pith, and the foliage to be so spiny that it is impossible to walk through clumps of it.

d. Color of lvs. light green.

5. zeyplovca, Hort. (P. psulsa, Becc., not Gaertn.). St. 8-20 ft. high, rarely much shorter: lvs. rather short; lfts. very many, recurved, drooping; lfts. subopposite, 4-ranked, ensiform, rigid, purplish green: fr. black.

6. hulmiis, Royle. Sts. stout, tufted, bulbiform, rarely elongated: lvs. subglabrous; lfts. scattered, interruptedly fascicled. Very close to P. annulata, but distinguished by the very long-peduncled, fruiting spadix. Hilly districts of India. Var. Hanceana, Becc. (P. Hanceana, Hort.), from China, is cult.

7. Roebelii, O'Brien. Figs. 2918, 2019. Lvs. 1 ft. or more long; lfts. 5-7 in. long, shining, dark green, soft, curved, subglabrous, often approximate, mostly falcate, not spinous at the tip. Assam to Cochin-China. Var. Hanceana, Bec. (P. Hanceana, Hort.), from China, is cult.

cc. Position of lfts. grouped or fascicled.

b. St. bulbiform: lvs. short.

e. Lfts. scattered, irregularly fascicled.


ee. Lfts. in nearly opposite fascicled.

8. acacioides, Buch. Caudex bulbiform, 8-10 in. diam., densely clothed with spathes and bases of spiny petioles; lvs. 2-6 ft.; lfts. in subopposite fascicles, many-ranked, 2½-3½ ft. long, very rigid, somewhat glaucous, marginal nerve very strong; petiole 1 ft. or more, with many spines: fr. bright red to blue-black. India.

d. Lvs. short.

e. Lvs. very slender.

9. phlebea, Hort. St. slender, graceful, 6-10 ft.; lvs. 10-16 in. long, recurved, drooping; lfts. 8-12 in. long, 4-ranked. Gt. 20, p. 173 (descrip.).


ff. Foliage glabrous.

11. sylvestr'is, Roxb. St. solitary, stout, 25-40 ft. high, clothed with persistent petiole-bases, the crown very large: lvs. 10-15 ft., glabrous, grayish green; petiole spiny; lfts. 1-2 ft., fascicled, 6-18 in. long and 2½-1 in. broad, 2-4-ranked, rigid: fr. orange-yellow, the seed rounded at both ends, pale brown. Very close to P. dactylifera and perhaps the origin of that plant. India. T.H. 10:351. V. 16:101. F. 1872, p. 29. Gn. 54, p. 117. E. H. Hart is highly praised.

ff. Foliage glabrous.

12. dactylifera, Linn. (P. eydoidfolia, Hort.). Date. Palm. Fig. 2920. St. erect, to 100 ft. and more: lvs. glaucous, arculate-scylling; lfts. linear-lanceolate, neuminate, 6-16 in. long, strongly complicate, the lower 4-ranked, the upper 2-ranked, irregularly and remotely aggregate: fr. cylindrical-elliptical, 1-2 in. long. Arabia, N. Afr. R.H. 1893, p. 127; 1912, p. 109. G.W. 11, p. 24. Var. excelsa, Hort., is cult. in Fla. See Date.

P. andamananus, Hort. Similar to P. rupia, but more elegant, differing from those in cult. by the regularity of its pinnae and narrowness of the terminal one. Andaman Isls.—T. dumosus, Hort. Soil. 1893. Of "dwarf habit" and grown to botanists. —P. natalensis and var. caeruea are offered, but no description is available.—P. panckae and var. Sandbergii. Presumably intro. within recent years by Sandberg & Co., St. Albans, England.

PHOLIDOCARPUS (Greek, scale and fruit; the fruit is covered with a scaly coat). Palmae. A palm of the oriental tropics. Trunk tall: lvs. orbicular, 4-5-parted; petiole spiny: fr. globose or ovoid with a tessellated pericarp; seed laterally inserted. About 5 species, Malayasia, all very imperfectly known. One species, P. How, Blume, is sometimes grown in the warmhouse and may be suitable for outdoor growth in S. Calif. This has lvs. similar to those of Borassus flabelifer, the petioles are armed with stout spines, the spadix loosely branched and the drupe ovoid, about as large as a fair-sized hen's egg, the rind rough and tessellated and has 3-seeds. Malayasia.

PHOLIDOTA (Greek, scale and ear; the scales of the unopened racemes are said to recall the rattle of a snake). Orchidaceae. Orchids with the habit of Cero­logyne, to be grown in a warmhouse, 55° to 65°. Rhizome's creeping: pseudobulbs consisting of a single internode: fls. small, short-peduncled, in slender racemes, each with a large bract; sepals and petals short, broad: labellum excavated or sac-like; column very short, winged around the top.—A small genus containing about 20 species, natives of India, S. China, and the Malay Archipelago. For cult., use strong light rich potting material, broken pots, old dry cow-manure, plenty of drainage. Do not allow to become very dry.

imbricata, Lindl. Pseudobulbs oblong sulate; lvs. oblong-lanceolate, plicate, 6-12 in. long: raceme long-peduncled, 3-8 in. long; fls. small, rather crowded on the raceme, white or yellowish, with a shade of violet. Feb.—May. India. B.R. 1213; 1777. L.B.C. 20:1934.

chinensis, Lindl. A small creeping epiphyte: pseudobulbs cespitose, 1-2-lvd.: lvs. oblong-undulate, acuminate: fls. greenish white, in drooping racemes not more than 2-3 in. long; sepals ovate; petals linear; labellum oblong, recurved.—This plant has long been known from Chinese drawings.

PHORADENDRON (Greek, tree thief). Loranthaceae. The mistletoe of E. N. Amer. is P. flavescens, Nutt. (Viscum flavescens, Pursh), Fig. 2921. It is parasitic on deciduous trees as far north as N. J. and S. Ind. and extending southward to Fla. and Texas; also Calif. R. 3:590. It makes dense bunches 1-3 ft. across, with thick oval or obovate yellowish green evergreen lvs. The forking twigs are terete, and break easily at the base. The fls. are dicous, borne in very
PHORADENDRON

2921. American mistletoe.-Phoradendron flavescens. (×¾)

2922. Phormium tenax.

short spikes or catkins: berries arther-white, globular, small. It is collected for Christmas greens (see Greens, Christmas). The Old World mistletoe is Viscum; see also Loranthus. (Trelease, Phoradendron, 1916.)

The phoradendrons are not cultivated. There are about 100 species of them, all American, largely tropical, but a few in the western states. The oak mistletoe of California is P. villosum, Nutt. A related genus is Areuthobium (or Razousomofskyia), extending across the continent of North America, but too small, or even minute, to have decorative value.

PHORMIUM

Greek, basket; referring to one use to which this fiber plant is put. Liliaceae. New Zealand Flax.

Very stout rigid perennial herbs prized in subtropical gardening, and in New Zealand used for fiber.

Leaves all radical from a short and stout branched fleshy-rooted rhizome, long-enamiform, equitant, yielding an exceedingly tough fiber: scape tall and leafless, with caducous bracts, short-branched toward top: fls. dull red or yellow, in a terminal panicle, on jointed pedicels; perianth tubular and curved, of 6 segms. connate at base, the 3 inner ones long and spreading at tip; stamens 6, exceeding the segms.; ovary oblong and 3-angled and 3-celled, bearing a slender declinate style: capsule oblong or narrower, loculicidal, bearing many compressed black seeds.-Species 2, in New Zealand and Norfolk IIs. These plants are popular outdoor subjects in Calif. and climates of like mildness, making very bold lawn clumps. In regions of cold winters, they are known as greenhouse tub-plants or as subjects for planting out in summer in subtropical bedding. They are prop. by seeds or division; if by the latter method, it is well that they be planted outdoors in sandy soil in May and divided in September.

For certain combinations and in places where it can have plenty of moisture, Phormium tenax is a valuable plant, having very distinct and unusual character all its own. The type is easier of cultivation than the variegated kinds. Much better results can be secured by raising the typical form from seeds than by division. Seed sown in February and grown on rapidly will make in May and divided in September.

The seedlings may be either planted out or potted in a well-furnished specimen 3 to 3½ feet high in a 6-inch pot. If one can afford room in a greenhouse, so much the better. The variegated forms require partial shade and uniform moisture; they do not come true from seed. (J. F. Cowell.)

A. Lvs. to 9 ft. long (in the wild), deep green, glaucous beneath, usually margined with a colored tinge. .

B. Leaflets 5 to 10 or even 15 ft. high, terete and glabrous, reddish purple, bearing numerous fls. which are usually dull red but varying almost to pure yellow; perianth 1 to 2 in. long: caps. stout, erect or inclined, 2 to 4 in. long. B.M. 3119. Gn. 26, p. 397; 30, p. 770; 70, p. 79; 73, p. 123. G. 33:533; 83:544. F.E. 18:288. G.L. 27:219.


The type and varieties all have the red margin. Var. Poverscourchii, Hort., differs from the type in narrower and more rigid lvs.; said to be hardier and freer-blooming. G.W. 1907, p. 3. - P. tenax is a most useful fiber plant in New Zealand, ranking in economic importance in the native flora only below the main timber trees.

AA. Lvs. to 5 ft. long, pale green, seldom glaucous or margined.

Cookianum, Le Jolis (P. Colensoi, Hook. f. P. Forsterianum, Col. P. Hoekeri, Gunn.). A smaller plant and less rigid: lvs. 2 to 3 ft. long, the apex usually much less split than in P. tenax: scape 5 to 7 ft. high, more slender, green, with smaller panicle; perianth 1 to 1½ in. long, yellower than the above: caps. long, pendulous, terete and twisted, 4 to 7 in. long. Var. variegatum, Hort., has yellowish white stripes. F.M. 1874:112. G. 33:553; 36:554. F.E. 18:288. G.L. 27:219.

PHOTINIA

(Greek, photeinos, shining; alluding to the shining foliage). Including Heteromeles and Porocarya. Rosaceae, tribe Pomeae. Ornamental woody plants, grown for their attractive flowers and fruits and the evergreen species also for their handsome foliage.

Deciduous or evergreen shrubs or trees: lvs. alternate, short-petioled, stipulate, usually serrate; fls. in corymbs or short panicles; petals 5, or seldom 6; stamens 10 to 20; styles 3, rarely 5 or 4; capsule at the base: fr. a small, 1- to 4-seeded pome with persistent calyx and with the top of the fr. rounded and hollow.—About 30 species, nearly all in E. and S. Asia, only 2 in Calif. and Mex.
PHOTINIA

Closely allied to the Aria group of Sorbus, which differs chiefly in the top of the fr. being solid and pointed.

The photinas in cultivation are shrubs, rarely trees, with rather lax evergreen or smaller deciduous leaves, turning scarlet or deep red in fall and with white flowers in many-flowered or sometimes few-flowered corymbs followed by very attractive red or scarlet fruits. The evergreen species are tender in New England, and bear only a few degrees of frost; but the deciduous P. villosa is hardy as far north as Massachusetts, and is very conspicuous in fall by the scarlet coloring of the foliage and afterward by the numerous scarlet fruits, which retain their bright color until midwinter and are not eaten by birds. Of the evergreen species, P. arbutifolia, which is very similar to P. serrulata and also to P. glabra, is the best known; it is a very striking object in winter, with its large clusters of bright red fruit ripening in December and contrasting well with the glossy dark green foliage. The photinas are not very particular as to soil, but thrive best in a rather light sandy loam, and the deciduous ones prefer sunny positions. Propagation is by seeds or by cuttings of half-ripened wood under glass and by layers; also by grafting on hawthorn or quince.

A. Lvs. deciduous; fls. in corymba or umbels. (P. variabilis, Hemsl. P. subumbellata, Rehd. & Wilson.)

b. Upright shrub, to 15 ft., with slender spreading or upright branches, or small tree: lvs. short petiolate, broadly ovate to oblong, acute, acuminate, sharply serrate, dark green and glabrous above, more or less pubescent beneath when young, 1½-3 in. long: fls. white, in 1½-2-in.-broad, glabrous or villos pubescent terminal on short lateral branches: peduncles warty: fr. about ¾ in. long, bright scarlet. June; fr. in Oct. Japan, China. G.F. 1:67. S.I.F. 1:49.-A very variable species. Var. lavis, Dipp. (P. lavis, DC. P. notabilis, arguta, Horst.). Fig. 2923, has narrower lvs., only sparingly pubescent when young and soon glabrous, glabrous and somewhat larger fr. G.F. 4:377 (adapted in Fig. 2923). Var. sinica, Rehd. & Wilson. Shrub or tree, to 30 ft.: lvs. thinner, elliptic or elliptic-oblong, sparingly pubescent at first, soon glabrous: inf. an umbel-like 3-5-fld. raceme, rarely corymbose, to 15-fld., loosely villos. Cent. China.

Closely allied to the Aria group of Sorbus, which differs from the handsomest evergreen trees of Cent. China; recently intro.; probably as hardy as the preceding species.


Davidsonia, Rehd. & Wilson. Tree, to 45 ft.; winter buds minute, acutish; branchlets appressed-pubescent while young; lvs. oblong-lanceolate or oblong, acuminate or acute cuneate at the base, pectinate or bright green above, paler beneath and pubescent on the veins at first, soon glabrous, 3-5 in. long; petioles about ¼ in. long; pendas 4-5 in. broad with slender terete branches, sparingly pubescent; fls. nearly ¼ in. broad: fr. subgloboso, orange-red, ½ in. across or slightly more. May: fr. in Oct. Cent. China.–One of the handsomest evergreen trees of Cent. China; recently intro.; probably as hardy as the preceding species.


2923. Photinia villosa var. lavis. (X ¾)

PHOTINIA

ALFRED REHDER.
PHOTOGRAPHY, HORTICULTURAL. As a means of description and of record, photography is of great importance to horticulture in all its branches. A reference to newspapers, magazines, and to trade catalogues of the day shows almost universal use of the "half-tone" engraving process; and these engravings are merely photographs transferred to a copper plate, and by means of minute chemically-etched dots given a printing surface for the typographic press. Many other means— notably motion—pictures— and photography—are adapted from or drawn directly from photographs, being then engraved by another photographic etching process on hard zinc. Other processes are now employed, as yet principally for newspaper use, which transform directly the best of the photographic work come from the professional; twenty times does satisfactory and efficient horticultural photographer is engaged, some special skill and certain precautions are necessary to secure the best results.

Every experiment station and agricultural college finds in photography an indispensable adjunct both to its research and descriptive work. For the botanist, photography provides both an uniquely accurate means of recording plant details, and of portraying the appearance of the growing plant in its habitat. A photographic herbarium is an excellent supplement to the usual dried specimens, and seed establishments are also coming to maintain photographic equipments, in order that they may readily preserve views of the varieties which it is desired to advertise.

In horticultural journalism, photography is of prime importance. In advanced colleges and at the meetings of various horticultural societies and institutes, the presentation of photographs by means of the stereopticon is found to be of considerable advantage, and the teaching or entertainment through the photographs method. As will be noted farther on in this article, there is also actual photography in colors now available. To a limited and decreasing extent, photographs are also printed on the prepared surface of boxwood blocks, and used in lieu of a drawing as a sketch for the wood-engraver.

Apparatus.

For views outdoors of trees, plants, and the like, any view camera of the regulation or of the "folding" type will answer, although, as it is often desirable to obtain relatively large details from trees or flowers, the plate size is that which a plate 3 by 7 inches in dimensions. For such size a rectilinear objective is preferable. A focal length of 5 inches is advisable; and if one of the two lenses forming the combination is available as an objective of about double the focal length of the combination, and the camera is provided with a bellows which draws out several inches beyond the focal length of this single lens, much facility in operation is provided. Any of the modern high-class view lenses are suitable, and those of the anastigmatic type, which are not only rectilinear but also render views in a flat and correct perspective, are preferable. It need not be assumed, however, that the very highest-grade lens is essential, for in the hands of a thoughtful and reasonably skilful operator, an ordinary rectilinear lens, costing, for the size mentioned, but $15 or $20, will often do satisfactory work. Whatever lens is used, it should be fitted into a quick-working shutter, as outdoor exposures, with modern rapid plates, must be made in small fractions of a second. The shutter, it may be explained to the unacquainted reader, is a convenient device for opening and closing the lens to the light for the interval of time desired by the photographer.

As there is frequent misconception of the work done by a lens, it may not be amiss to suggest to the inquiring horticultural photographer an investigation on his own account. The Photo-Miniature No. 140, "Lens Facts You Should Know," is a brief, clear, and concise statement of the principles, properties, and construction of lenses, which may be of real advantage. The focal length of any lens, in connection with the size of the plate upon which it is to be used, determines the angle and amount of view included. The human eye is a lens of about 16 inches focal length, and to have a photograph render perspective as seen by the average eye, an objective of the same focal length is required. Thus, on a 5 by 7 plate, a lens of 8 inches focal length will include twice as much in the view, and show it in half the size as seen by the average eye. This comparison of focal length is sometimes desirable and sometimes unpleasant. If the 8-inch lens is composed of two elements on what is known as the symmetrical plan, the rear element may usually be used alone (by screwing out the front lens), and it will have approximately double the focal length of the combination. This will give the perspective seen by the human eye, and will be needed to be used in connection with a bellows of at least the same length or "draw" as the focal length of the lens. Some of the high-grade lenses are now made on what is termed the "convertible" plan, each of the two elements being of a different focal length. Thus a certain lens which as a whole is of 7½ inches focus, includes one element of 12 inches focus and one element of 18 inches focus. Either of these single lenses, or the combination, may be used separately, so that from a given position three views, including proportions differing as 5, 8, and 12, may be made.

To photograph an object in natural size, the double lens is preferable. If the lens is of 8 inches focus, it will give natural size when placed equidistant between the object and the ground-glass focusing-screen of the camera, at double its focal length. Thus the field of view which would graphic work drawn out so as to have 16 inches between the ground-glass and the lens, while the object to be photographed should be maintained in position 16 inches from the lens.

A tripod, capable of adjustment as to height, and of
sufficient rigidity to sustain the camera in a moderately high wind, is easily obtained. The cheaper forms are fairly efficient, but the photographer who has much traveling to do finds it preferable to obtain one of the more expensive and carefully fitted types, which fold into a smaller compass.

For indoor work, including the making of photographs of fruits, flowers, or plants in large detail, a special form of camera-stand is very desirable. One arranged so that the camera may be maintained in an inclined or nearly vertical plane, while the object to be photographed rests on a plate-glass exposing-stand in front of the lens, gives great facility and ease of operation, and does away with many difficulties of illumination. A few experiment stations possess devices of this kind. A form which has been found exceedingly satisfactory in practice is described in an out-of-print number of The Photo-Miniature, "Photographing Flowers and Trees," and is here reprinted by permission in Figs. 2924 and 2925, showing the camera-stand both as arranged for horizontal and for vertical work.

In operation with this device the flower, fruit, or plant to be photographed is laid upon or placed in front of the plate-glass stand, and the camera, fastened by its tripod screw upon a movable bed, is adjusted as a whole, or through its bellows, until the desired size and focus are secured. The background may be varied as desired by cardboards or cloths placed out of focus in relation to the plate-glass stand. The camera-stand is mounted on casters, so that it may be readily moved about to secure the most favorable lighting. Objects which can best be handled on a horizontal plane may be disposed somewhat as shown in Fig. 2924. For work of this sort a north side-light is found vastly preferable to the conventional sky-light. A greater mistake in the equipment of a studio for horticultural work could not be made than to provide the sky-light deemed essential by old-fashioned professional photographers, although now happily abandoned by the more progressive workers for a "single-slate" light, which gives far better results. There should be provided in the workroom of the horticultural photographer several good reflecting surfaces, so that the side of the object opposite the main source of light may be properly illuminated.

All the apparatus above mentioned is applicable to color-photography by the Lumière method, as hereinafter sketched, but motion-picture photography requires apparatus peculiar to itself.

Under certain conditions, the use of the "flashlight" methods may be advantageous in horticultural photography; as, when an outdoor object must be obtained at night, or indoors where a flower may wilt under prolonged exposure. Flashlight processes depend upon the explosion or the rapid combustion of certain metals—such as magnesium—which, either alone or in combination with oxygen-giving chemicals, produce a light of great brightness and high actinic power for an instant. Further information upon flashlight may be found in The Photo-Miniature No. 135, "Flashlight Photography."

The horticultural photographer also requires an outfit for developing and printing; but as this may be conventional, it is not deemed necessary to discuss it here.

Plates and color-values.

As practically all horticultural photography has to do with the tints of growing things, the well-known color inaccuracy of the ordinary dry-plate is a serious disadvantage. The ordinary plate responds most actively to the rays at the blue end of the spectrum, and is very sluggish in taking an impression from green, yellow and red, the latter color, indeed, being rendered practically the same as black. Yellow, which in actual color-value is on a par with light blue, and sometimes to the eye seemingly more intense than white, is rendered by the ordinary plate as a dark color, as all operators who have photographed yellow roses, yellow apples, yellow plums, and the like, will have observed. Fortunately, there are available photographic plates known as isochromatic or orthochromatic plates, which, to a certain extent, correct these difficulties,
Lantern-slides.

A lantern-slide is a positive on glass, and therefore is made from a negative. It is made preferably from a special plate, much slower than the regular photographic dry-plate, because coated with silver chloride rather than a silver bromide emulsion. The slide is usually faced with a paper mask, so as to include only the desired portions of the picture, and protected by a cover glass. Negatives of any size may be used if a suitable arrangement is provided for reduction. This can readily be arranged by an adaptation of the camera-stand illustrated in Fig. 2924. A pair of light bars is added, running from the top of the plate-glass frame to a support at the other end of the stand, and a piece of heavy muslin or light canvas thrown over this serves to exclude the excess of light. A ground-glass frame is added back of the plate-glass, which latter is removed to give place to a turn-table arrangement, made to take and hold negatives of various sizes. In practice, the ground-glass end is turned toward the strong light, the negative to be used is adjusted in the turn-table, and the image focused in the camera. The 5 by 7 size largely used by horticulturists is in just the right proportion for the ordinary lantern-plate of American practice, which is 3¼ by 4 inches. Slides may also be made by contact, if the negative to be used is of suitable size. The 5 by 7 size is particularly suitable for smaller 4 by 5, 3½ by 3½, and 3¼ by 4½ hand-camera films are often so used, being placed in contact with a lantern-plate in an ordinary printing-frame, and given a short exposure to an artificial light. Such slides are seldom of good quality.

If it is required to make lantern-slides from diagrams, engravings or any positive material, a negative is first prepared, for making which the vertical position of the camera-stand (Fig. 2925) is very convenient. For many diagrams and for most "reading slides," there is much advantage in making the slide directly without the intervention of a negative, with the result that the letters or lines are shown as clear glass. The audience sees only the message or object, the background being dark; and the excessive light reflection, tending to tire the eyes, is avoided.

In making lantern-slides, it is important to learn the proper exposure, for errors in exposure cannot be corrected in development to any great extent. The careful worker will expose several plates upon the same subject, give all the same development, and act upon the experience thus gained. The standard all too often accepted by those who use lantern-slides is unfortunately low. Manufacturers competing wholly on the lowest price basis have accustomed even thoughtful persons to think their productions adequate, instead of which they are unfortunate, because they believe rather than reproduce the object to be shown.

Lanterns for projecting these slides are now simple, convenient, and cheap. One form, available wherever access may be had to an electric-light socket, can be carried in a small case and set up for use in less than ten minutes. It perfectly projects an image up to 6 or 8 feet in diameter, and is without complications. Built of aluminum, it is solid and durable, and its cost is but one-fourth that of former apparatus.

Colored lantern-slides.

The value of a good lantern-slide is increased more than tenfold if the slide is so colored as to show upon the screen the object or scene in natural hues. It is not difficult, with suitable knowledge and sufficient practice, so to tint the lantern-slide as to accomplish this object. But lack of action on the part of colorists whose work has given information and pleasure to thousands.

In practice, if a lantern-slide is to be colored, it is upon development by means of a suitably compounded developing solution.

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and the skilful operator may, by the use of the proper plate, in some cases a suitable ray-filter, give approximately correct values to all the colors of the spectrum. For all ordinary horticultural uses, when blue and yellow are not found in the same subject, the commercial orthochromatic or isochromatic plates of the most rapid speed are satisfactory. These give to yellow its proper value, at the same time improving the rendering of the green foliage and slightly increasing the truth of representation in pink, lavender, and the lighter red shades.

It is very much better, then, for the photographer who has to do with horticultural work to confine himself exclusively to these plates for all his work. If he has a subject including blue flowers, the especial activity of the blue rays, which otherwise would render the photographic impression as intense as if the object were white, can be restrained by a suitable ray-filter, which is applied in front of the lens. This ray-filter is either a glass cell filled with a 1 per cent solution of potassium bichromate, a piece of plate optical glass covered with a suitably stained colloidion film sealed with another optical glass and provided with a convenient mounting for slipping on the lens. (Such ray-filters may be commercially obtained at small cost, but ought to be known to be adequate for the particular plate to be used.) With this ray-filter and the plate before alluded to, the yellow is slightly over-valued, but the blue is given its proper relation. The beauty of outdoor photographs is vastly increased by the use of the ray-filter mentioned, because a proper color-value is given to the sky, and the cloud-forms are preserved in all their attractiveness. If the subject is a heavily loaded peach tree, for example, the accentuation of the yellow, brought about by the presence of the ray-filter, will give a needed slight exaggeration of color-value to the fruit, which, under treatment by an ordinary plate, will be almost indistinguishable from the mass of foliage. With the usual ray-filter the exposure required is practically trebled. In the collodion about the advantage has been taken of orthochromatic plates in photographing many of the subjects. The carnations, Plate XXII, show a variety of shades of pink and purple, and the image focused in the camera as usual. The 3½ by 4½ hand-camera films are often so used, being placed in contact with a lantern-plate in an ordinary printing-frame, and given a short exposure to an artificial light. Such slides are seldom of good quality.

Diagram and reading slides.

If it is required to make lantern-slides from diagrams, engravings or any positive material, a negative is first prepared, for making which the vertical position of the camera-stand (Fig. 2925) is very convenient. For many diagrams and for most "reading slides," there is much advantage in making the slide directly without the intervention of a negative, with the result that the letters or lines are shown as clear glass. The audience sees only the message or object, the background being dark; and the excessive light reflection, tending to tire the eyes, is avoided.

In making lantern-slides, it is important to learn the proper exposure, for errors in exposure cannot be corrected in development to any great extent. The careful worker will expose several plates upon the same subject, give all the same development, and act upon the experience thus gained. The standard all too often accepted by those who use lantern-slides is unfortunately low. Manufacturers competing wholly on the lowest price basis have accustomed even thoughtful persons to think their productions adequate, instead of which they are unfortunate, because they believe rather than reproduce the object to be shown.

Lanterns for projecting these slides are now simple, convenient, and cheap. One form, available wherever access may be had to an electric-light socket, can be carried in a small case and set up for use in less than ten minutes. It perfectly projects an image up to 6 or 8 feet in diameter, and is without complications. Built of aluminum, it is solid and durable, and its cost is but one-fourth that of former apparatus.

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The value of a good lantern-slide is increased more than tenfold if the slide is so colored as to show upon the screen the object or scene in natural hues. It is not difficult, with suitable knowledge and sufficient practice, so to tint the lantern-slide as to accomplish this object. But lack of action on the part of colorists whose work has given information and pleasure to thousands.

In practice, if a lantern-slide is to be colored, it is...
PHOTOGRAPHY

usually made slightly less dense or "contrary" than if it is to be shown without color. A photographer's retouching stand, which excludes light from the eyes of the worker and reflects light through the ground-glass and also through the slide to be colored, is needed. Coloring is effected by means of the use of dyes and stains of various characters, usually obtainable in the market. The color is applied by the use of brushes of varying sizes. The capible worker constantly compares the result of his efforts, either with standard slides of high quality or through projection upon a screen by means of a small lantern.

One reason why colored lantern-slides are so much more effective than those uncolored is in their exclusion of excessive light, which tends to dazzle and weary the eyes of the spectator, as previously suggested. Thus, a sky is blue and agreeable rather than white and dazzling.

Transparent colors must be exclusively employed, inasmuch as the effect to be obtained on the screen through projection is wholly that of transmitted light, and not by reflection.

The use of lantern-slides in general and of colored lanterns in particular for educational purposes has been greatly fostered by the action of several states in establishing departments of visual instruction, in which are grouped collections of carefully made lantern-slides upon various subjects, frequently available to residents of the particular states without other charge than transportation and a responsibility for damage. Pennsylvania, New York, Washington, Illinois, and Kansas are known to maintain such departments.

Motion-picture photography.

Reference has been made to the recent development of motion-picture photography. Motion-pictures are at present being viewed by millions of people daily in the various centers of population in the United States, but as yet little organized effort has been put forth for preparing motion-pictures primarily for educational purposes. Through the federal government, and in the Department of the Interior, the national parks are brought into notice by means of motion-picture films; and it is probable that a motion-picture outfit, both for the making of the exposures and for the proper display of the results, will shortly become an essential factor in connection with any modern educational institution. Particularly in reference to horticulture it is probable that the motion-picture will show to advantage orchard and planting operations, and the growing of great crops (as before mentioned in connection with asparagus, for example), and similarly will teach quickly and entertainingly many things now less adequately presented.

Photography in natural colors.

Many investigators have worked on this problem, but without what might be called reasonable and available success, until, in 1907, the Lumière brothers, acute opticians and plate manufacturers at Lyons, France, painstakingly developed what is known as the autochrome process. This process uses the known but unappreciated fact that color is not an inherent property of matter, but a sensation of the eye relating wholly to the character of light reflected from any object. Exceedingly minute particles of nearly transparent starch, colored to three primary hues, are intermingled and spread in a single layer over the surface of a glass plate, and upon this layer there is coated a sensitive and so-called panchromatic photographic emulsion. These minute starch particles, averaging about 5,000, 600 to the square inch, serve when the prepared plate is exposed glass side to the object (contrary to the usual practice) to separate or screen out the reflections from the object transmitting certain intensities relating to the colors then expressed in that particular light. Thus, from a red rose with green leaves, light is reflected through these dots to the effect that the underlying photographic emulsion is suitably affected for the purpose in mind. After exposure there occurs a process of development and re-development which removes most of the photographic emulsion save such as marks out the delineation of the object as depicted by the light and as will serve to obscure the colors not wanted. Under favorable conditions, the effect of the initial photograph in color upon a glass plate or transparency, which must be viewed as such by transmitted light suitably reflected from a white cloud or a white surface. If the light used in reflection has a differing spectrum from that used in the making of the view, the colors will not be seen as they were when the photograph was taken.

As yet no means have been devised for adequately duplicating these transparencies on glass, which, therefore, while very beautiful when properly made and viewed, serve rather as color memoranda or records than for the reproductive purpose conceived of an ordinary photograph.

In this book use has been made of the autochrome for obtaining the color records upon which the various color plates have been produced. For example, Plate VIII, Vol. I, showing the York Imperial apple, is a successful reproduction of an autochrome, as also is Plate XXX, showing hardy bulbs in full color, and Plate XXXY, cedery, showing current commercial practice in exact color.

These autochromes are relatively expensive to make, but require only a special ray-filter in addition to the ordinary camera equipment. With autochrome plates the careful worker is able to obtain many important and delightful records.

Inasmuch as the autochrome is viewed with success only by transmitted light, it early occurred to those working in this method to propose the autochrome as a means of obtaining a perfectly colored lantern-slide. Several collections have been made which show in an exceedingly beautiful manner great scenery, portraits, and the like, but the disadvantages encountered are to the effect that inasmuch as the autochrome is much less transparent than the average lantern-slide, it cannot be shown with success in connection either with an uncolored or a colored lantern-slide. If autochrome lantern-slides are grouped together and shown in a relatively small image with a very intense light (preferably that of the electric arc only), the result is excellent.

Other methods said to accomplish color photography spring up from time to time. So far, however, not one of them has been found to be of a permanently valuable and desirable character, or in any sense equal to the autochrome, which in itself is rather inadequate.

The use of photography in relation to horticultural education and merchandising is merely in its infancy. It is probable that greatly improved methods of reproduction will permit of the more extensive and more effective use of photographs, and it seems certain that the moving-picture will assume a much greater importance in educational, philanthropic, and commercial practice. Acquaintance with photography is, therefore, likely to prove of increasing value to the horticulturist.

J. HORACE McFARLAND.

PHOTOSYNTHESIS.

Green plants exposed to sunlight at a growing temperature are able to manufacture organic food substances, that is, carbohydrates. The term photosynthesis, derived from Greek words signifying "light" and "putting together," is applied to this process of food manufacture. Green plants manufacture not only their own food carbohydrates but also are the sources of practically all of the organic matter which may eventually furnish food for both plants and...
animals. It may be said, therefore, that life today is dependent upon the green leaf. The first carbon-containing compound made is a relatively simple substance, but the first recognizable material is sugar. The crude matter out of which organic substance is made in the cells of the green tissues is CO₂ (carbon dioxide) and water. The leaf, green, chlorophyl, and the protoplasm of the cell may be regarded as the important mechanism, while the source of energy for the chemical change induced is radiant energy, light. Air ordinarily contains about 0.03 per cent of CO₂, yet the ordinary green plant obtains all of its carbon for the making of organic matter from this extremely small quantity in the atmosphere. The chlorophyl is important insomuch as it absorbs the radiant energy which is directly or indirectly responsible for the process. Chlorophyl is distributed within the cells in definite granules, or small bodies, protoplasmic in nature, commonly ovoidal in form. The light absorbed is largely from the red or red-orange portion of the spectrum. It is possible that the energy so derived is first transformed into electrical energy, yet little is known upon this point. It is certain, however, that green plants are unable to utilize energy derived, for example, from the absorption of heat. The process may be briefly pictured in the following manner: The cell-sap absorbs the CO₂ which diffuses into the tissues from the air. By means of the energy absorbed by the chlorophyl bodies, within the cells, the CO₂ is supposed to be reduced to CO (carbon monoxide), and the same means resolves the water into its constituents. The products of these molecular changes form new substances, perhaps formaldehyde (CH₂O) and oxygen (O₂). The formation of formaldehyde is still somewhat uncertain; but in any case sugar is soon recognized. In all probability the formaldehyde molecules are immediately condensed to sugar (C₆H₁₂O₆). It will be noted that the surplus oxygen is in reality a by-product and during active photosynthesis is carried out by counting the bubbles given off from the cut stem of a water plant exposed to sunlight in a well-aerated vessel of spring-water. The content of oxygen in these bubbles is greater than that of normal air, and the rate of bubble-production is a fair estimate of the rate of photosynthesis.

As a rule the sugar formed in the leaf does not accumulate to any large extent, but is transformed into starch. Some of the sugar, however, may be immediately diffused to other cells or "transported," supplying the needs of this substance in growth. The starch which is deposited is in the form of insoluble granules, and the formation of these bodies on exposure of the green leaf to sunlight is so rapid as to make it possible in some cases to use starch formation as an index to rate of photosynthesis. During the night, when no photosynthesis occurs, the transformation and removal of the starch usually goes on rapidly, so that within an interval of twelve hours most of that formed during the day seems to have disappeared from the leaf. It is, in fact, changed to sugar prior to transportation but may be removed to other organs of the plant, as, for example, to fleshy roots or tubers, where it may again be converted into starch, accumulating at times to a considerable extent.

Photosynthesis is most rapid under those conditions of temperature which are favorable for growth. Under strong light and favorable temperature, however, a slight increase in the amount of CO₂ gives a higher rate of starch-production. The presence in the leaf or stem of other color bodies, such as browns and reds, is no indication that chlorophyl is absent. As a matter of fact, chlorophyl is generally present in such cases, but may be veiled by the more prominent color. In showy flowers, however, chlorophyl seldom occurs. Photosynthesis is inhibited by any condition affecting the general health of the plant, and it is low during cold and dark weather. The larger number of plants are most active in the brightest sunlight, but certain shade-loving species are injured by such exposures, and are adjusted to conditions of half-shade, such as obtain in the shade of trees or bushes.

B. M. Deggan.

PHRAGMOPEDILUM (Greek, phragmos, a fence, alluding to the divisions of the ovary). Orchidaceae. Terrestrial or epiphytic glasshouse orchids, formerly included (with Paphiopedilum) in Cypripedium.

Flowers numerous, deciduous, in a raceme or panicle; sepals 3, the lateral united into one organ located beneath the lip, the other back of the column known as the dorsal sepal; petals 3, the lateral similar, the other widely different, forming a pouch or sac known as the lip, the margins all around the orifice reflexed or turned in; columns short; stamens 2; ovary cylindric, 3-celled, the walls thick, the ovules borne on placenta on the divisions. About 11 species (Pfitzer, in Engler's Pflanzenreich. hft. 12 [iv. 50], 1903). Trop. Amer. from Panama to Peru, south. The species here considered were contained in P. Schlimii. 2926. Phragmopedilum Schlimii. (X36)
Phragmopedilum

The genus Selenipedium is still retained by botanists, however, with which Phragmopedilum agrees in the 3-celled ovary but from which it differs in habit, conduplicate coriaceous strap-shaped lvs., the fl. being articulated above the ovary and deciduous, and the seeds being fusiform. The orthography of the name is somewhat confused. The word was originally spelled Phragmopedilum as a section of Paphiopedilum, and this form is adopted by Pfitzer and by Index Kewensis. Rolfe, the English authority, at first wrote it Phragmopedium and more recently Phragmopedilum. (See discussion by him in Orchid Review, 9, 174, 175.)

All phragmopedils enjoy plenty of heat and moisture in the growing season, March to November (65° to 90°). Give good drainage. Use chopped sphagnum with broken clinkers from the furnace, and the addition of a little leaf-mold, raising the material as high above the rim of the pot as possible. This material is especially to be recommended for the young and divided plants. Give slight shade, and grow on raised benches near the glass. Water sparingly until growth begins. The four species, P. Dominianum, P. Sedenii, P. Schlimii and P. Sargentianum, should not be overpotted.

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- a. Petals similar to the dorsal sepal; stigma bi-nerved-pyriform.
- b. Petals narrower and longer than dorsal sepal.
- c. Lip without horns between sac and claw.
- d. Lvs. narrowly yellow-margin:
  - e. Scapes branched, many-fld.: petals but little longer than sepals.
  - f. Scapes simple, few-fl.d.: petals nearly twice as long as sepals.
- s. Schlimii
- t. Lindleyanum
- u. Sargentianum
- v. Boissieri
- w. Dominianum
- x. Caudatum
- y. Hartwegii
- z. Seegeri
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Phragmopedilum

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2. Lindleyanum, Rolfe (Cypripedium Lindleyanum, Sch. Lindleyanum, Rolfe, f.). Lvs. 15-20 in. long, leathery, deep green, with yellow margins: scape many-fld., pubescent, 2-4 ft. high; upper sepal ovate-oblong, undulate, light green with brownish veins; petals 2 in. long, deflexed, green with brown veins, ciliate; labellum olive-green, with brown veins and much spotted on the side lobes. Guiana. G. W. 13, p. 570.

3. Sargentianum, Rolfe (Cypripedium Sargentianum, Rolfe). Fig. 2937. Lvs. tufted, 6-8 in. long, oblong-lanceolate, acuminate, with golden margins: scape 6 in. high, 2-3-fld.: dorsal sepal oblong, acute, pale yellow; inner sepals similar; petals ovate, subacute, shorter than the lip; petals longer than the sepals, strap-shaped, slightly twisted, undulate, ciliate, pale yellow streaked with red and with bright red margins; labellum yellow, with pale red veins, deflexed side lobes speckled with red. Brazil. B. M. 7446. G.C. III. 15-781. A. G. 21:423.

4. caricinum, Rolfe (Cypripedium Piercense, Hort. C. caricinum, Lindl. & Paxt. Senipedium caricinum, Reichb. f.). Lvs. 1 ft. long, springing in sedge-like tufts from the long creeping rhizome: scape longer than the lvs., 3-6-fld.: lvs. mostly pale greenish, with the segms. bordered with white and having purple tips; sepals broadly ovate, waved, as long as the lip; petals more than twice as long, pendent, narrow, and much twisted; labellum oblong, the upper margins flat; staminodium provided with 2 hairy processes. Peru. B. M. 5466. F. S. 16:1648.

5. Klotzschianum, Rolfe (Cypripedium Schomburgkianum, Klotzsch. Senipedium Klotzschianum, Reichb. f. S. Schomburgkianum, Debois). Lvs. linear, 6-12 in. long, scarcely ½ in. wide, rigid, keeled: scape longer than the lvs., hirsute, purple, 2-3-fld.: dorsal sepal ovate-lanceolate, pale rose-colored, with reddish brown veins, the lower ovate, boat-shaped, colored like the upper one; petals 3½ in. long, linear, twisted, colored like the sepal; labellum greenish yellow, the infolded side lobes whitish, spotted. British Guiana. B. M. 7178. G.C. III. 15:791.

6. vitatum, Rolfe (Cypripedium vitatum, Vell. Senipedium vitatum, Reichb. f.). Lvs. 1 ft. long, linear-ligulate, acute, margined with yellow: sts. few-fld., 12-18 in. high; dorsal sepal oblong, subacute, greenish brown, with red; lower sepal about twice as broad as the upper, green; petals linear, pendent, undulate, reddish brown, striped with green and green toward the base, longer than the sepal; labellum shorter than the sepals, brown, greenish spotted with reddish brown inside. Brazil. I.H. 23:238.

7. Hartwegii, Pitk. (Cypripedium Hartwegii, Reichb. f. Senipedium Hartwegii, Reichb. f. in part). Lvs. broadly ovate, much attenuated at apex: scape glabrous, many-fld.: dorsal sepal oblong, acute, pale green, with rosy veins and white margin; petals linear-ligulate, from a somewhat cordate base, velvety-glandulose on the inside toward apex, pale yellow-green with rose-pink border; lip yellowish green, tinged brown in front, the infolded margins dotted with rose. Peru.

8. longifolium, Rolfe (Senipedium Roezlii, Reichb. f. S. Hartwegii, Reichb. f. in part). Cypripedium longifolium, Warsz. and Reichb. f. C. Roezlii, Regel). Lvs. tufted, 8-12 in. long, narrowly strap-shaped, tapering to point, strongly keeled: scape 2 ft. high, purplish, sparingly pubescent: lvs. large; upper sepals ovate-lanceolate, pale yellowish green, slightly streaked with purple; lower sepals ovate, obtuse, shorter than the lip; petals 3½ in. long, spreading, narrowly lanceolate, twisted, pale yellow with rose-colored margins and with a white line on the edge; labellum 2 in. long, green shaded with dull purple or brown in front, side lobes yellow, spotted with pale purple. Costa Rica. B. M. 5970, 6217. I.H. 20:138. R.H. 1873, p. 416; 1893, pp. 18, 19. F.M. 1874:119. F. 1871:126.—S. Roezlii, sometimes considered as a distinct species, is of more robust habit, having lvs. 2 ft. long and green scopes. Var. magniflorum, Hort. (Cypripedium magniflorum, Hort.), has the petals margined with white. A. F. 7:707. The following varieties also are distinguished in cult.: grandiflorum, latifolium, and Roezlii.

9. Boissierianum, Rolfe (Cypripedium reticulatum, Reichb. f. C. Boissierianum, Reichb. f. Senipedium Boissierianum, Reichb. f.). Plant of vigorous habit: lvs. about 3 ft. long, acuminate: scape few-fld., or sometimes paniculate, 3-7-fld.; lvs. of peculiar light green tint, with a few sepia-brown and green blotches on the whitish infolded part of the lip and with some brown spots on the margins of the sepals; ovary dark brown, with green apex and ribs; upper sepals ligulate-lanceolate, very crisp; lower sepals oblong, about equal to the labellum; crisp; petals spreading, long-linear, twisted and very crisp on the margins. Peru. G.C. III. 1:143; 21:54, 55. G. F. 4:608. I.H. III. 55:51.

P. Ainsworthii, Rolfe & Hurst. (Cyripedium Ainsworthii, Reichb. f. Seleneum Ainsworthii, Reichb. f.) Fig. 2928. Height 7-10 ft.; scape about 3 ft. long; spathe white, with deep rose spots; petals broadly ovate, rounded at the base, firm and veiny, bluntly rounded at the apex.

The genus is a hardy perennial herbaceous plant in which only half the ovary develops. This plant has the infl. of the verbenaceae and the habit of Priva. Oval solitary, erect, orthotropous, laterally axiled at the base; seed without albumen; cotyledons convolute; radicle superior; one cotyledon 4, didynamous; style and stigmas 2-lobed.

Leptosiphax, Linn. Lorested. Height 2-3 ft.; lvs. 3-5 in. long, thin, the lower long-stalked: fls. at first erect, soon spreading, and the calyx in fr. closed and abruptly deflexed against the axis of the spike, the teeth long, slender, and hooked at the tip. Common in moist and open woods, New Bruns. to Man., south to Fl. and Kans.; also E. Asia.—This very widespread and relatively unattractive plant has stimulated considerable speculation on the problem of the distribution of plants. HORTICULTURALLY, it may be worth a place in the wild-garden for its botanical interest. The mature calices adhere to clothing, like a bur, by the hooked tips of the teeth.

L. H. B.

Phrygium (from Greek word for toad, because the plant inhabits marshes). Marantaceae. Maranta-like plants with creeping rootstocks and large oblong showy radical leaves.

The genus is closely allied to Calathea and Maranta and is often confused with them. The Marantas are New World plants with 1 seed-bearing locule in the fruit, whereas Calathea and Phrygium have 3-seed-bearing locules, or at least a 3-celled ovary. In Calathea, the fl. cluster is terminal on a leafy st. or rarely on a leafless scape arising directly from the rhizome; in Phrygium, the cluster is lateral from the sheathing petiole. In Calathea the corolla-tube is usually slender; in Phrygium it is usually short.—Species 14 and a few others of doubtful position are admitted to the monograph by Schumann in 1902 (Engler's Das Pflanzenreich, iv. 48), and other species have been described since then; they are native in India, Malasia to New Guinea.


L. H. B.

Phygelius (Greek, sun flight, because it was said to love the shade). Scrophulariaceae. Small South African shrubs, hardly South and useful in greenhouses, something like penstemon.

Plants erect, glabrous or nearly so: lvs. opposite, stalked, crenate-dentate: fls. many, long and tubular, sepal, with exserted stamina in 2 pairs, and a long, filiform declined-dentate; calyx 5-parted; corolla trumpet-shaped, the limb with 5 short nearly equal blunt lobes: fr. a many-seeded caps.—Species 2.

Cape Fuchsia. Meyer. Cau. F UCSIA. Fig. 2931. Two to 5 ft., becoming woody at the base, glabrous, the st. with 4 angles or none, 3-6 ft. long, the lower long-stalked: fls. to ovate-lanceolate, rounded at the base, firm and veiny, bluntly small-toothed: fls. slender, 2 in. long, somewhat curved, 2-lipped, purple-scarlet, 1-4 together on the ends of long slender peduncules, drooping. Cape of Good
PHYLICA (old Greek name, now transferred to these plants). Rhamnaceae. Evergreen shrubs, rarely trees; lvs. alternate, crowded, ovate, lanceolate or linear; fls. small, axillary or in dense crowded heads or spikes; calyx obconical, urceolate or cylindrical, 5- or 6-lobed, persistent; petals wanting or bristle-like or cucullate; stamens 8, rarely 6; ovary 4-celled, rarely 3-celled: fr. inferior, crowned by the permanent calyx. S. Afr. Prop. by cuttings of half-ripened shoots. P. plumula, Thunb. Branches and twigs pubescent; lvs. linear-lanceolate, glossy above, tomentose beneath with revolute margins; spike oblong or roundish; bracteoles villose, twice as long as the tubular minutely pilose calyx, hairs of the tube reversed, appressed, segments ovate-lanceolate. S. Afr. G. W. 10, p. 306. P. ericoides, Lindl. Branches fastigate; twigs thinly pubescent; lvs. short-petioled, spreading or erectish, linear or linear-subulate: in a many-flowered head; stamens 5; ovary 3-celled; fr. superior, crowned by the persistent calyx. Malay Archipelago and China. The lvs. of P. khasiana, Korth. are glossy green above and grey below, with the prominent nerves of a brighter color. For the general culture of the Elastomaceous plants, consult a good work on the subject.

PHYLANTHUS (Greek for plant). Malvaceae. Greenhouse woody plants, with ornamental foliage and attractive flowers. Plants with short thick stems: lvs. opposite or the leaf axils; flowers in a short peduncled or corymbose head, rosy, about ½ in. across; petals 4, rarely 3; stamens 8; ovary 3-celled: fr. pink, in a close head; petals lobed. Borneo.-Species a half-dozen or more, mostly Archipelago and China. The lvs. of P. rotundifolia are praised for their color, both above and below, their venation, their plaited character, and their strong shadows and reflected lights. The lvs. are glossy green above, tinted along the curved nerves with metallic blue and purple; beneath they are a rich coppery red, with the prominent nerves of a brighter color. For the general culture of the Melastomaceous plants, consult Melastoma and Medinilla.

These are very ornamental stove perennials. Their cultural requirements from March to the end of summer call for a high temperature. From the end of February and through March the night temperature should stand at 65°; this may be gradually increased until it reaches 70° to 75° the middle of May. This high temperature should be held until the autumn, when it may be gradually reduced until the plants are held at about 60° for December and January. As the temperature is raised and the days become longer, the plant will show growth. Leaf-cuttings may be placed in a warm propagating-bed, where they have a bottom heat of 80° to 85° and by covering with glass, kept shaded and moist, they will soon root. Leaf-cuttings may be placed in a warm propagating-bed, in a sandy soil, as the root is not yet formed. In the spring and summer, the plants will need shading, but not too heavy as it will make the foliage soft. Late in autumn and winter they will stand full sun. Any renewing of the earth or compost or repotting should be done about the middle of February. A good compost to use is a fibrous loam four parts, fibrous peat one part, well-decayed cow-manure one part, and a moderate quantity of sand to make it open.-The plants may be increased by half-ripened wood or by leaf-cuttings transplanted in February or March. For wood cuttings, start a few old plants early in January, and when the growth shows half-ripeness the cuttings may be taken off with three joints and placed in a mixture of loam, peat, and sand in equal parts. These pots may be placed in the greenhouse in November and in February, they will soon root. Leaf-cuttings may be placed in a warm propagating-bed, in a sandy soil, as the root is not yet formed.

Wilhelm Miller.

L. H. B.
the small lateral branches which then resemble pin
ate lvs., such as walnut or sassafras, and even full like
lvs., leaving conspicuous scars on the main branches;
several species have the branches flattened into leaf
like organs with fls. and rudimentary lvs. on the mar
gins: fls. axillary, apetalous, monoeccious or dioecious,
in small clusters or singly; sepals 4–6, imbricate; disk
present but rudimentary petals in the staminate fls;
stamens 2–6 (or more), usually 3; styles slender; ovary
3-celled, 2 ovules in each cell.—About 500 species,
mostly in tropical regions. Related to Breynia, Gloch
chion, and Securinega. Some of the species com
monly cult. under the name of Phyllanthus belong more
to Breynia or Glochidion. The genus has not been
thoroughly studied since Mueller monographed it in D.C. Prod. 15, II; 274, where it is divided into 44
sections, some of which, as Emblica, Cicca, Bradecia
and Xylogynia, have been considered separate genera.
Most of the species here included are grown as ornna
mental shrubs in the greenhouse. P. acicoides (P. dis-
tichus) is often cultivated, especially in the gardens and
lowlands of Jamaica and the West Indies for the fruit
which is pickled or made into preserves; it is acid
and astringent; the root is an active purgative and the
seed is also cathartic. P. Emblica is also grown in the
tropics for the edible fruit. P. nicouic is often used in
greenhouses and for bedding out in summer, and in the
warmer parts of Florida for permanent hedges.
In general, phyllanthus is propagated from green
wood cuttings from the larger side shoots rooted in
sand in the hothouse. They are usually taken in August
or September. Some leaves are left on the cutting and the
sand is kept just moist but not allowed to dry. The
snow-bush grows readily from root cuttings. P. acicos
and P. Emblica and some other species are often grown
from seeds; the latter is difficult to propagate vegeta
tively except by layering.

A. Branches terete or angular; lvs. well developed.

b. Lvs. not distinctly distichous, often variegated.

d. Lvs. not distinctly distichous, often variegated.

c. Stamens 6–10, filaments united, anthers not opening
vertically.

d. Stamens 6–10, filaments united, anthers not opening
vertically.

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vertically.

c. Stamens 6–10, filaments united, anthers not opening
vertically.
Amer.—P. exita, urban, similar to P. speciosus, but the flat branches tend to be rhomboid.—P. paniculata, Swartz, related to P. angustifolius, W. A. Hamilton (Phil. 2:164).—P. empetrifomis, Don (Bryanthus empetrifomis, Gray.—Menziesia empetrifomis, Smith). Five to 8 in.: lvs. glabrous, ½-¾ in. long; fls. 6 or more; pedicels slender, glandular; calyx purple; corolla campanulate, red-purple, about ¼ in. long. May–July. Brit. Col. to Calif. B.M. 3176. C.L.A. 21, No. 11:11. Var. amabilis, Rehd. (P. amabilis, Stapf). Fls. smaller, broadly campanulate, whitish or pinkish; anthers short. B.M. 8405. Var. albata, Hort. Fls. white. Var. polifolia, Hort. Taller: fls. purple.

erecta, Drude (Bryanthus erecta, Lindl. Phyllobodium erectum, Schott). Hybrid between the preceding species and Rhododendron Chamisactus. Six to 10 in.: lvs. slightly serrate, glabrous, ½ in. long; fls. 2–10, corolla rotate-campanulate, rosy pink, ½ in. across. F.S. 7:636. J.F. 1:58.—Originated about 1846 in the nursery of Cunningham & Fraser, at Comely Bank, Edinburgh.


ALFRED REIDER.
Physalis (Greek for bladder, because the thin calyx enlarges and incloses the fruit). *Solanum*. HUSK TOMATO. GROUND CHERRY. Herbs of warm and temperate countries grown somewhat for the edible fruits and also for the ornament of the great colored fruiting calyx of some species.

Annual and perennial plants, sometimes lightly woody at base, straggling or diffuse in growth, glabrous or pubescent, summer-blooming. lvs. alternate (often opposite or subopposite on short shoots), mostly angled and distinctly petioled, usually soft in texture; fls. not showy, usually on axillary or extra-axillary peduncles, mostly blue or yellowish or whitish; calyx 5-toothed or cleft, becoming large and bladder-like and inclosing the 2-celled globular yellow or greenish often more or less viscid berry; corolla rotate or short bell-shaped, usually with purplish spots in the center, plicate, short-tubed and mostly 5-toothed; stamens 5; style slender, the stigma somewhat 2-lobed.

—Probably 75 species, mostly American, but a few in Eu. and Asia. The species are variable and therefore confusing to the systematists. The genus is allied to Nicandra, and more remotely to Capsicum, Lycopersicum.

Most of the species are of little consequence horticulturally, although *P. Alkekengi* and *P. Franchetti* are much prized for the glowing red very large calices, and *P. pubescens* and *P. persicaria* are grown for their edible fruits. Several of the species are known for their fruits where they grow in a wild state, and they may sometimes be transferred to gardens. In most parts of the United States and Canada one or more species grow about gardens, in fields, and in waste places. These species are popularly known as "ground cherry."
The fruits are often made into preserves, although they are said to be sometimes biennial, but apparently perennial; probably variable in duration. *P. persicaria*. Gn. 41, p. 577; 49, p. 233; 57, pp. 28, 432.

—The strawberry tomato is an old garden plant, grown for its highly colored bladders: The plant grows 12-18 in. tall. Of easiest cult. In the N., plants are usually started indoors. It is a perennial, the root withstanding much frost if protected, but it is usually grown as an annual. Not hardy in the northern states.


—One of the most profusely advertised novelties of recent years. It is a most striking and showy plant. It was brought to England from Japan by James H. Veitch, and first described with a name by Masters in 1894. In 1879, however, it had been described by Franchet, of the Jardin des Plantes, Paris, as a form of *P. Alkekengi*, but without name. The frs. are very brilliant orange-red in autumn. The berry is said to be edible. It is very likely a variant of *P. Alkekengi*. The plant called *P. Bunyardii*, Hort., is a very free-fruiting form, not so robust as *P. Franchetti*, with glowing calices; probably a form of this species or by some suggested as a hybrid with *P. Alkekengi*.

AA. Plants with green or yellow and at most only red-veined calices. Mostly grown for the edible berry.

b. Sta. glabrous or very nearly so.

ixocarpa, Broth. TOMATOILLO. Fig. 2933. Erect annual, 3 or 4 ft. tall, bearing smooth branches and lvs., the latter thin, ovate or lance-ovate and variously toothed or notched; fls. large and open (¾ in. or more across), the border bright yellow and the throat bearing 5 black-brown spots; anthers purplish: husk or enlarged calyx purple-veined and entirely filled by the
large round, purplish sticky berry, and is sometimes torn open by it. Mex., and intro. northward to the northern states.—The form in cult., described here, is probably *P. capensis*, Dun., now regarded by some as a form of the cosmopolitan *P. angulata*. The writer prefers, however, to refer the plant to *P. izocarpa*, although there is doubt as to the identity of the cult. plant with this species. Although the cult. plant is sometimes sold as *P. edulis* (erroneously), the fr. are usually too mealy to be eaten from the hand (at least as grown in the N.). It is a very vigorous and productive plant and is of some consequence as an ornamental, but it is too weedy to be of much value. The fr. is larger than in the native *P. angulata*. The plant figured by Carrère as *P. violacea* (R. H. 1882:216) is the one here described. In Mex., the frs. are said to be used in the making of chilli sauce and as a dressing for meats, usually under the name of "tomatoes." The Mexican forms are confused.

**Physialis**

**Physialis pubescens**, Linn. STRAWBERRY TOMATO of vegetable-gardens. DWARF CAPE GOOSEBERRY. HUSK TOMATO. Fig. 2934. Low annual, trailing flat on the ground, or sometimes ascending to the height of a foot: lvs. rather thin and smooth, more or less regularly and prominently notched with blunt teeth: fls. small (½ in. or less long), bell-shaped, the limb or border erect and whitish yellow, the throat marked with 5 large brown spots; anthers yellow: husk smooth or nearly so, thin and paper-like, prominently 5-angled and somewhat larger than the small yellow sweetish and not glutinous fr. of N. Y. to the tropics. The plant is very prolific, and the frs. are considerably earlier than in the other species. When ripe the frs. fall, and if the season is ordinarily dry they will often keep in good condition on the ground for 5 or 4 weeks. The frs. will keep nearly all winter if put away in the husks in a dry chamber. They are sweet and pleasant, with a little acid, and they are considerably used for preserves, and sometimes for sauce. The plant is worthy a place in every home-garden. It is grown more or less by small gardeners near the large cities, and the frs. are often seen in the winter markets. The chief objection to the plant is its prostrate habit of growth, which demands much ground for its cult. In good soil it will spread 4 ft. in all directions, if not headed in. The plants are set in rows 3 or 4 ft. apart and 2 or 3 ft. apart in the row. This physalis has been long in cult. It was figured by Dillenius in 1774, in his account of the plants growing in Sherard's garden at Eltham, England. In 1781 it was figured by Jacobin, and by Bentham as *Physalis barbadensis*, from the island of Barbados, whence it was supposed to have come into cult. In 1807, Martyn also described it under the name of Barbados winter cherry, or *Physalis barbadensis*, and says that it is a native of Barbados. None of these authors says anything about its culinary uses. Dunal, in 1852, described it as var. *barbadensis of Physalis hirsuta*, but later botanists unite Dunal's *P. hirsuta* with Linnaeus' *P. pubescens*, of which this common husk tomato is but a cult. form.

**Physalis peruviana**, Linn. (P. edulis, Sims). CAPE GOOSEBERRY. Fig. 2935. As compared with *P. pubescens*, this is a much stronger grower, the plant standing partially erect and attaining a height of 1½–3 ft.: lvs. thicker, less regularly toothed, more pointed, heart-shaped at the base, and very pubescent or fuzzy: fls. larger (½–¾ in. long), open-bell-shaped, the limb or border widely spreading and light yellow, the interior of throat blotched and veined with 5 purple spots, the anthers blue-purple: husk thicker and larger than in the last, somewhat hairy, and has a much longer point. Tropics. B.M. 1068. R.H. 1913, p. 85 (as var. *edulis*).

—This species is too late for the northern states. The berry is yellow, not glutinous, and much like that of *P. pubescens* in appearance, but it seems to be less sweet than of that species. This plant has been cult. for two centuries, probably. It was described and figured by Morison in 1715 in England. In 1725, Foulke gave a description of its cult. in Peru, saying that it was then cult. with care and was greatly esteemed as a preserve. The particular form of the species cult. in our gardens is that described and figured by Sims in 1807 as *Physalis edulis*, the "edible physalis." Sims' account says that "this plant is a native of Peru and Chili, but is cult. at the Cape of Good Hope, in some parts of the E. Indies, and more especially at the English settlement of New S. Wales, at which latter place it is known by the name of Cape gooseberry, and is the chief fr. the colonists at present possess; is eaten raw, or made into pies, puddings or preserves." The plant is rarely sold by American seedsmen.

**Physaria** (Greek, a pair of bellows, alluding to the didymous fruit and slender style). Cruciferae. Perennial herbs, low, canescent: sts. many and spreading: lvs. mostly entire: fls. yellow; calyx inflated, arched, net-veined; petals spathulate to oblong, entire: fr. strongly didymous with a narrow partition; cells inflated, membranous, nerveless; several-seeded. Four species. N. W. Amer. *P. didymocarpa*, Gray. Very canescent, about 3 in. high: radical lvs. petiolate with roundish toothed angled or entire blade or oblanceolate and more or less acuminate toothed below; coryne lvs. mostly entire, spatulate: racemes dense; fls. variable in size; sepals lanceolate, surpassed by the rather narrow pale yellow petals: fr. strongly didymous, rather deeply notched above, entire or more or less ovoid at base. This species has been intro. abroad in botanic gardens.

**Physianthus** (Greek, bladder flower, referring to the base of the corolla-tube). Aeclepiadaceae. The plants known to gardeners as Physianthus are species of Araujia. Physianthus now being referred to that genus. They are twiners with showy flowers, grown under glass or in the open in summer.

Including *Physianthus* and Schubertia (as is done by Beatham & Hooker), Araujia comprises a dozen or more species in the warmer parts of Amer., all with opposite lvs. and whitish or rosy fls.: corolla-tube short or long, inflated at the base; lobes 5, very wide or narrow, overlapping toward the right in the bud; crown with 5 scales attached to the middle of the tube or lower, flat and erect or convex and appressed to the staminal tube: seeds long, bearded. Schubertia and *Physianthus* should perhaps be considered as subgenera, the former containing the hairy plants with somewhat funnel-shaped fls.; the latter nearly glabrous plants.
shrubs, grown for their white flowers; the attractive inflated pods and the bright green foliage. Araujia albens s-shaped, plant as above described is the probably a form of this species. WILHELM

araujia sericoida catches moths in a slightly different fashion. See G.C. III. 20:233. For other "cruel plants," see Cuscuta and Vinciezoa.

When well grown, araujias or physianthus blooms bloom freely throughout September and October. They seem to have no special soil requirements and may be flowered outdoors from seed sown indoors in early spring, or they may be kept permanently in a cool greenhouse and grown from cuttings. It is seldom that A. graveolens is seen grown well in greenhouses, the plants being usually sickly and infested with mealy-bug. As a summer vine in the open it makes vigorous growth, and after taking a summer sabbatical it usually blooms profusely. The flowers are larger than those of stephanotis.

Cuttings make the best flowering vines. These may be taken from the ripe wood before cool weather. Seeds are freely produced, and germinate well soon after being taken from the ripe wood before cool weather. Seeds are usually sickly and infested with mealy-bug.


seeds 2-4, yellowish shining.-Thirteen species have been distinguished in N. Amer. and one in E. Asia. Formerly usually referred to Spiraea, from which it is easily distinguished by the stipulate lvs., by the inflated follicles and the long glossy seeds; sometimes united with Neillia, which differs chiefly in the not inflated pods dehiscent only along the ventral suture, the campanulate or tubular calyx-tube, and in the elongated inflorescence.

The ninebarks are hardly, small or medium-sized spreading or upright shrubs with usually 3-lobed leaves and with umbel-like heads of whitish or sometimes pinkish flowers appearing late in spring, and followed by clusters of small pods, inflates in some species and often assuming a bright red color late in summer. They are well adapted for shrubberies and grow in almost any soil. They propagate easily by either hardwood or greenwood cuttings, also by seeds.

a. Carpels 3-5, rarely 3.  
b. Pods glabrous.

Physianthus Physianthus albens, L. H. Bailey. Stout, woody

Deciduous: bark peeling off in thin strips: lvs., alternate, petioled, stipulate, serrate and more or less lobed: fls. in umbel-like racemes; calyx-tube cup-shaped; sepals 5, valvate; petals white or rarely pinkish, spreading; stamens 20-40; pistils 1-5, more or less united at the base: follicles inflated, opening along both sutures, seeds 2-4, yellowish shining.—Thirty species have been distinguished in N. Amer. and one in E. Asia. Formerly usually referred to Spiraea, from which it is easily distinguished by the stipulate lvs., by the inflated follicles and the long glossy seeds; sometimes united with Neillia, which differs chiefly in the not inflated pods dehiscent only along the ventral suture, the campanulate or tubular calyx-tube, and in the elongated inflorescence.

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a. Carpels 3-5, rarely 3.  
b. Pods glabrous.


b. Pods tomentose.

amurensis, Maxim. (Spiria amurensis, Maxim. Opulaster amurensis, Kunze. Neillia amurensis, Nichols.). Similar to the former, higher and of more vigorous growth: lvs. 3-5-lobed, with acute or acuminate, doubly serrate lobes, usually pubescent beneath, 2-5 in. long: fls. large, with grayish tomentose pedicels and calyx: pods only one-third longer than calyx-lobes. June. Amurland. Gt. 14-489.

intermedius, Schneid. (Opulaster intermedius, Rydb. O. Ramaleu, Nels.). Shrub, to 5 ft.: lvs. orbicular in outline, 3-lobed with rounded lobes, doubly crenate, usually sparingly hairy beneath or glabrous, 1-21/2 in. long: corymbs dense; pedicels and calyx finely pubescent: pods 3-5, inflated, one-third longer than the calyx-lobes. June. and No. to Colo. and S. D.

2936. Ninebark.—Physianthus opulifolius. (X 1/4)
aa. Carpels 2, turgid, tomentose.

b. Pedicels and calyx pubescent.

bracteatus, Reh. (Opulaster bracteatus, Rydb. O. Randalei, Nelson, partly). Shrub, to 6 ft.; lvs. broadly ovate in outline, rounded or subcordate at the base, 3-lobed, broadly crenate-serrate, obtuse or acute at the apex, glabrous or nearly so, 1-3 in. long; corollas many-fld.; bracts obvolute or spatulate, often foliaceous, persistent; fls. nearly 1⁄2 in. across, white; pods 2, united about half in June. Colo.—Plant more compact and fls. larger than in P. opulifolius.

monogynus, Coul. (Opulaster monogynus, Kunze. Spiraea monogyna, Torr. Neilia Torrey, Wats.). Fig. 2937. To 3 ft. high: lvs. smaller, 3⁄4–1 1⁄2 in. long, incised 3-5-lobed, with incised serrate lobes, usually glabrous: corollas rather few-fld.; bracts lanceolate, caducous; pedicels usually only sparingly pubescent; pods 1–2. Colo. to Calif. G.F. 2:5 (adapted in Fig. 2937).

glabratus, Reh. (Opulaster glabratus, Rydb.). Shrub, 2–4 ft.; lvs. orbicular-ovate, truncate or cordate at the base, 3–5-lobed, doubly crenate-serrate, obtuse or rounded at the apex, glabrous, about 1 in. long; corollas rather small, but numerous; bracts small, caducous; fls. about 1⁄4 in. across, white or pink: pods 2, united to about the middle. June. Colo.—Very floriferous.

2612 PHYSOSTEGIA

***Physostegia*** (Br. et Tier.) — A large cluster of 15 species, S. America.

**Physeteridae.** Sometimes known as "negro's head." The trunk furnishes the "vegetable ivory" of commerce.

**Physeterium (Greek, *physo* + *teus*), referring to the shape of the scales of the crown). 

**Asclepiadaceae.** Twining glabrous shrubs: lvs. opposite, leathery, shining; fls. large, umbellate; sepals small, narrow; corolla cup-shaped, lobes very short; corona processes 5, very large, usually in dense terminal heads or spikes, sometimes somewhat umbellate, the filaments long and curled; corolla opening more or less by 5 very narrow segments.

**2938. Phytoelema comosum.** A tufted alpine plant growing in a crevice. (X 1/2)

(sometimes remaining closed); stamens 5, free from corolla, filaments more or less dilated at base, anthers free and distinct; styles 2-3-cleft, often protruding, the lobes very narrow; fr. a caps. crowned by the calyx-teeth, laterally dehiscent.—Species about 40, Eu. and adjacent Asia, mostly in the mountains, sometimes at great elevations.

The flowers in ptyoteuma are mostly shades of blue, more or less purple, rarely white. There are two forms of inflorescence, the globular and the long-and-narrow, the former being the more interesting. The showy feature of *P. comosum*, at first glance, seems to be a group of colored and much elongated pistils; but these pistil-like bodies are really corollas which usually show slits at their inflated base and are narrowed above into a very slender tube from which the style and stigmas are much exserted. In this species the corolla does not open, but in the others it finally splits at the top, making a spreading or wheel-shaped flower. The plants usually seed freely and may also be propagated by division, which is best performed in spring after growth begins. They thrive in ordinary garden soil in either rock-garden or border. In an account of the cultivated species, Correvon (Gn. 63, pp. 39-41, 58) distinguishes three cultural groups: (1) the mural or open species, comprising *P. comosum*; (2) the rock-loving species, comprising *P. caricioides*, *P. Chamelitt*, *P. coniforum*, *P. globulariaefolium*, *P. hemisphaericum*, *P. humile*, *P. laevis*, *P. serratum*, *P. sieberi*, *P. scheuchzeri*; (3) the open-ground species, as *P. australis*, *P. bolivianum*; *P. canescens*, *P. Halleri*, *P. limonifolium*, *P. Micheli*, *P. ornitum*, *P. serrulifolium*, *P. speciosum*. The rock-loving species (2) require rock fissures in grass-like. The rock-loving species (2) require rock fissures in grass-like. The rock-loving species (2) require rock fissures in grass-like. The rock-loving species (2) require rock fissures in grass-like. The rock-loving species (2) require rock fissures in grass-like.
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P. spicatum, 6.
P. spicatum, 14.

A. Infl. a raceme or paniculate.

1. canescens, Waldst. & Kit. Scabrous, grayish green: st. unbranched: lvs. sessile: lvs. ovate, crenate-serrate, narrowed at base; upper ones nearly entire: fls. blue, short-petioled, solitary, sparse. Hungary, Caucasus.—The plant described by Correvon under this name is said to have fls. in close spikes.

AA. Infl. a compact umbel.


AAA. Infl. a spike or head.

b. Fruiting spikes long and narrow, cylindrical.

c. Flowering spikes roundish or oval.

d. Stigmas 2.

3. scorzonerifolium, Vill. Fig. 2939. This and P. betonicafolium should probably be regarded as botanical varieties of P. Michelii, but for clearness and for horticultural purposes they may be considered as distinct species. A native of the Alps with long-spiked fls. of sky-blue (B.M. 2271): lvs. poly-morphanous.

4. Michelii, All. This may also be distinguished from P. scorzonerifolium and P. betonicafolium by having the calyx pilose at the middle, it being glabrous in the other two. A native of Mt. Cenis in Sardinia, with lvs. ovate-lanceolate or narrow, not cordate: color of fls. deep blue, in lengthening spikes.

dd. Stigmas 3.


c. Flowering spikes oblong or nearly so.

d. Spikes dense.


dd. Spikes loose.

8. limonifolium, Sibth. & Smith. Fig. 2939. Tall, fl-st. 20-28 in. high, and branching; fls. light blue, open in a long narrow spike: this may be distinguished by the st.-lvs., which are few and pass into bracts; radical lvs. lanceolate, long-petioled, sparingly toothed. Asia Minor. B.M. 2145 (as P. striatum). L.B.C. 7:687 (as P. virgata).

BB. Fruiting spikes little elongated, merely oval.

c. Number of fls. about 5.

9. pauciflorum, Linn. Very dwarf, said by Correvon to be the smallest and most tufted of the genus, about 3 in. high: lvs. entire or toothed at obtuse tip; root-lvs. short, obovate-lanceolate: bracts ciliate, entire or subdentate at base, never dentate at apex: fls. few in heads with ovate-oblanceolate, violet-blue. W. Alps, Carpathians and Pyrenees. Gn. 63, p. 40.

c. Number of fls. about 12.

10. globularifolium, Sternb. & Hoppe. Probably a variety of P. pauciflorum with larger sts. and lvs. widened in the upper part and toothed, and by more globose heads: root-lvs. 2-4 lines longer and thrice as wide, and the bracts always entire at the base: fls. violet. Austrian Alps.
violate-blue, in globular heads. High Alps.—P. Carástis, Biroli, is a thick-set form of P. humile. Probably P. serratum is also a form of this species with larger st., somewhat wider lvs., and calyx glabrous rather than minutely ciliate. Gn. 28:30; 63, p. 40.


ccc. Number of fls. 15 or more.

14. orbiculare, Linn. (P. confusum, Kerner. P. austriacum, Beck). Rootstock mostly thick, the st. simple and usually erect, ½-2 ft. tall: lvs. ovate; root-lvs. cordate or ovate; upper st.-lvs. linear: bracts sub-serrate, spreading or reflexed: fls. purple. Eu. B.M. 1466 (as P. cordata). L.B.C. 2:122.—A very variable species, and widely distributed, from England to mountain pastures on the continent. Keeps to P. argirion, a distinct, the basal lvs. having blades longer than petioles, upper lvs. ovate-lanceolate, and especially by the erect fl.-bracts. Also P. confusum, from granite rocks of the Tyrol, which seems from its description to be a very different plant, with long and grass-like lvs. and deep violet fls.


WILHELM MILLER [L. H. B.]†

PHYTOLACCA (a hybrid name: Greek, phytos, plant, and French ivc, or Italian lcce, lake; referring to the crimson berries.) Phytozacca. Ornamental herbs and woody plants; some of them yield edible parts of minor value.

Shrubs, herbs, or trees, sometimes climbers, with angled or suberect branches, glabrous or nearly so: lvs. alternate, sessile or mostly petiolate, acute or obtuse, entire; stipules none: fls. small, borne in erect or nodding racemes on spikes which are at first terminal but by further growth of the st. may come opposite the lvs.; calyx of 4 or 5 persistent rounded sepals; stamens about 5–30; ovary of 8–16 distinct or connate carpels: fr. a feathery berry; seeds 1 in each cell.—Twenty-six species as defined by Walter in Engler’s Das Pflanzenreich, hft. 39 (IV. 53), published in 1906, distributed in tropical and sub-tropical regions, mostly in Amer., and a few in Asia and Afr., one species extending to Canada. They are plants of simple requirements in the regions where they grow, and are prop. readily by seeds. P. dioica is a very useful tree for ornament and shade in S. Calif. The common pokeweed (P. americana) is a familiar wild plant in E. N. Amer.; it is a plant of good habit, vigorous growth, and ornamental berries, and is sometimes planted in back borders and wild-gardens. Related genera in cult. are Escilla, Rivina, Agrostis.

a. Stems and carps less than 10, usually 8.

esculenta, Van Houtte (Pircinária esculenta, Moq. Phytozolaca Kalémüer, Gray. P. pekinensis, Hance). Somewhat woody, suberect, the sts. thick, green and glabrous: lvs. short-petioled, broad-elliptic or ovate, the apex somewhat acute or blunt: infl. suberect, loosely racemose, not surpassing the lvs., the peduncle and radicle glabrous: fls. pedicellate: calyx white, the parts rounded; stamens commonly 8, with white filaments and rose-colored anthers; style recurved: fr. with 8 free carpels.

China, Japan.—Cult. for the edible lvs. This name is catalogued in English as “American grape.”

ascidosa, Roxb. Much like the last: peduncles and radicle scabrous: filaments and anthers white; style suberect; calyx-parts green at middle, white on margins, apex acute; lvs. ovate-oblong, acuminate at apex. China and Japan; spontaneous in India and said to be cult. for its lvs. which are edible when cooked.

aaa. Stems 20–30; carpels 7–10; fls. dioecious.

dioica, Linn. (Pircinária dioica, Moq. Phytozolaca populifolia, Salish. P. arbores, Hort.). Evergreen tree, attaining great thickness of trunk and spread of top: branches glabrous: lvs. slender-petioled, glabrous, elliptic or ovate, mostly broadly acute at apex, the mid-nerve extending at the tip: infl. racemose, scarcely surpassing the lvs., suberect or pendulous: male fls. with 20–30 stamens, and calyx-parts elliptic and obtuse, white-spotted; female fls. with about 10 staminodes, the calyx parts broad, the ovary globose and 7–10-carpeled: fr. berry-like, the carpels connate at base and free at top. S. Amer., the “umbí” and “bella sombra” of Spanish-speaking people. This species was intro. into Santa Barbara some 40 years ago, and is now well distributed in S. Calif.; there are trees with spread of top of 60 ft. and trunk 6 ft. diam., with buttwings 2 ft. high. It is a tree of astonishingly rapid growth, soon

gined: fls. purplish or greenish white, in peduncled simple racemes and borne on stout bracted pedicels; ovary 10-carpeled and green, ripening into a wine-purple berry. Maine through Ont. to Minn., and far southwest; naturalized in Eu. after a weed, particularly in clearings and new lands. B. M. 331. Gn. 21, p. 179. G. 7:697. Mu. 1, p. 53.—A robust plant with heavy odor, but of good habit and clean. This species, the common pokeberry, is offered by dealers in native plants and its young asparagus-like shoots are sometimes used as a pot-herb. Its latte berries yield a strong sour juice of a very distinct hue, but it has never been fixed for dyeing purposes. Children sometimes make red ink from the berries for amusement. The berries have been used to give color to pale wines, but its use for this purpose is injurious and in Portugal has been prohibited by royal decree. The roots are emetic, purgative, and somewhat narcotic. The word “poke” is supposed to come from the American Indian word poke, which apparently referred to any plant yielding a red or yellow dye, as pokeweed or bloodroot. In President Polk’s campaign his followers wore lvs. of pokeweed. In collecting young shoots for greens, care must be taken not to include any portion of the root, as this would give a bitter taste and might induce death. Probably a botanical variety of P. comosum, Sieb., not Vill.). Asparagus; but the wealth of other pot-herbs renders this name unnecessary. It may be increased by seeds or by division of the thick roots. A variegated form once cult. for ornament is shown in R.H. 1887, p. 16, the lvs. light green above often shaded rose and more or less margined white, beneath pale rose to violet.

aaa. Stems and carpels less than 10, usually 8.

PHYTEUMA PHYTOLACCA
Spruces are propagated by seeds, which ripen in fall and are usually kept dry and cool during the winter and sown in spring outdoors in prepared beds or in frames or boxes. The young seedlings should be shaded and watered in dry weather and may remain a year or two before being transplanted in nursery rows when not sown too thickly. Varieties and rarer kinds are often increased by layers or by grafting on seedling stock of P. ecesis. P. canadensis is used for forms of this species and for P. mariana and P. rubra. Veneer-grafting in spring or August in the greenhouse is usually employed, less commonly cleft-grafting with half-hardened wood. The dwarf forms grow readily from cuttings under glass in August or fall, and many of the small root suckers can be used in early spring; also most other forms and species, especially those with thinner and finer branches, can be raised from cuttings.

The spruces are important timber trees. The soft and light straight-grained wood is much used for construction, the interior finish of houses and for fuel, also for ship-building; but it is not durable in the ground. The bark of some species is used for tanning leather, and the resinous exudations are sometimes employed in medicine. From the red and black spruce, spruce beer is made by boiling the branches with honey. Spruces are often known in nurseries, especially in this country, under the name of Abies.

The grafting of piceas. (E. P. Drew.)

In the writer’s experience, P. canadensis is a good stock on which to graft the finer varieties of spruce or those having four-sided leaves. For the stock the stock of Abies or Tsuga and some of the recently introduced Chinese pines are often used.

If the cion should die, do not use the stock again but keep in shaded frame, syringing till danger of wilting is over and harden gradually. Be careful not to keep the earth in the pots too wet, as roots are liable to rot. Place the stocks in greenhouse after light frosts, and graft as soon as roots have started—about last of January generally. Do not wait until buds have made much growth, for then the sap will be running strongly to the upper buds, leaving the cion to remain dormant. When stocks and cion are of same size, the veneer-graft may be used. In large stocks, use slit- or side-graft. Be sure that the knife is sharp enough to shave dry wood.

Cut the cion in elongated wedge-shape; place it in the cleft by twisting the stock with left hand, fitting the cion exactly with the right. Be careful to wax well, as a hole the size of a pin left on the cut surface will be fatal to the cion. Place the grafted plants in a close frame until the cion is well started. Syringe from two to three times a day, shading when too hot. Give air gradually and keep in shaded frame, syringing at least twice daily. Do not cut back the stock for one year, as the cion may make second growth and winter-kill. If cion should die, do not use the stock again until after a year’s rest, as two consecutive plantings will usually ruin the root; this holds good only with P. canadensis. The above method can be used with equal success on Pinus, Abies, Juniperus, and other evergreens propagated by grafting.

Ornamental value of spruces. (Thomas H. Douglas.)

The piceas embrace some of the most useful as well as ornamental trees of the conifer family. They cover a great variety of forms, from the stiff-branched stately and rugged P. pungens to the lithe graceful and drooping P. breweri. The American species comprise...
P. mariana, P. canadensis, P. rubra, P. pungens, P. Engelmannii, P. Breweriana, and P. sitchensis. The grand and towering Douglas spruce and the graceful hemlock spruce, so called, are not true spruces and will not be noticed in this article.

The white spruce, *Picea canadensis*, is a native of the northern parts of America and is justly thought to be one of our best conifers, a compact and upright grower of great longevity; trees growing at Waukegan, Illinois, of mature age, are well branched at the bottom, retain their pyramidal form, and annually make an upward growth. It is the most aromatic of the piceas; in fact, this odor is often used to identify it while young from the Norway spruce or Engelmann’s spruce. It grows on a great variety of soils, bears crowding well and also will stand severe pruning; hence it is used for windbreaks and hedges. Seedlings vary considerably in color, some of them fairly rivaling the blue form of the *P. pungens*. This tree, being a native of a cold climate, is subject to the ravages of the red-spider in a warm climate and should not be planted south of Philadelphia or St. Louis. There is a variety of *P. canadensis* found in the Black Hills that stands extreme drought better than the northern form and is largely planted on the dry prairies of Nebraska and the Dakotas. It does not, however, do so well in northern Illinois or further east as the northern variety.

*Picea Engelmannii*, one of the gems of Colorado, resembles *P. canadensis* more than it does its near neighbor, *P. pungens*, being of finer foliage and not so stiff-branched as the latter. It is one of the few conifers that will stand the extreme cold of Petrogad, Russia, but on our western prairies it soon loses its lower branches, as it seems to be unable to withstand the hot and drying winds of that section in late summer and early autumn. In the eastern states, however, it does not have this fault, as the cooler and more humid air seems better to agree with it.

Another Colorado conifer, *P. pungens* (the blue form being called by some the “queen of the piceas”), is a striking and noble tree, seeming to be hardy wherever tested and on all varieties of soil. Strong, sturdy, and upright in growth, its form alone would make it a striking figure in any landscape. Its beautiful color varies from a light silvery hue in some specimens to a dark blue, almost purple in others. In some specimens the branches are in distinct and regular whorls, resembling *Araucaria excelsa*. Undoubtedly the oldest and finest specimens of this grand tree are found on the former grounds of the late Robert Douglas, at Waukegan, Illinois. These trees are nearly 35 to 40 ft. high and show no signs of weakening anywhere, being one mass of foliage from the ground upward. The green form of *P. pungens* is an excellent tree, but is not so much appreciated by planters and lovers of trees as it should be, as it is always compared to its more striking variety, the blue spruce. There is a fine specimen growing on the above grounds, even larger than the blue form, which does not suffer in comparison with its near neighbors, *Abies concolor*, *A. Fraseri*, *Picea Engelmannii*, *Tsuga canadensis* or hemlock spruce, *Pseudotsuga Douglasii* or Douglas spruces, and *Pinus Strobus*, all large and fine specimens, equal to any in the Middle West.

*Picea mariana*, or black spruce, is undoubtedly the poorest tree of the genus from a landscape gardener’s point of view. It has very short needles and is greatly disfigured by its cones, which hang on for years when young, and show no signs of weakening anywhere, being one mass of foliage from the ground upward. The green form of *P. pungens* is an excellent tree, but is not so much appreciated by planters and lovers of trees as it should be, as it is always compared to its more striking variety, the blue spruce. There is a fine specimen growing on the above grounds, even larger than the blue form, which does not suffer in comparison with its near neighbors, *Abies concolor*, *A. Fraseri*, *Picea Engelmannii*, *Tsuga canadensis* or hemlock spruce, *Pseudotsuga Douglasii* or Douglas spruces, and *Pinus Strobus*, all large and fine specimens, equal to any in the Middle West.

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LXXXVIII. Picea canadensis (or P. alba).—A golden variety.
foot, and this is doubtless one of the largest specimens in cultivation.

Of the foreign species, P. excelsa is most popular; in fact it is the best known and most largely planted of any of the genus. It makes a large fine-looking tree, grows in a great variety of soils, is hardy throughout most of North America, is the most rapid grower of any of the pines, and stands close planting very well. It is used more than any other tree for windbreaks and shelter-belts. It bears pruning well. Hedges of this species and P. canadensis that have been planted more than forty years are growing on the Douglas grounds.

One fine specimen tree on these grounds measures about 6 feet high and 64 feet from tip to tip of its lower branches. Other foreign species, but not so well known nor so thoroughly tested as the preceding, are used more than any other tree for windbreaks and shelter belts. Of these

There are several species of Picea from China and Japan that will doubtless prove hardy in the eastern states. Of these P. jezoensis var. pendula has proved one of the best in the eastern states; also P. bicolor, which forms a handsome pyramidal tree of rapid growth with dark green foliage, has proved perfectly hardy. All pines will stand the pruning-knife, but this should be used not later than July 1 in the northern states and earlier farther south. They are propagated from seed the same as larch; and their varieties, of which there are a great number, are either grafted or raised from cuttings over bottom heat.

INDEX.

For names not found here or in the supplementary list, consult Abies and Tsuga.

A. Lvs. spreading, sometimes 2 in. long: winter buds acute...
B. Cones 4–6 in. long, or shorter in some varieties with stiff scales: branchlets glabrous or pale yellow...
C. Young branchlets pale yellowish gray, pubescent: petioles very prominent, often recurved...
D. Length of lvs. ½–1 in.

1. Smithiana
2. Schrenkiana
3. polita
4. asperata
5. excelsa
6. obovata
7. orientalis
8. rubra
9. mariana
10. canadensis
11. Engelmanni
12. pungens
13. sitchensis
14. jezoensis
15. purpurea
16. bicolor
17. Omorika
18. Breweriana

KEY TO THE SPECIES.

A. Lvs. quadrangular, all 4 sides with stomata...
B. Cones obovate or orbicular, rounded, closely appressed before ripening...
C. Cones 2½–5 in. long...
D. Length of lvs. ½–2 in. young branchlets glabrous, more or less pendulous...

1. Smithiana
2. Schrenkiana
3. polita
4. asperata
5. excelsa
6. obovata
7. orientalis
8. rubra
9. mariana
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E. Lvs. spreading, sometimes 2 in. long: winter buds acute...

For names not found here or in the supplementary list, consult Abies and Tsuga.

PICEA 2617
Section I. 

PICEA, Willk.

Leaves quadrangular, with stomata on all sides; scales of cone closely pressed against maturity, broad and entire or nearly so.

1. SMITHIANA, Boiss. (M. Morindia, Link, P. Kük­
row, Carr.). Tree, to 150 ft., with wide-spreading branches and slender pendulous branchlets; leaves crowded, usually thicker than broad, acute, bright or dark green, 1½ to 2 in. long; pistillate fls. purple; cones 5 to 7 in. long, dark brown and glossy; scales subquadra­
ticular, with entire margin, firm. Himalayas. G.C. II. 24:393; III. 35:325; 38:395. Gn. 19, p. 39; 35, p. 599; 39, p. 72. C.L.A. 7:364. F.E. 16:705.—One of the most graceful spruces; hardly so far as N. Y. The young growth starts very early and is liable to be injured by frost in spring, especially when planted in warm and damp situations.

2. SCHRENKIANA, Fisch. & Mey. (P. obovata var. 
Schrenkiana, Carr.). Tall pyramidal tree, with pendulous branchlets, somewhat similar to P. excelsa: leaves, equally 4-sided, acute, somewhat dull green, 1½ to 2 in. long, on young plants often slightly shorter; cones cylindrical-ovate, 3 to 4 in. long; scales with entire margin. Siberia (P. Schrenkiana).—Similar in habit to the preceding species but branchlets not so long and leaves shorter. A very desirable and hardy spruce. Var. globosa, Schelle. About 6 ft. high, globose in shape.

3. POLITIA, Carr. (P. Torano, Kochne. P. bicolor, Hort., not Maxim.). Tree, to 90 ft., forming a dense, broad pyramid, with rigid stout branches when young, older trees with the habit of P. excelsa, with somewhat pendulous branches: young branches thick, glabrous, yellowish brown; leaves, rigid, thicker than broad, often falcate, shining dark green, ½ to 1 in. long; pistillate fls. green, staminate yellowish; cone oblong, 4 to 5 in. long, dark brown, glossy; scales with finely denticulate margin. Japan. S.Z. 2:111. G.C. II. 13:233; III. 21:251. Gn. 13, p. 239. S.I.F. 2:2.—One of the most distinct species, of very striking appearance with its rigid spiny leaves, spreading in all directions from the stout branches, but usually of rather irregular habit.

4. ASPERATA, Mast. Tree, to 100 ft., with grayish brown bark peeling off in thin flakes; branchlets pale yellowish gray, pubescent; leaves, ovate-oblanceolate, 4 to 5 in. long, glossy; terminal leaflets ovate, 1½ to 2 in. long; pistillate fls. purple; cones cylindric-oblong, 4 to 7 in. long, light brown; scales obovate, with cross-denticate margin. N. and Cent. Eu. Em. 1:102. Mn. 4, p. 185; 6, p. 85. P.E. 15:350, pl. 50. H.W. I. 1-1, pp. 54-61. C.L.A. 11:311. G.W. 2, p. 535; 6, p. 322.—Though P. Abies is the correct name for this species according to the rules of priority, we have retained here the name P. excelsa, because Picea Abies and Abies Picea might be easily confused and are certainly somewhat perplexing. It seems therefore advisable to take the next oldest names which are P. excelsa and P. montana, var. montana for the Norway spruce and Abies alba, Mill. for the silver fir. This tree is extensively planted as an ornamental tree in the northern and eastern states; it is of rapid growth and is a handsome tree, with its graceful habit and dark green dense foliage, but, like many spruces and firs, loses much of its beauty when it grows old, and usually after 30 years it becomes thin and ragged in the top. It is one of the best conifers to plant for shelters and windbreaks. The Norway spruce is very desirable, and a great number of garden forms are in cult. Some of the more important are the following:

Pendulous or sparingly branched forms of P. excelsa:


Lou, irregularly branched monosymmetric forms: Var. Bár-
y, Bes. With vigorous young branches and short
form, the young branches brown, often with short fas-
cicled branchlets: lvs. bright green, rigid, pointed.

Variozgated forms: Var. fiedonensis, Beissn. (Abies ezedea fiedonensis, Gord.) Lvs. pale yellow at first, becomin bronze brown and finally green. Var. argén-

The most important of the geographical forms are: Var. fénica, Ruhr. Similar to P. obovata: cones not more than 3 in. long. N. Eu. and N. Asia. Var. medióxina, Nyland. Sometimes or rarely shrubby: lvs. short, shorter, lustrous, green: cones to 3 in. long. Resembl
es somewhat P. orientalis. N. Eu. Var. alpéstris, Brügg. Slow-growing compact tree: young branches velutinous: lvs. shorter, usually obtusish, dull yel-
ownish or grayish green: cones 2-5 in. long. Resembl
es in habit and foliage somewhat P. canadensis. In
the Alps at high altitudes. - There are two forms of the common Norway spruce differing in the color of the young cones: Var. chlorelára, Purk. Young cones green, lvs. obtusish, more appressed; leading last. Var. erythrocárpa, Purk. Young cones violet-purple: lvs. more spreading, pointed; leading earlier.

6. obováta, Ledeb. (P. ezedea var. obováta, Koch.) Tree, to 100 ft., similar in habit to the following, with somewhat pendulous branches: young branches brown, glabrous or slightly pubescent: lvs. quadrangular,
acute, dull or bluish green, ¾-4 in. long; pistillate fls. purple: cone oblong-ovate, light brown, about 1¾ in. long; scales with entire margin. N. Eu. to Kamchatka and Manchuria. G.W. 3, p. 91. R.T. 1884, p. 274. Var. 5, p. 189.-Of slower growth than P. ezedea and more graceful.

fore valuable for smaller gardens. It holds its lower limbs for many years. Var. alba, Carr. Low form of broadly pyramidal habit, with wide-spreading branches. Var. aürea-spica ta, Beissn. Young shoots yellow. Var. nitans, Niiettz. With graceful hanging branches. Var. semi-
virgata, Schwerin. Branches with few lateral branch-
lets, which gives the plant a loose slender appearance.


9. marítima, BSP. (P. ígix, Link. P. breéfóliá, Pech.) The native Black Spruce. Figs. 2942, 2943. Tree, usually to 20-30 ft. or occasionally to 100 ft., with slender, often pendulous branches forming a narrow, irregular head: bark gray-brown: young branches brown or yellowish brown: lvs. quadrangular, obtusish, dull dark or bluish green, less than 1 in. long; scales rounded and finely dentate at the margin. From Canada to Va. Minn. and Brit. Col. S.S. 12:596. -Very variable in habit; cone-bearing trees often only a few feet high when growing in swamps. The most ornamental garden form is var. donúti, Schneid. (P. ígix donúti, Carr.), with ascending crowded branchlets forming a dense conical pyramidal. A similar form, somewhat broader at the base with more light bluish green foliage, is var. Beissneriana, Rehd. (P. ígix marítima, Beissn.). G.C. III. 11:80. Var. fasti-
Section II. CASICA, MAYR.

**Picea***

Lvs. quadrangular or more or less compressed; scales of cone loosely appressed before maturity, rhombic and usually elongated, cross-denticulate, and more or less wavy on the margin.

11. **Engelmannii**, Engel. (*P. columbiana*, Lemm.). *Abies commutata*, Murr.). *Engelmannia Spruce*. Tree, to 150 ft., with slender spreading branches in closely arranged whorls, forming a dense and narrow pyramid in young trees, winter buds with brownish yellow usually appressed or little spreading scales: young branches pale brownish yellow, pubescent: lvs. slender, straight or slightly incurved, acute, bluish green or steel-blue, ½-1 in. long, without resin canals, of a strong aromatic odor when bruised: fls. purple: cones oval- to cylindric-oblong, light brown, 1½-3 in. long; scales rhomboidal, narrowed and truncate at the apex. From Alberta and Brit. Col. to Wyo. to Colo. and Utah. S.S. 12:600. G.F. 4:211 (erroneously named Douglas fir). M.D.G. 1896:403; 1905:123.—A very ornamental tree, especially attractive by the contrasting colors of the foliage, but it can hardly be grown successfully in the eastern states; it does not stand the hot summers well, and is probably not hardly farther north than Mass. Var. speciosa, Beissn., is of slower growth and more compact habit, with more ascending branches and shorter, more rigid lvs.


15. *purpurea*, Mast. Tree, to 60 ft. with wide-spreading branches: branches orange-yellow, hispid: winter buds broadly ovoid: lvs. quadrangular, more or less compressed, curved, obtuse or acutish, with 2 white bands above, green beneath, with greenish lines above, sharply acuminate, ½-3/4 in. long: cones cylindric-oblong, 2½-4 in. long; scales rhomboidal, narrowed and truncate at the apex. From Wyo. to Colo. and Utah. S.S. 12:602. G.F. 4:211 (erroneously named Douglas fir). M.D.G. 1896:403; 1905:123.—A very ornamental tree, especially attractive by the contrasting colors of the foliage, but it can hardly be grown successfully in the eastern states; it does not stand the hot summers well, and is probably not hardly farther north than Mass. Var. speciosa, Beissn., is of slower growth and more compact habit, with more ascending branches and shorter, more rigid lvs.

Section III. OMOrika, MAYR.

Lvs. more or less compressed, with glaucous lines above, green below: scales of cone closely appressed before maturity, broad and entire or nearly so on the margin.


18. *Breweriá*, Wats. Tree, 80-120 ft. high, with the branches at the top slightly ascending, the lower ones horizontal or pendulous, with whip-like pendulous branchlets often 7-8 ft. long, furnished with similar, slender lateral branchlets; young branches reddish; lvs. straight, acute; branchlets and lvs. in spring bright reddish brown, glabrous: lvs. quadrangular, thick, pungent, 3 1/4-2 in. long; cones reddish brown, 1 1/4-2 in. long, with broad rounded or truncate scales. W. China.—P. *Wilsonii*, Mast. (I.) Tree to 90 ft.; branchlets glabrous; lvs. quadrangular, slender, 1/4-1/2 in. long, bright green; cones reddish brown, 1 1/4-2 in. long with obovate, rounded scales. W. China.—P. *W. Wilsonii*, Mast. (P. Mastenii, Mayr. (I.) Tree to 60 ft.; branchlets glabrous; lvs. quadrangular; coniferous, acute, 1/4-1/2 in. long; cones ovate-oblong, 1/2-1 in. long; scales suborbicular, narrowly ovate, finally recurved at margin. Cent. China. G.C. III. 33:145-151.

Not in cult. are the following species: P. *gemmato* Rehd. & Wilson, P. *p. formosa*; P. *P. Wilsonii*, Mast. (P. Mastenii, Mayr. (I.) Tree to 150 ft., with gray bark: branchlets yellow, glabrous: lvs. quadrangular, thick, pungent, 3 1/4-2 in. long; cones light brownish orange, 1 1/4-2 in. long, with obovate, rounded scales. W. China.—P. *P. Wilsonii*, Mast. (P. Mastenii, Mayr. (I.) Tree to 60 ft.; branchlets glabrous; lvs. pale green; flower buds ovate, ovate; dark brown, lustrous: lvs. quadrangular, curved, acute, 1/4-1/2 in. long: cones cylindrical-oblong, 1-1 1/2-2 in. long: scales suborbicular, narrowly ovate, finally recurved at margin. Cent. China. G.C. III. 33:146-150.

ALFRED REHDER.

**PIERIS**

**PIERIS** (a mythological name). Including *Portáns*, *Ericódeis*. Ornamental shrubs, grown chiefly for their handsome white flowers.

Evergreen or deciduous shrubs or rarely small trees: lvs. alternate, short-petioled, entire or serrate; lvs. in often pinnate racemes or in axillary clusters forming terminal racemes; calyx-lobes valvate or distinct; corolla globose or urceolate, with 5 short lobes; stamens 10; anthers oblong, with a pair of awns near the base or the filaments 2-toothed below the apex; caps. with 5 dehiscent valves; seeds linear-oblong, not winged, with membraneous testa. About 10 species in N. Amer. and in E. Asia south to the Himalayas. Often included under Andromeda. Closely allied to *Lyonia*, which is distinguished by its awnsless anthers, and to *Zemíbia*, which has the anthers 4-valved at the apex. The foliage of some species is said to be poisonous to cattle.

The pieris are handsome shrubs with medium-sized oval to lanceolate leaves and with rather small white flowers in large terminal panicles or in racemes. The evergreen *P. floribunda* and the deciduous *P. mariana* are hardy North and, like the other species, are valuable for the earliness of their flowers. The most beautiful are *P. japonica* and *P. formosa*; the first thrives still in Massachusetts in sheltered positions, but the flowers are usually winter-killed, while *P. formosa* can be grown only South. They are easily forced, and *P. japonica* especially may be recommended for this purpose; it makes a very handsome and graceful pot-plant for indoor cultivation.
inside decoration with its slender racemes of pure white flowers hanging over the glossy bright green foliage. The species of Pieris, like other Ericaceae, grow well in a moderately moist well-drained and porous soil, but dislike limestone and heavy clay; a partly shaded situation suits them best. Propagation is by seeds treated like those of azalea or rhododendron; also by layers, and the evergreen kinds by cuttings of almost ripened wood in August under glass, kept during the winter in a cool greenhouse. They root very slowly; cuttings taken from forced plants root more readily.

a. Lvs. evergreen.

b. Fls. in terminal panicles formed the previous year and remaining naked during the winter: lvs. serrulate.

c. Panicles upright.


cc. Panicles drooping.


formosa, D. Don (Andromeda formosa, Walt.) Shrub or small tree, to 20 ft.: branches glabrous; lvs. crowded at the ends of the branchlets, elliptic-oblong to lanceolate, acuminate, broadly cuneate at the base, finely serrulate, glabrous, lustrous above, 2-5 in. long; fls. in terminal drooping or spreading panicles, to 6 in. long; corolla white, tinged with pink, ½ in. long. April, May. E. Himalayas. B.M. 8283. G.C. II. 18:509. Gn. 54, p. 77. G. 27:183; 38:425, 427. I.H. 5:162.—Very similar to the preceding species, but larger in every part; less hardy.

b. Fls. in axillary clusters, forming terminal leafy racemes; lvs. entire.


AA. Lvs. deciduous or half-evergreen, entire: fls. in racemes.

marina, Bentham. & Hook (Andromeda marina, Linnaea marina, Lam. Lyonia marina, D. Don. Lesotho marina, DC.) Stagger-Bush. Fig. 2947. Deciduous shrub, 2-4 ft. high, glabrous or nearly so: lvs. oval to oblong, obtuse or acute, usually cuneate at the base, entire, 1-3 in. long: fls. nodding, in axillary clusters on leafless branches of the previous year, forming 2-5-in-long racemes; corolla cylindric-campanulate, white or pale pink, almost ½ in. long: caps. ovate-pyramidal. April-June. A. I. to Fla. B.M. 1679. Mn. 2:47. G.O.H. 113. A.G. 10:281 (adapted in Fig. 2947).—The foliage is said to poison lambs and calves.

ovatifolia, D. Don (Andromeda ovatifolia, Wall.) Half-evergreen or deciduous shrub or tree, to 40 ft.: branches glabrous; lvs. coriaceous, oval or elliptic to ovate-oblong, short-acuminate or acute, usually rounded at the base, glabrous or hairy on the veins beneath, 2-6 in. long: fls. in simple lateral racemes with a few lvs. at the base, 2-6 in. long; sepals ovate to triangular-lanceolate; corolla oblong-urecinate, white, slightly pubescent outside, ½ in. long. May-June. Himalayas. Var. lanceolata, Clarke (P. lanceolata, D. Don.) Lvs. elliptic-oblong to elliptic-lanceolate, narrowed at the base, smaller; sepals greenish, oblong to lanceolate. Himalayas, China. Var. elliptica, Rehd. & Wilson (P. elliptica, Sieb. & Zucc.). Lvs. thinner, deciduous, elliptic-ovate to ovate-oblong. Japan. S.I.F. 2:60. This variety is hardier than the type.

P. phillipheralia, DC. Evergreen shrub. 1-2 ft. high, glabrous; lvs. ovate or nearly so: lvs. ovate to elliptic, 2-4 in. long: fls. in axillary clusters, forming terminal leafy racemes; lvs. entire. P. phillipheralia, DC. Evergreen shrub, 1-2 ft. high, glabrous; lvs. ovate, serrulate near the apex, 1½-2½ in. long; racemes axillary, 4-12-fl.; corolla ovate, white. Feb., March. W. Fla. B.H. 30:56. H.B. 2:122.

PIGAFETTA (derivation not known). Palmacea. Tall palms: sts. stout, aculeate above, remotely annu­late below, creeping at base: lvs. terminal, pinnalet-
of water. Sometimes they are used as edgings much prized. They are easy to grow, being propagated by cuttings. They thrive best when given an abundance of water. Sometimes they are used as edgings in greenhouses for their compact fern-like sprays and for screening the pots with green, and they also tend to equalize the moisture conditions and thereby contribute to the welfare of the orchids. When the staminate flowers open, the pollen is usually discharged forcibly and visibly. If a plant is put in a sunny place when the pollen is ripe, it may set up a vigorous bombardment, particularly if the foliage is sprayed. (See I.H. 1, p. 64, 1854, for an account of this phenomenon.) The artillery plant is seen in nearly every greenhouse, but whether there is more than one species in common cultivation it is not easy to determine, for specific characters are difficult to draw. The leaves, although opposite, are unequal. Usually the branchlets develop alternately on the branch. The species are confused.

PILEA (pileus, a Roman cap: one of the segments of the perianth in the first described species covering the achene). Syn., Adoea. Urticaceae. Mostly weedy plants, but forms of one or two species are grown in greenhouses for their compact fern-like sprays and for the interesting phenomenon of forcibly discharging the pollen, whence the name "artillery plant."

Annual or perennial herbs, glabrous or pubescent: lvs. opposite, usually strongly 3-nerved: fls. monocious or dioecious, mostly very small and in axillary clusters; stamens 3-4, and the sepals in the staminate fls. of the same number; sepal-lobes in pistillate fls. 3, the ovary 3-angled and erect and bearing a sessile tufted stigma, with 3 scale-like staminodia: fr. an achene, ovate or nearly orbicular, compressed, more or less invested in the perianth. There are 150 or more species of Pilea in the tropics, chiefly of Amer.; and few extra-tropical; one, P. pumila, is a small nettle-like but stinging plant growing in the northern states.

The artillery plants of the gardens are small branchy half-succulent herbs, usually grown in pots and allowed to reach a foot or so in height. The gracefully curving branches of small ovate or obovate shining leaves are much prized. They are easy to grow, being propagated by cuttings. They thrive best when given an abundance of water. Sometimes they are used as edgings in orchid houses, to screen the pots with green, and they also tend to equalize the moisture conditions and thereby contribute to the welfare of the orchids. When the staminate flowers open, the pollen is usually discharged forcibly and visibly. If a plant is put in a sunny place when the pollen is ripe, it may set up a vigorous bombardment, particularly if the foliage is sprayed. (See I.H. 1, p. 64, 1854, for an account of this phenomenon.) The artillery plant is seen in nearly every greenhouse, but whether there is more than one species in common cultivation it is not easy to determine, for specific characters are difficult to draw. The leaves, although opposite, are unequal. Usually the branchlets develop alternately on the branch. The species are confused.

PILOCARPUS (Greek, pilos, cap, and karpos, a fruit, from the shape of the fruit). Rutaceae. Shrubs or small trees, sometimes attaining 10 feet.

Leaves pinnately compound, of 1-4 pairs and a terminal lift.; lfts. opposite, but the lvs. usually alternate: fls. in elongated racemes: petals 4-5, valvate; stamens 4-5; ovary 4-5-lobed, not tubercled. There are 15 species, natives of Trop. Amer., principally Brazil. The plants of the genus form the source of the alkaloid "pilocarpine," and together with plants of several other genera, the source of the drug "jaborandi."
entire, coriaceous, pellucid-punctate: petals ovate or oblong-ovate, acute; stamens subulate: fr. a dark brown or blackish follicle; seeds glabrous. W. Indies.

—Intro. into Calif.

Cephalocereus, Holmes, has been described as P. penicellatus, by Bentl. & Trin., but is distinguished from it by shorter lvs. and lfts., stiffly pubescent branchlets and sts., more openly flowered, with smaller racemes and peduncles, and the presence of conspicuous bracteoles above the middle of the fl.-peduncle. B.M. 7435.

ARNOLD V. STUBENRAUCH.


PILOLYNE: Melodoria.

PHILALÀRIA (Latin, a little ball, alluding to the shape of the involucres). Marsileæceæ, one of the fern allies. Small aquatic plants, sometimes used in ponds: rootstock fibrous, with a creeping rachis rooting at the nodes; leaves reduced to filiform stipes, often or clustered at the nodes: involucres solitary at the nodes, sessile or shortly stipitate, globular: sori 2-4, vertically adnate.—About 6 species, Eru. Asin., Austral., New Zeal., and N. Amer.

globulifera, Linn. Rootstock creeping under water, often to a considerable extent; leaf-stems filiform, bright green, like the lvs. of Elodea, 1-3 in. long, usually few together at the nodes: involucres involute about the size of a pea, slightly hairy, sessile or borne on very short erect or recurved stipes. Eru. Asin., and Austral.

PILUMA: Trichophila.

PIMÉLEA (Greek, fleshy, referring to the fleshy seeds). Thymelæceæ. Rice-Flowers. Mostly shrubs, fitted for greenhouse culture, although reported to be hardy in the open wherever the lemon can be grown successfully.

Woody, or rarely herbaceous, with small opposite or alternate, always simple and entire lvs.: inf. usually a terminal head or cluster, never umbellate, often with an involucre of 4 or more bracts at the base; fls. hermaphrodite or functionally dioecious, white, pink or rose, 4-lobed, ovary 3-celled: fruit a small drupe, included in the base of the perianth. Eru. Asin., Austral., and New Zeal. Of the 80 or more species, only 3 or 4 (as P. ferruginea, P. ligustrina and P. spectabilis) are much known in cult. here, but there are other very showy species, some of which are grown in the Old World.

These fine evergreen shrubs may be increased readily from cuttings of the young half-ripened shoots in March. Make these cuttings 2 to 3 inches long and place in pans, leaving about an inch between the cuttings. The pots are filled with a mixture of loam, peat, and sharp sand in equal parts. See that the pans are well drained. Place where they may have a temperature of 55° to 60° and keep covered with glass. See that they are shaded and moist, and they will soon root. When the summer comes, they should be given more ventilation, to ripen up whatever wood they have made. In autumn they may have a temperature of about 50° at night with about 10° rise with sun heat. They will do well in about 45° for a winter temperature, with about 55° to 58° on bright days. In winter, give great care to watering so they will not become too wet, just keeping in a nice moist state. By February they may have any necessary potting, using a mixture of fibrous loam four parts, fibrous peat one part, leaf-mold and well-decayed cow-manure one part each, and enough clean sharp sand to make it porous. Pot firmly. They may now be given a temperature of 55° during the night with about 65° on bright days and by April they should be standing 5° to 8° more. They will now need a shift into 5- or 6-inch pots, and give them a pinch back when they have made a little growth. In summer they may have the strongest growths tied out in a horizontal position. Give them as much water as advised for the previous summer and by the next spring the plants should flower. For established plants, they will require heading in after they are through flowering and encouraged to make growth freely during the summer. Give these plants plenty of syringing as they are liable to be affected with red-spider; their treatment year after year will be similar to that mentioned before, only with larger shifts and to be assisted by weekly applications of liquid manure to give them renewed vigor. (J. J. M. Farrell.)

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1. longiflora, R. Br. Sts. 4 ft. or more high, slender, erect, very leafy; lvs. sometimes alternate, linear, hairy: fls. pure white, hairy externally, long and slender; heads globose, many-fl., perianth silky; anthers yellow, not exserted. W. Austral. B.M. 3251.

2. drupacea, Labill. A straggling shrub 6-8 ft. high or lower: branches leafy: lvs. ovate to oblong-elliptical or oblong-linear, glabrous above, slightly silky hairy beneath, distinctly penninerved: fls. white or tinged with pink, silky hairy; anthers yellow, hardly excised; heads sessile, few-fl.; fr. a red or black drupe. Victoria, Tasmania. L.B.C. 6:540.

3. imbricata, R. Br. Small erect shrub, much branched, from less than ¾-1½ ft. high, usually clothed with long, silky hairs, but sometimes glabrous: lvs. usually crowded, alternate or opposite, oblong-linear to linear; involucral lvs. similar to stem lvs., much shorter than fls.: fls. white, outside hairy; tube cylindrical, heads terminal, globular, many-fl. W. Austral. B.M. 3833 (as P. nana, and which is included under var. piligera in Fl. Austral.).

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4. hypericina, A. Cunn. St. erect, slender, to 8 or 10 ft. high: branches not very leafy: lvs. opposite,
PIMELEA

elliptic-oblong, smooth: fls. white, hermaphrodite and female on distinct plants, very hairy externally; hermaphrodite fls. longer and more slender: heads many-fl., and crowded.—Very similar to P. ligustrina, in fact placed as a variety of it in Flora Australiensis; distinguished in having more involucral lvs. much shorter than the fls. and silky pubescent or hoary. Austral. B.M. 3330.

5. ligustrina, Labill. Erect, 5–6 ft. high: lvs. opposite, ovate to oblong or elliptical; involucral lvs. 4, very rarely 5 or 6, as long as the fl.-tubes, glabrous; fls. sometimes female only, silky hairy, white, in rather large globular heads. Austral., Tasmania. B.R. 1827.

6. suavolens, Meissn. Erect, often less than 1 ft. high, sometimes branching at base only, reaching 2–3 ft.: branches very leafy: lvs. opposite, ovate, oblong-lanceolate to oblong-linear; involucral lvs. 4–8, usually as long as the fls. and ciliate; fls. yellowish when fresh, usually hairless and pale, glabrous, very large, the fls. silky-hairy, white. W. Austral. B.M. 4543 (as P. macrocephala).

BB. Lvs. not penneined or very obscurely so.

c. Color of involucral lvs. green.

d. Fls. white.


9. gracilliflora, Hook. Erect, slender, 2½ ft. high: lvs. lanceolate, dotted above; involucral lvs. 6, shorter than the fls.: fls. long, slender, glabrous.—Very similar to P. sydowia, and described as the same in Fl. Austral.; distinguished from it by narrower lvs. dotted above, and more slender pure white fls. B.M. 3228.

10. arenaria, A. Cunn. Small, erect shrub, dichotomously branched, to 2½ ft.: lvs. opposite, ovate, obscurely downy above, silky hairy beneath; involucral lvs. not different from st.-lvs.; fls. silky on outside, white; anthers and style not protruded beyond perianth-tube; heads few-fl., and sessile. New Zeal. B.M. 3270.

DD. Fls. mostly rose-colored (varying to whitish and bluish).

11. rosea, R. Br. Erect, small: branches sparingly leafy: lvs. opposite, linear-lanceolate or ovate, glabrous both sides, margins revolute; involucral lvs. 4, as long as the fls.: fls. pink or while, with long spreading hairs on lower portion of tube, silky on upper portion. W. Austral.—Very closely allied to P. ferruginea, but fls. larger and bracts more acuminate. B.M. 1458; 3721 (as P. Hendersonii). L.B.C. 1: 88.


DDO. Fls. white and pink in same head.

13. nivosa, Labill. (P. incola, R. Br.). Erect, bushy or straggling, 6 ft. or more high: branches and under side of the lvs. white, with a dense tomentum: lvs. ovate or orbicular, glabrous above; involucral lvs. 4–6, larger than st.-lvs.: fls. white or pink, tonging or silky: heads globular, terminal, many-fl. B.R. 24: 24. F.C. 1: 19.

cc. Color of involucral lvs. pink or red, or tinged only at margin.


15. spectabilis, Lindl. Erect, 3–4 ft. high, glabrous: lvs. crowded, mostly opposite, linear-oblong or lanceolate; involucral lvs. 4–6, ovate or ovate-lanceolate, half as long as nearly as long as the fls., usually tinged only at margins: fls. white after expansion, hairy outside: heads very large, globular, many-fl. W. Austral. B.R. 27: 33. B.M. 3950. R.B. 20: 157. G.W. 3, 414. F.E. 16: 610.—A very handsome, showy plant, now probably the most popular species.


L. H. B.†

PIMENTA (from the Spanish pimento, allspice). Myrtaceae. Highly aromatic trees, one species of which is the allspice.

Leaves large, leathery, feather-veined, long-stalked, black-dotted beneath: fls. numerous, small, white, borne in terminal or axillary, trichotomous cymes; calyx-tube top-shaped; petals 4–5; stamens numerous: drupe 1–2-seeded.—Five or six species, native of Trop. Amer. As a genus Pimenta is distinguished from its near allies (Engenia, Myrtus) by the circular or spiral embryo and the 2-celled ovary with 1–6 ovules pendulous from the apex of each cell.
Allspice is the unripe berry of *P. officinalis*, which is gathered and dried in the sun. Its name comes from the idea that allspice combines the flavors of clove, cinnamon, and nutmeg. Allspice is common in the wild in Jamaica, inhabiting limestone soil. It is more extensively cultivated or run wild in Jamaica than anywhere else. It is cultivated up to 4,000 feet. The plant is not offered in the American trade, but there seems no reason why it could not be cultivated in Porto Rico.

*officinalis*, Berg. (*Eugenia Pinnata*, D.C.). **ALLSPICE.** *Pimenta*. Figs. 2949, 2950. Differentiated from the other species by the oblong lvs., 4-lobed calyx and globose drupe. Tree, 30–40 ft. high; lvs. 2–6 in. long; petiole 1in. long; fls. 3 lines long: drupe 3 lines thick. Cuba, Jamaica, Mex., Cent. Amer. B.M. 1230 (as *Myrtus Pimenta var. longifolia*).

*P. areca*, Kostel., the bayberry or bay-run tree is by some separated in the genus *Amenisia* (*Myrtaceae*). A shrub or small tree in the W. Indies, Venezuela, and Guiana, from the dried lvs. of which (and probably also from other myrtaceous plants) the bay oil or oil of myriss is distilled: bark separating in shreds or plates; lvs. shining above, very aromatic. L. H. B.

**PIMPERNELLI: Amagallis.**

*PIMPINÉLLA* (possibly from Latin *bipinnula*, bipinnate). *Umbrifera*. About 75 species of herbs, one of which has been described under *Anise, P. integerrima*, Gray (see *Tendril*), has been offered by one dealer in hardy native plants. It differs from *Anise* in being a perennial plant with lvs. 2-3-ternate and segms. entire. B.B. 2:526. P. *major*, Huds. (P. *magna*, Linn.). Sts. 1–2 ft., angularly striate: lvs. pinnate, lfts. all ovate-serrate, somewhat cut, the terminal one 3-lobed. Er. Probably not in cult., but a form listed as *P. magna rosea*, Hort., with rose-colored fls. is cult. in England as a border and rockwork plant.

**PINÁNGA** (Malay name). *Palmacea*. tribe *Aréceae*. Slender spineless bamboo-like palms from India and the Malay Archipelago.

Stems erect: lvs. terminal, unequally lobed or pinnatisect, or simple and bifid at the apex; segms. plicate, many-nerved, the lower ones acuminate, the upper confluent, the margins not thickened, recurring at the base; rachis acute above, convex below; petiole convex above; sheath elongated: spadix usually small, very simple: branches in groups; spathe 1, symmetrical, swollen or compressed and 2-winged: fls. rather small, the staminate one on each of a side of a pistillate, thus differing from *Arecaceae* in which the pistillate fls. are solitary: fr. ovoid or elliptical, orange or red, with a membranous hulk.—About 40–50 species. For cult., see *Palma*.

**Kühlii, Blume.** Fig. 2951. Sts. tufted, 20–30 ft. high, slender: lvs. 3–4 ft.; lfts. many, 1–2 ft., falcate-linear to linear-lanceolate, finely acuminate, strongly 2–3-ribbed, upper confluent; petiole variable in length, somewhat scurfy; fr. 1½ in. long, shortly acuminate. Sumatra, Java. G.C. III. 31:101. G.W. 12, p. 209. Known also as *Ptychosperma* and *Seaforthia Kühlii*.

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**PINE.** What the apple is among the fruits, what the oak is among the broad-leaved trees of the temperate zone, the pines represent among the conifers, excelling all other genera in this most important family in number of species, in fields of distribution, in extent of area occupied, in usefulness and importance to the human race. No other trees of the temperate zone have contributed so largely to the building up of civilization, and no other, it may be predicted, will continue longer to fill...
the important place in the household of civilized men; for not only do they furnish in a number of species the most satisfactory qualities of wood for structural purposes, but their frugality in regard to soil conditions will preserve them a place as wood-producers in many of the poorer soils when the more valuable for agricultural use have all been turned over to food-production.

Among the seventy or more well-distinguished species—over 600 species and varieties of Pinus have been described—all inhabitants of the northern hemisphere, ranging from the subtropical plains and mountains to the poles—will find their place in the coniferous forest, and most of them, when mature, have not only distinct and remarkable characteristics, but bear some striking resemblance to the umbrella-like fashion of the crown. They will have stout branches and the crown may have broadened and flattened, or piked picturesque in their age, in their intermediate stages, or picturesquely in their age, in their intermediate stages, or in the candelabra-like branches, P. contorta, resembles the umbrella-like fashion which the stone pine (P. pinea) exhibits so strikingly in the Italian landscape. This flattening of crown is characteristic of most yellow pines, while the pines or nut pines have a tendency to the broom-like or apple-tree appearance. Of the eastern species, the white pines alone preserve to some extent the conical habit of the crown in imitation of the species with more or less symmetrical horizontally spreading branches, which render them pleasing objects throughout all periods of life. On the Pacific Coast a number of species preserve the conical form.

In the choice and combination of plant material it should be kept in mind that the pines are essentially light-needling species, hence do not bear overtopping or crowding unless they have a chance by their rapid growth in height to escape from the pressure of their neighbors. The pines are the most satisfactory of the different groups, as they vary in height, and laggards, remaining dwarfs or medium-sized trees; again the king of pines, the common white pine, and its giant congener the sugar pine, with the bull pine in favorable situations, take first rank, the first with a maximum height of 200 feet and more, the last with over 200 feet, while many of the so-called scrub pines, like P. virginiana, P. serotina, P. Banksiana, the Alpine white pines, P. flexilis, P. arbutifolia, P. Peuce, P. pumicea, P. densiflora, and most nut pines reach rarely over 40 feet; some, like P. koraiensis, P. Bunias, P. montana, with several of the nurserymen's varieties, remain actually dwarfs and maintain a compact bush-like appearance for a long time.

In regard to foliage, quite a large variety can be secured. For grace and elegance nothing better than the five-needled white pine can be suggested, although P. flexilis from the Himalayas, with its slenderer and longer branches and more drooping foliage, and the dwarfs P. Peuce from Macedonia and P. koraiensis, with their denser and more compact crowns, and some others of the white pine tribe, may vie with it. Among the yellow pines, the native almost entirely overlooked, P. glabra, deserves mention in this connection, where the climate permits its use, as well as the interesting sand pine, P. clausa.

For richness, fulness, and vigor of foliage, the red pine (P. resinosa) outranks even the much-plantied more somber Austrian pine, and for interest in development nothing can compete with the longleaf pine (P. palustris). With its needles, which in young specimens exceed a foot in length, surrounding in dense graceful tufs the big silvery buds at the tip of the candelabra-like branches, P. palustris offers a most striking appearance. Unfortunately, it is not adapted for planting north of 32°.

The thin, grayish, short foliage of the frugal Banksian pine and of several other of the scrub pines, and the short stiff needle of the red pine, P. clausa, and the interesting one-needle pine (P. monophylla) resemble the spruce foliage. Color of bark varying in species from silvery gray through red and yellow tints to almost black, and character c-size of cones from the diminutive globoid forms of P. contorta to the long pendulous cones of the sugar
pine, 2 feet in height, and the hooked, ponderous cones of \(P. \text{ Torreyana}\) and \(P. \text{ Sabiniana}\), may also influence choice of material.

With wide range of distribution and hence adaptiveness as far as climate is concerned, we have the short-leave pine \(P. \text{ echinata}\), which is found from Massachusetts to Texas, and in the West the bull pine \(P. \text{ ponderosa}\), which ranges from the moist Pacific Coast to Washington to the dry slopes of Arizona. In Europe, the Scotch pine comes nearest to such wide distribution. Besides the native northern species, there have been found hardy in the northeastern states the Scotch and Austrian pines, \(P. \text{ Bungeana}\), \(P. \text{ Cembra}\), \(P. \text{ koraiensis}\), \(P. \text{ montana}\), \(P. \text{ Thunbergii}\), while the Mexican pines and those of southern Asia will endure only the light frosts of the southern states. Yet in the parks of Washington, D. C., the following pines are to be found: \(P. \text{ Strobus}\), \(P. \text{ Cembra}\), \(P. \text{ excelsa}\), \(P. \text{ Lambertiana}\), \(P. \text{ Ayacahuite}\), \(P. \text{ koraiensis}\), \(P. \text{ pauciloba}\), \(P. \text{ Tada}\), \(P. \text{ ponderosa}\), \(P. \text{ rigida}\), \(P. \text{ nigra}\), \(P. \text{ Acladina}\), \(P. \text{ virginiana}\), \(P. \text{ aristata}\), \(P. \text{ menziesii}\), \(P. \text{ Pinaster}\), \(P. \text{ edulis}\), \(P. \text{ pungens}\), \(P. \text{ sylvestris}\), \(P. \text{ Massoniana}\); and the probability is that most of the other species could find a place there if not to thrive.

The list of species hardly in the Arnold Arboretum (Boston) comprises the following:

1. Thriving well.

- Bankianiana
- Bungeana
- Cembra
- densiflora
- echinata
- Jeffreyi
- koraienstis
- P. excelsa and \(P. \text{ ponderosa pendula}\) thrive well in a sheltered place, but are probably not quite hardy here.

2. Hardy, but not of promising growth.

- aristata
- arisata var. Murraya
- edulis
- flexilis
- monophylla.

In the interior middle states the number which would stand the extremes of drought and cold would probably be reduced; a partial list found in the Missouri Botanical Garden is given below:

The best are given first. All of the later ones on the list will out sooner or later, as the city smoke is very detrimental to conifers. None does very well on that account.

- Mughus (Punzillo) "best three.
- austriaca.
- Strobus.
- Cembra.
- rigida.

For seaside planting, \(P. \text{ rigida}\) has shown itself most fit, and of foreigners in proper climate, \(P. \text{ Pinaster}\) and \(P. \text{ kahlepenus}\), while \(P. \text{ contorta}\) on the northwest coast and the frugal \(P. \text{ radiata}\) on the southwest coast are the seacoast trees par excellence.

The pines are essentially inhabitants of the poor sandy soils and dry situations, their stout root-system enabling them to seek the scanty water-supplies where other species find it difficult. Some, like the white pine, are adapted to a variety of soil conditions, but only a few can endure a surplus of water: \(P. \text{ resinosa}\) will follow the white cedar into the swamp and thrive there as well as with the Banksian pine on the poorest gravel; \(P. \text{ rigida}\) is at home both in wet and dry places; the Scotch pine of the Baltic sand plains may be found in the peat-bogs, but only eking out a miserable existence, while \(P. \text{ Tada}\), the old field pine, makes magnificent trees in the southern swamp, and with its slow growth under such conditions an excellent timber. \(P. \text{ contorta}\) and \(P. \text{ serotina}\) also are indifferent to water conditions at the root; so is the Cuban pine, but \(P. \text{ palus-}

Fires belies its name, for it is only very rarely found in poorly drained places and does not thrive there.

The propagation of pines does not offer any difficulties. The seed usually has a high germination percentage in most species if kept dry and cool, and it retains vitality for several years, deteriorating of course somewhat from year to year. To avoid deterioration in transoceanic shipments, packing in charcoal dust has been found very serviceable. While most of the pine seeds sprout readily, the white pine, with some others, has the bad habit of being yearly in part unless treated to a hot-water bath for twenty-four hours before sowing; or perhaps by sowing in autumn immediately after coming out of the cone, which is during the first two weeks of September. The seeds would be sown in light mold early, rather thinly to permit a good root-system to develop, covering them thinly according to size of seed, not over \(\frac{1}{2}\) inch, which is best done by sifting sand over the seed with a sieve. During the first year special care is necessary to regulate the water-supply and transpiration for the young seedlings; they need to be kept humid, not wet, but resent drought as much as a surfeit; and especially sudden changes from drought to wet are likely to produce "damping-off." To prevent too rapid transpiration, the familiar lath screens should be applied.

To prevent the formation of excessively long tap-roots which some species form, mechanical means may be adopted; but the best plan is to manure near the surface, so that fibrous roots will be organically formed. Such manure consists of one-third steamed bone-meal and two-thirds ammonia superphosphate. Root-pruning and transplanting in nursery rows when one or two years old is practised to secure a stocky root-system. In Germany one-year-old Scotch pines are planted by the million for forest purposes, but for ornamental purposes older plants are to be used; yet it is safest not to use them older than three or four years for permanent situations. In the third year usually the firstbranching occurs, indicating that the root-system is now well established.

In transplanting, the utmost care must be taken not to expose the roots to drying influences, a thin loam puddle answering best to keep them moist. While transplanting can be done at any time of the year, it is safest to do so in early spring, except when a droughty season is likely to follow, in which case fall planting is to be preferred.

A large number of nurserymen's varieties, dwarf and pendulous, varicolored, and the like, have been developed, especially from \(P. \text{ sylvestris}\) and \(P. \text{ Strobus}\). The most interesting freaks perhaps are those bushy forms derived from \(P. \text{ canariensis}\) and \(P. \text{ Pinus}\) produced by layering, in which single needles instead of the usual bundles of two in one sheath are produced, imitating the primary single needles of seedlings. The manner in which nurserymen's varieties are propagated by grafts or cuttings is discussed under \(P. \text{ Pinus}\).

According to the nature of the pines, if there is choice of location possible, the well-drained situations, even dry ones, should be reserved for them. They belong, with few exceptions, to the hillslopes not the bottoms, to the sands not clay soils, and will stand southern exposures better than the spruces.

Pines are frugal by nature, and can stand poverty better than surfete,—nevertheless they respond best to medium conditions, namely, a mellow surface and well-drained deep loam, not too rich, kept fluffy and loose enough to permit the natural development of the heavy tap-root system. Under such conditions, the peculiar rich foliage gives most satisfaction and the rank luxuriant growth which leads to poor form is checked; disease from fungi is obviated; the cottony scale (almost the only enemy of the white pine) is more readily fought, and injuries from caterpillars and beetles are more easily repaired. Lately,
two enemies of the white pine have developed which require attention. The one, a fungous disease, seems to be an importation from Germany, the white pine blister rust \((\text{Peridermium strobii})\), which attacks young trees and young foliage of the white pine tribe. It needs gooseberry and currant as intermediary host plants. The other pest is the white pine weevil, which works in the young shoots and disfigures the tree by inducing repeatedly new leaders to develop.

To prune evergreens, and especially pines, requires an artist, or else the result will be malformation: the best plan is to correct form by breaking out the center bud from such shoots as project beyond proper limits; thereby also a more compact growth is induced, which in the pines with their own habit is desirable. If it becomes necessary to prune the branches, the cut must remove also the bolster at the base of the branch; the resinous exudation will prevent decay, and the cambium soon covers the scar if the cut has been made properly. For hedge planting the pines furnish no specially desirable material, being light-needing and therefore thinning out soon in the interior; yet the white pine will stand as a hedge for a considerable time and also the dwarf \(P. \text{montana}\). Perhaps some others may answer the purpose.

For the botany of the pines, see \(\textit{Pinus}\).

\textbf{PINEAPPLE.} The pineapple (see \(\textit{Ananas}\)) is indigenous to America. It produces one of the most delicious fruits now regularly on the markets. The finest qualities are developed when the fruit is permitted to ripen naturally upon the plant. For distant markets the crop has to be gathered in varying degrees of unripeness to suit the time required in transit.

The year 1850 seems to be the earliest date at which pineapple-growing was attempted in the United States. This attempt was made near St. Augustine, Florida, according to Taylor. In 1869, planting was begun on the Keys, but the want of facilities for rapid transportation and the more favored Cuban and Porto Rican plantations, made the development slow. In 1897, about $15,000 worth was imported from the Hawaiian Islands.

Good pineapple land may usually be obtained for $25 to $100 an acre, the higher-priced land being in favored locations at railway stations and near settlements. The cost of clearing and preparing varies from $20 to $80 an acre, according to the cost of labor and the character of the growth on the land.

From 8,000 to 15,000 plants are needed to the acre, varying with the variety and the notion of the planter. The price of plants in the field varies from $3 to $350 the 1,000 for Red Spanish to $350 the 1,000 for the finer varieties. The cost of cultivating and fertilizing an acre for one year varies from about $20 to $150. It requires about eighteen months from the time of setting out to the maturing of the first crop, which yields 50 to 200 crates to the acre. Under favorable circumstances the second crop may be double that of the first. By careful attention the plantation may be continued for eight or ten years without resetting; the second or third crop frequently bears the maximum amount.

When a common variety is planted, the returns are mainly from the sale of fruit, but with fancy varieties the sale of plants constitutes the main source of returns. Four hundred dollars or more an acre has been realized frequently for a crop of the commonest varieties; in this case increase in plants cannot be considered as of much value. The value of a crop of fancy fruit is about double that of the common, and $1,000 worth of plants may be sold without detriment to the plantation, if it is a variety that is in demand. From this must be subtracted the cost of transporting to the markets which varies more or less with the distance the fruit is hauled. This cost varies with the quantity shipped, from $20 to $80 or more an acre.

The pineapple thrives in a variety of soils, but whatever its texture it must not be moist or wet. The pineapple plant will survive air-drying for months, but decays rapidly in a moist atmosphere. The greatest acreage is located upon dry sandy land, formerly overgrown with spruce-pine (\(\textit{Pinus clausa}\)) or a mixture of spruce-pine and hardwood. Chemical analyses of the soil from pineapple fields show an exceedingly small fraction of a per cent of the essential fertilizer ingredients present. A physical analysis shows the nitrogen content is very low. A considerable acreage is planted on the Florida Keys. Here there is only a small amount of leaf-mold, often not more than an inch on the average, covering a coralline rock. But for the fact that pineapples actually grow and make crops on such soil it would seem entirely incredible.

With conditions of soil as described above, it is imperative to fertilize, and under the existing conditions in the pineapple belt there is no other remedy than the addition of commercial fertilizers, and nothing better. While much is still to be learned about fertilizing this crop, it is fairly well established that for pineapples on spruce-pine land, dried blood, ground bone, and nitrate of soda are good sources of nitrogen; that low-grade sulfate of potash, carbonate of potash and high-grade sulfate of potash are good sources of potash; that acid phosphate should be used in small quantities only or avoided, using pulverized bone instead. A good plan for fertilizing is to drop a small handful of cottonseed meal into the bud immediately after setting out. In October, apply about 600 pounds of bone-meal and 400 pounds of low-grade sulfate of potash (not kainit) to the acre, or the equivalent of these fertilizers in some of the forms mentioned above. A second application may be made the following February; at this time the amount may be increased 10 to 25 per cent, according to the growth the plants have made. A third application may be made in June or July; and if the plants have grown vigorously a still further increase in amount may be made. A fourth application may be made in October, increasing the amount if the plants have grown vigorously. The succeeding applications may be made at the water-gated above, and the increasing and decreasing of the amounts may be determined by the progress of the plants. As the average spruce-pine pineapple land is not sufficiently fertile to grow a full crop of pineapples, much more depends upon proper fertilizing than any other one operation.

This plant is propagated by means of crowns, slips, suckers, and rattoons. The crown is the leafy part...
of the fruit as found in the market. Just below the fruit small plants form, which are left in the field when the fruit is gathered; these are known as slips. In the axils of the leaves buds occur; those that develop near the ground make strong plants in a few months and are known as suckers. (Fig. 2952, after Weston.) A strong plant will mature an "apple" in June and produce two to five suckers by the middle of September. Buds that develop from an underground part and form a root-system independent of the parent plant are known as rattoons. Crowns are not planted extensively, as they remain on the fruit when marketed. Good strong suckers are usually employed for planting out. Rat- toons are left in the field to replace the plants which have borne a crop, but they are not sufficiently numerous to make a full stand; hence some of the suckers must be left also. Slips require a year longer than suckers to mature a crop. According to Webber, it requires ten to twelve years to mature a plant from seed. Plants are raised from seed only for breeding purposes.

If spruce-pine land is prepared, it is cleared of all stumps, wood, roots, and any other organic material, and is plowed deep and leveled off smooth. The fields are then laid off in beds of six or eight rows wide depending on the variety. The beds should be narrow enough to permit fertilizing and working with a scuffle-hoe without entering the beds, as breaking the leaves is very detrimental. For Red Spanish the rows are made 18 to 20 inches apart; for Queens, 20 to 22 inches; for Porto Ricos, 30 to 36 inches. They are usually placed in checks of about the same distances.

The methods employed on the Keys are quite different. The land is cleared by cutting off the trees, shrubs, and the like, which are allowed to dry and are then burned. The plants are then set out with a grubbing-hoe; they must be set out irregularly, as the rocky soil does not furnish root-hold everywhere. Such fields become exhausted in a few years and have to be abandoned.

Cultivation consists in running over the ground with a scuffle-hoe. When the plantation is set out in beds the handle of the hoe is long enough to permit cultivating to the middle without the laborer entering the bed. Only about an inch of the surface soil is agitated, usually immediately after the fertilizer has been applied. Weeds are not troublesome, excepting in fields that have been cultivated a long time. Under sheds tillage is more frequent and appears to be more necessary. On the Keys no tillage is possible, but tall-growing weeds and such ligneous plants as may spring up are cut off. In all of the work among pineapple plants the greatest care should be exercised to avoid breaking the leaves, which are very brittle.

The fruit is picked a week before it would mature. It is packed at once into barrel (12 by 20 by 36 inches) and half-barrel (12 by 10 by 36 inches) crates, usually in the latter, the different sizes being packed in separate crates and designated as 18's, 24's, 30's, 36's, 42's, 48's, and 54's, according to the number required for a half-barrel crate. The fruit must be handled without being bruised and packed firmly to prevent its abrasion in transit. To protect the fruit each one is wrapped separately in brown paper.

Since the propagation is accomplished by means of offsets, the varieties are fairly stable and rather definitely marked. The variety most extensively grown is called Red Spanish, Spanish, or Reds. It has a medium-sized apple, and is a hardy plant. Abachi (Abakka), Blood, Queen (Fig. 2953), Sugar Loaf, Enville (Fig. 2954), and White Antigua are varieties that produce medium-sized apples of excellent quality. Black Jamaica, Black Prince, and Prince Albert produce large fruits or apples of excellent quality. Smooth Cayenne and Porto Rico produce large apples of good quality, those of the latter being of greater size. Other varieties are grown more or less extensively, and there are different names for these varieties, but the foregoing have been officially recognized by the Florida State Horticultural Society. It has been found very advantageous to build a shelter for "pines," in the winter a shed protects the plants from frosts and freezes. Pineapple plants freeze at 32° F. This degree of cold does not kill the heart of the plant, but only the larger part of the leaves. Pines under sheds have passed through a temperature of 25° F. without serious injury. The roof of a shed is usually flat, or undulating with the surface of the land. The height varies with the desires of the individual, but is usually about 8 feet above the ground.

In Fig. 2955 the roof is slightly less than 7 feet from the ground. The stringers running crosswise in the figure are 1 ½ by 3 by 21'; those running lengthwise are 1 ½ by 1 ½ by 15'. The material for the roof is cypress plastering lath of usual length and width. The stringers running lengthwise are 46 inches apart. The openings between the laths are just the width of a lath. The amount of lumber needed (to the acre) is about as follows:

- 424 posts (352 for roof, 72 for sides) 4" x 4" x 8'.
- 160 pieces 1 ½ x 3 x 20'.
- 900 pieces (840 for roof, 60 for sides) 1 ½ x 1 ½ x 15'.
- 80,000 lath (75,000 for roof, 5,000 for sides) ½ x 3 x 4'.

It requires about 9,000 feet of lumber for the above material exclusive of the lath. All lumber must be first-class and free from knots. This can still be reduced by about 2,500 feet by using wire in place of the 1 ½ by 1 ½ by 15' and weaving the lath in this. Under the most favorable circumstances such a shed can be erected for $450 an acre, but this is about the cheapest and lightest form that will withstand the elements.

The following diseases and insects attack pineapples:

2953. The Queen pineapple.

2954. The Enville pineapple.
bud, keeping out sand but not interfering with growth. Blood and bone, or blood, bone and tankage, may also be used. (3) Spike; longleaf: This disease manifests itself by the leaves failing to expand at the base, thus giving the plant a contracted appearance. The outer portion of the leaf spreads from the center of the plant, but usually fails to take on a broad flat healthy appearance. Experiments have proved that this disease may be produced by improper use of commercial fertilizers, although the disease has occurred where no fertilizer had been used. Abundant evidence is at hand to show that the disease is not due to an organic agent but rather to an unfavorable condition in the soil. Change the fertilizer, avoiding acid phosphate, kainit, and cottonseed-meal in large quantities, and give protection as by a pineapple shed (spike is a rare thing under sheds). (4) Blight; wilt: This disease occurs in a sporadic manner, usually without any apparent regularity. In some varieties the first intimation of blight is by the outer end of the leaves turning red, and later by the tips wilting. This wilting progresses until the entire plant has dried up. According to Webber the direct cause is a soil-inhabiting fungus which attacks the roots. Remove the wilted plants and set in healthy ones. If the plants are of valuable varieties trim off all diseased roots and set in healthy ones. In later stages the leaves rot off at the place attacked. Drop a small handful of tobacco dust into the bud of the plants.
Growing period, because they are not conveniently transplanted. Three plants may be placed in 6-inch pans, keeping them close to the side of the pan in triangular form. A good-growing medium consists of two parts peat soil, one part Shrub loam and one part sand, with plenty of drainage. When in full growth, the top of the pan will be fully covered by the viscid leaves. Watering the plants from above should not be practiced because of destroying the dew-like deposit on the surface of the leaves. The pans should be placed in saucers of water, and set in a light position in the warm house; give plenty of sunshine and the plants will readily flower throughout the summer. In October place the plants in the cool end of the house to rest. The growth will gradually deteriorate until it assumes the rosettes of small succulent leaves to carry them through the resting period.—Young plants are propagated almost as readily as echeverias. The small rigid leaves should be carefully broken from the main stem; if not broken clean they will not reproduce young plants. These should be laid flat on sand in pans of convenient size; the top of the pan should be protected by glass or a bell-jar, to retain the moisture; place the pan in a saucer of water. In four to six weeks the young plants with the leaf attached will be sufficiently rooted to allow potting. One of the worst pests are woodlice. (G. H. Pring.)

A. Color of fls. yellow.

B. Spur 2 or 4 times as long as remainder of the corolla.

Caudata, Schlecht. (P. orchideaideae, A. DC. P. Bakeriana, Hook. ) Less in dense rosettes when young, long and narrow; on older plants few and large, obovate and obtuse; scapes 5-12 in. high; fls. ½-1½ in. long and broad; spur curved, about as long as the rest of the corolla; throat spotted and lined with red; palate very prominent and densely bearded. Low pine barrens, N. C. to Fla. and La. B.M. 7263. B.R. 135.

AA. Color of fls. purple to bilac.

Spur 2 or 4 times as long as remainder of the corolla.

Caudata, Schlecht. (P. orchideaideae, A. DC. P. Bakeriana, Hook. ) Less in dense rosettes when young, long and narrow; on older plants few and large, obovate and obtuse; scapes 5-7 in. high; fls. deep carmine, with lighter throat and reddish lines, attaining 2 in.; lobes as long as the rest of the corolla; throat spotted and lined with red; palate very prominent and densely bearded. Low pine barrens, N. C. to Fla. and La. B.M. 7263. B.R. 135.

BB. Spur about as long as remainder of the corolla.

C. Fls. ½-1 in. long and broad.

Grandiflora, Lam. Scapes 5-8 in. long; fls. "blue, rarely purplish violet," according to De Candolle, 10-15 lines long, 9 lines broad (3 or 4 times longer than in P. vulgaris); lobes undulate; palate with 1 or 2 white spots; spur straight, a trifle shorter than the broadly funnel-shaped tube. W. Eu. G.C. III. 10:373.—According to Bentham, this is a large-fl. variety of P. vulgaris, with longer spur and broader lobes, which in the western part of Eu. passes into the common form.

Hirtiflora, Tenore. Scapes 3-4 in. high; fls. 8 lines long and broad, lilac or rose (blue according to Tenore, and shown as purple in B.M.), with a white tube; spur straight or curved, about as long as the rest of the corolla. S. Eu. B.M. 6785. Gn. 25, p. 291. G. 11:251.—Possibly distinguished from P. grandiflora by the color of the tube, which is white outside and yellow in the throat. According to Burttidge there is a variety with pure white fls.

CC. Fls. ½-1 in. long and broad.

Vulgaris, Linn. According to Hooker, this differs from P. hirtiflora in the bright blue color and the retuse lobes of the corolla, as also in the less globose caps.: scapes 1-5 in. high; fls. bluish purple or violet, about 6 lines long; spur nearly straight, about 2 lines long or as long as the rest of the corolla. Wet rocks, Eu., Asia, New England, and north and westward. G. 57, p. 335; 69, p. 101. —Sometimes called "Labrador violet."

P. elatior, Michx., in N. C. to Fla., is a beautiful species that should be in cult.: plant 3-5 in. across and 10-12 in. tall. lvs. viscid-glandular, in pale green rosettes: fls. white, purple, to ¾ in. broad.

PINK: Dianthus.

L. H. B.†

PINUS (ancient Latin name). Pindoce. PINE-TREE. Ornamental trees grown for their handsome evergreen foliage and symmetrical or picturesque habit, some also for their conspicuous large cones; many species are valuable timber trees. See Pine.

Resinous evergreen trees with usually whorled branches, rarely shrubby: winter buds covered with imbricate scales: lvs. of 2 kinds; the primary lvs. are spirally arranged and as they appear on young seedling plants and occasionally on shoots from the old wood, are green and subulate, but commonly they are reduced to small scarious bracts bearing in their axils the acicular, semi-terete or triangular secondary lvs. borne on an undeveloped branchlet in clusters from 2-5, or occasionally more, rarely reduced to 1, surrounded at the base by sheaths of 8-12 bud-scales: fls. monocious; the
staminate ones axillary, clustered at the base of the young shoots, catkin-like, yellow, orange, or scarlet, composed of spirally arranged numerous 2-celled anthers with the connective enlarged and scale-like at the apex (Fig. 2956); pistillate lateral or subterminal, greenish or purplish, consisting of numerous spirally arranged scales each in the axil of a small bract and bearing 2 ovules inside near the base (Fig. 2957); cone subglobose to cylindric, with woody scales closely appressed before maturity and tightly enclosing the seeds, which are usually furnished with a long thin wing, but in some species are wingless or short-winged; the apex of the scales is usually more or less thickened and the exposed part, which is usually rhombic in outline and terminal, if apophysis, is often protruded into prominent bosses or knobs; the apophysis is terminated by the umbo, usually differing in color and ending mostly in a spine or prickle. In P. Strobus and the allied species the apophysis is flat and thin, and bears the spineless umbo at the upper end, while in most other pines the apophysis is thickened and transversally keeled and bears the umbo in the middle. These differences belong to the most important characters in the grouping of the species: other valuable characters are furnished by the structure of the lvs., which contains either 1 or 2 fibrovascular bundles and usually 2 or more resin-ducts, being either external (or peripheral), i.e., situated beneath the epidermis; or medial (or subepidermal), i.e., inclosed by the tissue of the lf.; or internal, i.e., close to the fibro-vascular bundles; some species, as P. Armandi, P. resinosa, P. sitchensis, also P. exzelsa, P. lambertiana, P. virginiana, and the like, have resin-ducts in 2 positions, either external and medial or internal and medial, but such combinations are not found in all the lvs. of these species. Strengthening cells, i.e., cells with thickened walls, are mostly present beneath the epidermis and usually around the resin-ducts, sometimes also along the fibro-vascular bundles. (See Figs. 2958-2961.) The number of the fibro-vascular bundles and the position of the resin-ducts can be readily seen with a common magnifying glass in thin cross-sections made with a sharp razor from the middle of the lf. and placed on a glass plate. — About 80 species are known, distributed throughout the northern hemisphere from the arctic circle to Mex. and the W. Indies, N. Afr., and the Malayan Archipelago; in the tropical and subtropical regions they are confined to the mountains. In the following enumeration the species are grouped according to Schott’s classification. To facilitate the determination of the cult. species, a key is given to determine plants without cones, but owing to the great variability in pines this key may fail, if the plant in hand represents some uncommon variation. Good illustrations are found in Sargent, Silva of N. America, vol. 11; Lambert, Description of the Genus Pinus; Lawson, Pinetum Britannicum; Forbes, Pinetum Woburnense; Antoine, Die Coniferen; Clinton-Baker, Illustrations of Conifers, vol. 1; Pardé, Iconographie der Conifères (in course of publication). For the horticultural varieties, see Beissner, Nadelholzkunde, second edition (1909), and the new edition by A. H. Kent of Veitch’s Manual of the Conifères. Among other important works may be mentioned E. A. Carrieres’s Traité général des Conifères, second edition, 1867; Heinrich Mayr’s Die Waldungen von Nordamerika, 1890; G. Engelmann’s Revision of the Genus Pinus, in Transactions of the Academy of Science of St. Louis, published in 1880; Maxwell T. Masters in Journal of thr...
For planting rocky slopes P. Banksiana, P. rigida, P. virginiana, and some species are valuable; and if dwarf forms are desired P. montana is one of the best, thriving better than any other species in shaded positions and as undergrowth in open woods.

A great number of the species are hardly North. Among the hardest are P. Strobus, P. Cembra, P. parviflora, P. Bunnea, P. koraiensis, P. rigida, P. Banksiana, P. Thunbergii, P. resinosa, P. sylvestris and P. montana. The Mexican species and those from southern Asia stand only a few degrees of frost.

The pines are not very particular as to the soil, and in their native habitats they usually occupy the less fertile situations, as dry uplands and sandy plains. Some, as P. rigida, P. coriacea, and P. Teda, can be grown both in dry and in swampy ground. P. palustris is very unhappily named, since it almost never grows in swamps. Pines are much used for the afforestation of swamps. Pines are very valuable; the last three-species are now much grown both in dry and in swampy ground. P. sylvestris, P. banksiana, and P. Cembra; the more tender P. juliansana, P. Banksiana, and P. Cembra, are propagated by seeds sown in spring in prepared beds or frames, or in boxes or pans; the seeds should be covered slightly with fine soil, but the larger ones about ½ inch, and the young seedlings shaded and watered when necessary. Varieties and rarer kinds are grafted on their types or allied species, usually by veneer-grafting on potted stock in the greenhouse in winter, or in spring outdoors by cleft-grafting in the terminal bud (M.D. 1901, p. 15). Cuttings of the dwarf forms do not root readily; the easiest to root are young shoots with primary foliage, as they sometimes appear on older branches or on the trunk.

The pines belong to the most important timber trees in their native countries; these are, in eastern North America, P. palustris, P. Strobus, and P. echinata; in the western states, P. Lambertiana, P. monticola, and P. ponderosa; in Europe, P. sylvestris and P. nigra; in eastern Asia, P. Thunbergii and P. densiflora, and in the Himalaya, P. excelsa. From the resinous secretion of many species, chiefly P. palustris, P. caribea, P. Pinaster, P. halipepsis, and P. longifolia, turpentine, turpentine, tar, and pitch are obtained. An essential oil used medicinally is distilled from the leaves and young shoots of several species. Edible seeds are produced by some species in America by P. edulis and P. centrobies; in Europe by P. Pinea and P. Cembra; in East India by P. Gerardiana. Mats similar to cocoa mats are manufactured from the leaves of P. palustris, and pine wood for stuffing mattresses is made from leaves of European and American species.

For another account of the relative value of species of Pinus and their culture, see "Pine."
PINUS

CC. Cones 10-18 in. long: branchlets pubescent.

D. Scales of cone rounded: lvs. stout .... 10. Lambertiana

DD. Scales of cone elongated and more or less recurved: apex: lvs. slender. 11. Ayacahuite

AA. Umb of scales dorsal.

B. Seeds wingless or with very short wing: cone green at maturity.

C. Margin of int. entire: lvs. 3/4-1 in. long.

D. Number of lvs. 3 or 4.

E. Lvs. usually 4. 12. Pumila

EE. Lvs. usually 3. 13. Cembroides

DD. Number of lvs. 1 or 2.

E. Lvs. usually 2; sometimes 3. 14. edulis

EE. Lvs. usually 1; sometimes 2. 15. monophylla

CC. Margin of U. serrulate: lvs. 3. 2-4 in. long. 16. Bungeana

BB. Seeds with long wing, cones purple at maturity.

C. Cones with minute incurved prickles. 17. Balfouriana

CC. Cones with long slender prickles. 18. aristata

II. Pitch Pines (Diploxylon).

Wood usually heavy, coarse-grained, generally dark-colored, sap-wood pale, often thick sheaths of fibrous clusters persistent (in the following species): lvs. with 2 fibro-vascular bundles, serrulate: umbo of cone-scales dorsal.

A. Seed-wing very short or long and adnate.

B. Wing very short, deciduous: lvs. 3, 6-8 in. long. 19. Pinea

BB. Wing long, adnate: lvs. 3, 8-12 in. long.

C. Apophysis broad-pyramidal; seed 1/4 in. long. 20. canariensis

CC. Apophysis elongated and more or less recurved; seed 3/4-1 in. long. 21. longifolia

AA. Seed-wing articulate.

B. Wing of seed membraanus, long.

C. Lvs. in 2's: cones deciduous, deciduous at maturity, in No. 29 persistent and lvs. sometimes in 3's.

D. Resin-ducts external.

E. Branchlets bloomy: lvs. 2 1/2-5 in. long. 22. densiflora

EE. Branchlets not bloomy.

F. Lvs. 4-5 in. long.

G. Color of branchlets yellow-brown: lvs. dark green, slender and thin. 23. Massoniana

GG. Color of lvs. orange: lvs. stout, light green. 34. resinosa

FF. Lvs. 3-5 in. long.

G. Umbro obscure, gray: lvs. more or less bluish green. 25. sylvestris

GG. Umbro more or less pricked, surrounded by a black marking: lvs. bright green. 26. montana

DD. Resin-ducts medialis, or medialis and external.

E. Cones deciduous: resin-ducts medialis.

F. Winter buds brown, resinous, ovate-oblong. 27. nigra

FF. Winter buds grayish white, cylindrical. 28. Thunbergii

EE. Cones tenaciously persistent: lvs. in 2's and 3's. 29. sinensis

CC. Lvs. in 3's or in 2's and 3's.

D. The cones deciduous.

E. Resin-ducts medialis.

F. Young cones subterminal.

G. Branchlets clausus: cones 6-10 in. long. 30. ponderosa

GG. Branchlets glaucos: cones 6-15 in. long. 31. Jeffreyi

FF. Young cones lateral.

G. Lvs. 3-5 in. long. 32. echinata

GG. Lvs. 6-9 in. long. 33. Taeda

HH. Resin-ducts medialis: lvs. 8-18 in. long.

FF. Winter buds white: cone dull brown, 9-10 in. long. 34. palustris

EE. Winter buds light brown: cone lustrous, brown, 3-6 in. long. 35. caribba

DD. The cones tenaciously persistent, often serotinous: resin-ducts medialis (except in No. 36).

EE. Lvs. in 2's.

F. Resin-ducts external.

G. Lvs. with 2 fibro-vascular bundles:

H. Lvs. 5-8 in. long. 37. Pinaster

HH. Lvs. 1-3 1/2 in. long.

I. Prickles of cone stout. 38. pungens

II. Prickles of cone slender.

J. Cones remaining closed for many years. 39. clausa

JJ. Cones opening at maturity. 40. virginiana

GG. Cones unimagisterial.

H. Length of lvs. less than 4 in.

I. Cones not prickly, lateral. 41. Banksiana

II. Cones prickly, sub-terminal. 42. contorta

HH. Length of lvs. 4-6 in.: cones with stout and large prickles. 43. maritima

EE. Lvs. in 3's: cone prickly.

F. Cones symmetrical.

G. Length of lvs. 6-8 in.: cones remaining closed for 1 or 2 years. 44. serotina

GG. Length of lvs. 8-10 in.: cones opening at maturity. 45. rigida

FF. Cones unimagisterial.

G. Prickles of cone minute: upper part of trunk rough. 46. radiata

GG. Prickles of cone stout: upper part of trunk smooth. 47. attenuata

BB. Wing of seed thick: short: lvs. 3 or 5, 6-13 in. long: cones large.

C. Lvs. in 3's, 6-12 in. long.

D. Cone contiguous: branches about 1 in. longer than the seed: lvs. stout. 48. Coulteri

DD. Cones broadly ovate: wing about 1/4 in. longer than the seed: lvs. slender, flexible. 49. Sabiniina

CC. Lvs. in 2's, rigid, 8-15 in. long: cone broadly ovate: seed short-winged. 50. Torreyana

II. KEY FOR DETERMINING PINES WITHOUT CONES

(Compare Figs. 2958-2961.)

A. Number of lvs. 6, only occasionally 3 or 4.

B. Sheaths deciduous: fibro-vascular bundle 1.

C. Edges of lvs. serrulate.

D. Length of lvs. 1 1/2-2 in.

E. Branchlets glabrous or nearly so.

F. The lvs. 6-8 in. long: branchlets glauccus. 7. excelsa

FF. The lvs. 8-10 in. long: branchlets not glauccus.

G. Tree a rather dense pyramid with ascending branchcs. 6. Peuce
PINUS

GO. Tree an open pyramid.

H. Lvs. light bluish green ........ 33. Teda

II. Lvs. dark yellow-green ........ 44. serotina

III. Buds ovate, acuminate, resinous; lvs. 6-11 in. long, dark yellowish green .... 30. ponderosa

PP. Length of lvs. 8-7 in. (see also No. 29).

G. Character of lvs. slender.

H. Foliage pale yellowish or bluish green; buds oblong-ovate, dark brown ........ 47. attenuata

II. Foliage bright green; buds ovate, bright chestnut-brown .... 46. radiata

GG. Character of lvs. stout.

H. Form of buds thick, ovate, acute or acuminate .......... 30. ponderosa

* HH. Form of buds oblong-ovate .......... 45. rigida

AAA. Number of lvs. 3 (see also No. 14).

B. Branchlets glaucous.

C. Buds very resinous .... 40. virginiana

CC. Buds not or little resinous.

D. Hue of lvs. dark bluish green .... 32. schinata

DD. Hue of lvs. bright green .... 22. densiflora

BB. Branchlets not glaucous.

EE. Character of lvs. 1-3½ in.

F. Branchlets brown or orange; resin-ducts medial.

GG. Character of lvs. slender; branchlets brown .......... 39. clausa

HH. Character of lvs. stout, twisted: branchlets orange or orange-brown

II. Character of lvs. ovate, acute, resinous.

III. Buds resinous: lvs. ovate, chestnut-brown .... 37. Pinaster

PP. Lvs. 1-3½ in. long, pale yellowish green, in 2's or 3's, 8-18 in. long, resiny, den

BB. Lvs. 8-11 in. long.

BBB. Lvs. 8-11 in. long, deciduous.

CC. Fibrö-vascular bundle 1: sheaths persistent.

D. Margin of lvs. entire: lvs. ovate, not resinous.

E. Margin of lvs. serrulate: lvs. ovate, resinous.

F. Margin of lvs. serrulate: lvs. ovate, resinous.

GG. Branchlets yellowish: buds brown.

HH. Branchlets light yellow-brown: buds bright chestnut-brown .... 21. longifolia

II. Habit of lvs. stiff.

III. Length of lvs. 6-12 in.

EE. Foliage not reflected.

F. Foliage not reflected: lvs. ovate, acuminate, resinous

G. Foliage media and external: lvs. oblong-ovate, not resinous: lvs. sometimes 8 in. long, dark bluish green.
Section I. CEMBRA.

Group 1. CEMBRA.


Group 2. FLEXILES.


Group 3. STROBII.

5. parviflora, Sieb. & Zucc. Tree, to 80 ft., of dense, pyramidal habit, with slender, horizontal branches: branchlets light greenish brown, puberulous; lvs. crowded, rather stiff, usually twisted, forming brush-like tufts at the end of the branchlets, bluish green, ¾-1½ in. long: cones ovate or oblong-ovate, almost sessile, reddish brown, 2-3 in. long; seeds dark brown, hardly ½ in. long, with short wing. Japan. S.Z. 2:115. S.I.F. 2:2. A.G. 14:212.—Handy and very ornamental pine, bearing numerous decorative cones when older. Cult. plants are often grafted and assume a more irregular habit. In Japan it is often cult. in pots and dwarfed. Var. glabla. Beissn. With bluish green lvs. The wild form with somewhat longer lvs., longer cones and seeds with longer wings has been described as P. pentaphylla, Mayr.

6. Peuce, Griseb. (P. exelsa var. Peuce, Beissn.). Attains 50 ft., with ascending short branches forming a narrow dense pyramid: branchlets greenish, glabrous, not glaucous; winter buds ovate: lvs. straight, bluish green, 3-4 in. long: cones short-stalked, cylindrical, ½-6 in. long, with obvolute scales; seed 4 lines long. S.E. Eu. Gn. 76, p. 613.—An ornamental hardy pine of

buds cylindrical, chestnut-brown: lvs. slender and thin, 3-6 in. long, serrulate, bright green: cones peduncled, long-conical, 4-6 in. long, yellowish brown; scales obovate, appressed, much thickened in the middle, with large broadly rhombic apophysis and small obtuse thickened umbo often slightly recurved; seeds pale reddish brown, ovoid, compressed, ½ in. long, with a sharp edge all around. Cent. and W. China. B.M. 8347. G.C. III. 33:34 (as P. koraiensis), 65. R.H. 1910, p. 425.—A handsome pine which has proved hardy at the Arnold Arboretum.
denus, regular habit and slow growth; forms a narrower and denser pyramid than the white pine (P. Strobus).


Var. zebrina, Bailly (var. variegata, Hort.), has the lvs. with a whitish zone near the tip. F. E. 31:191. R.H. 1889, p. 392.

8. Strobus, Linn. (Ströbus Ströbus, Small). WHITE PINE. Figs. 2958, 2963, 2964. Attains 100 feet (or less) and occasionally 150 ft., with horizontal branches in regular whorls forming a symmetrical open pyramid; in old age the head is usually broad and open and often very picturesque; branchlets greenish or light greenish brown, glabrous or slightly puberulous: winter buds ovate, acuminate: lvs. soft, bluish green, 2-4 in. long (or 3½-5): cones on stalks ½-1 in. long, cylindrical, slender, often curved, 2-4 in. long, with oblong-ovate scales; seed red-brown, mottled with black, 3 lines long. New England to Man.; south to Ga., Ill. and Iowa. S.S. 11:538, 539. A.G. 12:645; 13:1. Gn. 30, p. 494. F.E. 15:340. C.L.A. 11:310; H. W. II:139. R.H. II. 7:364.-Handsome tree, somewhat resembling the white pine, but foliage more narrow, more slender pyramid; in old age usually round-topped and irregular: branchlets puberulous, yellowish or reddish brown: winter buds cylindrical, acute: lvs. stiff, bluish green and glaucous, 1½-4 in. long, with few inconspicuous or no lines on the back: cones short-peduncled, cylindrical, slender, slightly curved, 5-11 in. long, yellowish brown; scales pointed by the slightly thickened umbo; seed red-brown, mottled with black, ½-1½ in. long. Brit. Col. to Idaho and Calif. S.S. 11:540, 541. G.F. 5:5, 7. R.H. 1869, p. 126 (as P. Groezelii). F.E. 31:296.—Similar to P. Strobus, but forming a somewhat narrower, more slender pyramid; hardy as far north as Mass.

9. monticola, Don. MOUNTAIN WHITE PINE. Tree, to 100 or occasionally 150 ft., with slender, spreading, somewhat puberulous branches forming a narrow open pyramid; branchlets puberulous, yellowish or reddish brown; winter buds ovate, acute: lvs. stiff, bluish green and glaucous, 1½-4 in. long, with few inconspicuous or no lines on the back: cones short-peduncled, cylindrical, slender, slightly curved, 5-11 in. long, yellowish brown; scales pointed by the slightly thickened umbo; seed red-brown, mottled with black, ½-1½ in. long. Brit. Col. to Idaho and Calif. S.S. 11:540, 541. G.F. 5:5, 7. R.H. 1869, p. 126 (as P. Groezelii). F.E. 31:296.—Similar to P. Strobus, but forming a somewhat narrower, more slender pyramid; hardy as far north as Mass.

10. Lambertiana, Douglas. SUGAR PINE. Fig. 2965. Tree, to 200 or 220 ft., with spreading somewhat puberulous branches forming a narrow open pyramid; old trees usually with flat-topped widespread open head: branchlets brown, pubescent; winter buds oblong-ovate, apiculate: lvs. stout, sharply pointed, dark bluish green, 3-4 in. long, with conspicuous white lines on the back: cones on peduncles 2-3½ in. long, cylindrical, often slightly curved, light brown, lustrous, 10-20 in. long; seed about ½ in. long, dark brown or nearly black. Ore. to Mex. S.S. 11:542, 543. Gn. 31, pp. 152, 153. G.C. II. 28:11; III. 1:769. F.S.R. 1, p. 129. M.D.G. 1905:126. G.W. 8, p. 617.—One of the tallest trees of the Pacific Coast; in the eastern states it is hardy as far north as Mass., but grows slowly; has handsome dark foliage.


Section II. PARACEMBRA.

Group 4. CEMBROIDES.

12. Parryana, Engelm., not Gord. (P. quadrifolia, Sdw.). SUGAR PINE. Pinon. Tree, to 40 ft., with stout, spreading branches, forming a regular pyramid, but in old age usually round-topped and irregular: branchlets puberulous, light grayish brown; lvs. 3-5, usually 4, rigid, incurved, pale glaucous green, 1½-1¾ in. long; cone subglobose, 1½-2 in. broad, chest-nut-brown, lustrous; apophysis thick, pyramidal, consistently keeled; umbo with minute recurved prickle; seed about ½ in. long. Calif. S.S. 11:549. M.D.G. 1903:97.—Not hardy N.
PINUS

13. cembroides, Zucc. (P. osteosperma, Engelm.). Small tree, usually not over 20 ft., with stout spreading branches forming a round-topped head; branchlets dark orange, pubescent at first: lvs. usually 3, sometimes 2, slender, dark green, with stomata on all 3 faces, much incurved, 1-2 in. long; cone subglobose, 1-2½ in. broad; apophysis pyramidal, strongly keeled, lustrous brown, with broad obtuse umbo; seeds oblong-ovate, 1½-2½ in. long, dark brown, with very narrow wing. Ariz. to Low. Calif. and N. Mex. S.S. 11: 550. G.F. 4: 433. F.S. 4, p. 325. — A slow-growing densely branched pine; tender. By some authors the preceding and the two following species are referred to this species as simple variations in the number of lvs.

14. edulis, Engelm. (Caryopteris edulis, Small). Nut Pine. Fig. 2966. Small tree, 10-20 or occasionally to 40 ft., with horizontal branches, bushy when young, with low, round-topped head in old age: branchlets light yellowish brown, puberulous at first: lvs. 2-3, rigid, dark green, 3½-4½ in. long; cones almost sessile-broadly ovate, greenish yellow, lustrous, about 1½ in. long; apophysis pyramidal, strongly keeled; umbo with minute recurved tip; seed ½ in. long; with narrow wing remaining attached to the scale. Colo. to N. Mex. and Texas. S.S. 11: 552. F.E. 29: 205. — Hardy as far north as Mass., forming a slow-growing and compact bush. The seeds are an important article of food among the Indians. Var. albivariagata, Hort., has white lvs. mixed with the green ones.

15. monophylla, Torr. & Frem. (P. fremontiana, Engelm.). Tree, 15-20, occasionally to 50 ft., similar to the preceding; branchlets light orange, glabrous: lvs. usually solitary, sometimes 2, terete, rigid, spineless, glaucous green, 3½-4½ in. long; cones broadly ovate, light brown, 1½-2 in. long; apophysis depressed-pyramidal, ridged, the flattened umbo with a minute incurved tip; seed ½ in. long. Calif. to Colo. and Ariz. S.S. 11: 551. G.C. II. 20: 44; 26: 137. — Of slow growth, hardly as far north as Mass. The solitary lvs. have been believed to consist of 2 connate ones, but this is certainly not the case, as the solitary fibro-vascular bundle plainly shows.

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18. aristata, Engelm. (P. Balfouriana var. aristata, Engelm.), Hickory Pine. Foxtail Pine. Bushy tree, occasionally to 50 ft., sometimes a semi-prostrate shrub: branchlets light orange and almost glabrous: lvs. stout or slender, dark green, 1-1½ in. long, with white lines inside; cones cylindrical-ovate, 3½-4½ in. long; apophysis flattened, the concave oblong umbo with minute incurved spine; seed ½ in. long. Calif. S.S. 11: 553. — Not hardy N.

2967. Scotch pine. — Pinus sylvestris (X%). No. 25.

Group 5. Gerardiana. 16. Bungeana, Zucc. Lace-Bark Pine. White-Bark Pine. Tree, to 50 or 100 ft., with long and slender branches; bark flaky; lvs. light gray: young branches grayish green, glabrous: lvs. rigid, acute, light green, 2-4 in. long; cones almost sessile, conic-ovate, light yellowish brown, 2-3 in. long; apophysis much broader than high, ridged, with a triangular pointed and recurved umbo; seed dark brown, with narrow wing, ½-1½ in. long. N. W. China. B.M. 8240. G.C. II. 18: 9. — Hardy slow-growing tree of bushy habit in cult. and with rather sparse light green foliage.


17. Balfouriana, Jeffrey. Foxtail Pine. Tree, to 40, occasionally 90 ft., narrow-pyramidal; young, irregular and open in old age; branchlets dark brown, puberulous at first: lvs. crowded, incurved and pressed against the branches, rigid, acute, dark green on the back, with conspicuous white lines inside, 1-1½ in. long, remaining for 10-12 years on the branches; cones pendulous, subcylindric, dark purplish brown, 3½-5½ in. long; apophysis flattened, the concave oblong umbo with minute incurved spine; seed ½ in. long. Calif. S.S. 11: 554. — Not hardy N.


Section III. Parapinaster.

Group 7. Pinea.


Group 8. Longifolius.

20. canariensis, C. Smith. Tree, to 80 ft., with slender branches forming a broad, round-topped head; branchlets yellowish: lvs. slender, spreading and pendulous, light green and lustrous, 9-12 in. long, with medial resin-ducts; cones cylindric-ovate, 4-8 in. long; apophysis low-pyramidal, irregularly 4-sided, light brown and
glossy, with obtuse umbo; seed ½ in. long. Canary Is. G.C. III. 3:721. — Handsome pine cult. in Calif., where it does very well and grows faster than the native P. radiata on very rocky and dry locations; in colder regions grows sometimes in the greenhouse.

21. longifolia, Roxbg. (P. Roxburghii, Sarg.). Tree, to 100 ft. or more, with round-topped asymmetrical head; branchlets light yellow-brown; winter buds oblong, light chestnut-brown, not resinous; lvs. slender, pendulous, light green, 8–12 in. long, with external resin-ducts; cones short-stalked, conic-ovate, 4–7 in. long; apophysis elongated-pyramidal, compressed, more or less recurved; umbo obtuse; seed ½–1 in. long. Himalayas. — Important forest tree in its native country. Not hardy N., but cult. in Calif. Very decorative as a young plant, with its long drooping light green foliage.

Section IV. PINASTER.


22. densiflora, Sieb. & Zucc. JAPANESE RED PINE. Tree, to 100 ft., with spreading branches forming an irregular, rather broad head; branchlets orange-yellow, bloomy: buds oblong-ovate, chestnut-brown: lvs. slender, acute, bright bluish green, 2½–5 in. long; cones short-stalked, conic-ovate to oblong, grayish brown, somewhat oblique at the base, about 2 in. long; apophysis flattened and slightly ridged, those near the base sometimes elongated; umbo small, with a short prickle or obtuse; seed grayish yellow, ¼ in. long. Japan. S.Z. 2:112. S.I.F. 1:1. Gr. M. 2:22. — Ornamental hardy tree, rapidly growing when young, often very picturesque when older. Many garden forms are cult. in Japan, several of them with variegated lvs. The best are perhaps var. umbraculifera, Mayr, a low form with horizontally spreading branches forming a flat head; var. pendula, Mayr, with pendulous branches; var. aurea, Mayr, with yellow foliage; var. flavo-termitata, Mayr, with the tips of the lvs. yellowish white, and var. Óculus-draconis, Mayr, like var. variegata, Mayr, similar to the varieties, of the same name under P. Thunbergii. (No. 28.)

23. Massoniana, Lamb. Tree, to 80 ft., with slender, spreading branches; branchlets yellow-brown; lvs. very slender and thin, light green, 5–8 in. long; cones oblong-ovate or ovate, dull brown, 2–3 in. long; apophysis flattened, slightly keeled, with a small, flat, unarmed umbo; seed ½ in. long. China. — Not hardy N. and rarely cult. Often confounded with P. sinensis and P. densiflora.

24. resinosa, Ait. RED PINE. NORWAY PINE. Tree, to 70, occasionally to 150 ft., with stout branching and sometimes pendulous branches forming a broad pyramidal head when young and an open round-topped one in old age; branchlets orange-color; buds ovate, acuminate, light brown, resinous: lvs. slender and flexible, acute, dark green and lustrous, 4–6 in. long; cones subsessile, conic-ovate, light brown, 1½–2½ in. long; apophysis flattened, conspicuously keeled, obtuse, with small dark unarmed umbo; seeds dark brown, ¼ in. long. Newfoundland to Man., south to Pa. and Minn. S.S. 11:550, 551. A.G. 12:645. C.L.A. 11:310. — One of the most ornamental pines for northern parks, quite hardy and of vigorous growth. Lumber tree.

25. sylvestris, Linn. SCOTCH or SCOTS PINE. Fig. 2967. Tree, to 70, or occasionally 120 ft., with spreading, often somewhat pendulous branches, pyramidal when young, with broad and round-topped often picturesque head in old age: branchlets dull grayish yellow: winter-buds oblong-ovate, brown, resinous: lvs. rigid, acute, twisted, bluish green, 1½–3 in. long; cones short-stalked, conic-ovate, grayish or reddish brown, 1½–2½ in. long; apophysis little thickened, slightly keeled, only those near the base elongated; umbo small, obtuse; seed dark gray, ½ in. long. Eu. to W. and N. Asia. Gn. 36, p. 167; 38, p. 455; 49, p. 296. H.W. 1:4, pp. 121–6. F.E. 29:157. G.C. III. 34:298. F.S.R. 1, p. 10. — One of the most important timber trees of Eu. It is quite hardy, but has little to recommend it at an ornamental tree. Several geographical and garden forms have been distinguished. Var. argentea, Stev. Foliage light bluish green, with silvery hue. Var. áurea, Beiss., with the young lvs. golden yellow. F.E. 13:972 (pl. 14). Var. nivea, Schwerin. Lvs. a dirty greenish white. Var. Beissneriana, Schwerin. Lvs. green at first, changing to golden yellow in summer. Var. columbaris compácta, Bailly. Slow-growing, dense, columnar form. F.E. 1889, p. 389. Var. fastigiata, Carr. (var. pyramidalis, Hort.). Of pyramidal habit. Var. virgata, Casp. Sparingly branched form with long flagellate branches. H.W. 1, p. 126. Var. crispata, Schwerin. Lvs. curved in different directions, having a crisp appearance. Var. pendula, Beiss. With pendulous branches. Var. phímilis, Beiss. Dwarf globose bush. Besides these varieties a number of geographical races have been distinguished which differ chiefly in habit, growth, and hardiness and are more of silvicultural than of horticultural interest. The best known are var. rigénsis,
26. montana, Mill. SWISS MOUNTAIN PINE. Very variable in habit, usually low, often prostrate shrub, sometimes pyramidal tree to 40 ft., similar to the preceding; branchlets usually of darker, brownish color: lvs. bright green, acutish, stout, crowded, 3/4-2 in. long; cones ovate or conic-ovate, 1-2 1/2 in. long; apophysis often pyramidal; lumps light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in P. sylvestris, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:3, pp. 140-9. M.D. 1912, pp. 140-9. G.W. 1, p. 351. — Hand-some hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. uncinata, Willk. (including var. rostrata and rotundata, Ant., var. arborea, Tuseuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent. Var. pumilio, Willk. (P. pumilio, Haenke, P. carpatica, Hort., var. fruticosus erecta, Tuseuf). Cone regular, subglobose to ovate, before maturity glaucous and resinous: lvs. stiff, acute, spren:ding metrical pyramid, m old age sometimes broad and flat-subspherical to ovate, before maturity glaucous and resinous: lvs. bright green, acutish, stout, crowded, 3/4-2 in. long; cones ovoid or conic-ovate, 1-2 1/2 in. long; apophysis often pyramidal; lumps light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in P. sylvestris, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:3, pp. 140-9. M.D. 1912, pp. 140-9. G.W. 1, p. 351. — Hand-some hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. uncinata, Willk. (including var. rostrata and rotundata, Ant., var. arborea, Tuseuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent. Var. pumilio, Willk. (P. pumilio, Haenke, P. carpatica, Hort., var. fruticosus erecta, Tuseuf). Cone regular, subglobose to ovate, before maturity glaucous and resinous: lvs. stiff, acute, spren:ding metrical pyramid, m old age sometimes broad and flat-subspherical to ovate, before maturity glaucous and resinous: lvs. bright green, acutish, stout, crowded, 3/4-2 in. long; cones ovoid or conic-ovate, 1-2 1/2 in. long; apophysis often pyramidal; lumps light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in P. sylvestris, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:3, pp. 140-9. M.D. 1912, pp. 140-9. G.W. 1, p. 351. — Hand-some hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. uncinata, Willk. (including var. rostrata and rotundata, Ant., var. arborea, Tuseuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent. Var. pumilio, Willk. (P. pumilio, Haenke, P. carpatica, Hort., var. fruticosus erecta, Tuseuf). Cone regular, subglobose to ovate, before maturity glaucous and resinous: lvs. stiff, acute, spren:ding metrical pyramid, m old age sometimes broad and flat-subspherical to ovate, before maturity glaucous and resinous: lvs. bright green, acutish, stout, crowded, 3/4-2 in. long; cones ovoid or conic-ovate, 1-2 1/2 in. long; apophysis often pyramidal; lumps light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in P. sylvestris, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:3, pp. 140-9. M.D. 1912, pp. 140-9. G.W. 1, p. 351. — Hand-some hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. uncinata, Willk. (including var. rostrata and rotundata, Ant., var. arborea, Tuseuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent. Var. pumilio, Willk. (P. pumilio, Haenke, P. carpatica, Hort., var. fruticosus erecta, Tuseuf). Cone regular, subglobose to ovate, before maturity glaucous and resinous: lvs. stiff, acute, spren:ding metrical pyramid, m old age sometimes broad and flat-subspherical to ovate, before maturity glaucous and resinous: lvs. bright green, acutish, stout, crowded, 3/4-2 in. long; cones ovoid or conic-ovate, 1-2 1/2 in. long; apophysis often pyramidal; lumps light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in P. sylvestris, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:3, pp. 140-9. M.D. 1912, pp. 140-9. G.W. 1, p. 351. — Hand-some hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. uncinata, Willk. (including var. rostrata and rotundata, Ant., var. arborea, Tuseuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent.
is especially very handsome as a young plant, with its long, dense lvs.

28. Thunbergii, Parl. (P. Massoniana, Sieb. & Zucc., not Lamb.). JAPANESE BLACK PINE. Tree, to 100 ft., or occasionally to 120 ft., with spreading, often somewhat pendulous branches, forming a broad, pyramidal head:

branchlets orange-yellow, the winter buds oblong, grayish or silvery white; lvs. stiff, sharply pointed, bright green, 3-4 in. long; cones short-stalked, ovoid, grayish brown, 2-3 in. long; apophysis flattened, with small, depressed umbo, obtuse or with a minute prickle; seed grayish brown, 1/4 in. long. Japan. G.C. II. 23:345. S.Z. 11:115. S.F. 1:1.—Handsome tree and hardy N. Several horticultural varieties have been introd. from Japan: one of the most distinct is var. Oculus-draconis, Mayr, each lf. being marked with 2 yellow bands and therefore the tufts of the lvs. at the end of the branches, if seen from above, show alternate yellow and green rings, hence the name Oculus-draconis (dragon-eye). Var. variegata, Hort., has the lvs. partly yellow or occasionally wholly yellowish white. There are also similar forms in P. densiflora which may be distinguished by the brown color of the winter buds.

29. sinensis, Lamb. (P. leucodermis, Maxim. P. funebris, Komar. P. Hayagi, Mast. P. Wilsonii, Shaw. P. labuloformis, Carr.). Tree, to 70 ft. bark of trunk dark gray, fissured, red on the limbs: branchlets pale orange-yellow or pale grayish yellow, slightly bloomly while young; winter buds oblong, light brown, lustrous, slightly or not resinous: lvs. 2-3, often 2, stiff, glaucous, with rough margins, 2-4 in. long; cones subcylindrical, ovoid, 1½-2½ in. long, persistent for several years, pale yellow-brown; apophysis rhombic, prominently keeled, with an obtuse or mucronate umbo; seeds brown, mottled or whitish, over 1/2 in. long, with the wing 1/2 in. long. Cent and W. China. Var. densata, Shaw (P. densata, Mast. P. pruinosa, Mast.). Lvs. 3-5 in. long, stiff: cones ovoid, 2-2½ in. long, oblique, with their posterior scale usually broader than the apophysis and on the upper side keeled, with prominent. Var. yunnanensis, Shaw (P. yunnanensis, Franch.). Lvs. often 3, slender, 4-8 in. long; cones 2½-3½ in. long; apophysis flat, umbro small; seed with wing nearly 1 in. long. S.W. China. G.C. III. 38:226.

30. ponderosa, Douglas (P. Benthamiana, Hartw.). YELLOW PINE, BULL PINE. Fig. 2970. Tree, to 150, occasionally to 230 ft., with stout spreading and often pendulous branches usually ascending at the ends and forming a narrow, spire-like head: branchlets orange-brown, fragrant when broken: winter buds oblong-ovate or ovate, resinous: lvs. acute, dark green, 5-11 in. long; cones almost sessile, often in clusters, ovate-oblong, light reddish or yellowish brown and lustrous, 3-6 in. long; apophysis depressed-pyramidal or flattened, with a broadly triangular umbo terminated by a stout, usually recurved prickle; lower scales with more elongated apex; seed ½ in. long. Brit. Col. to Mex., east to Neb. and Texas. 11:560, 561. G.F. 8:395. G.C. III. 8:557, 501, 509. F.S.R. 3. p. 99. M.D.G. 1905-126.—

31. Jeffreyi, Balfour (P. ponderosa var. Jeffreyi, Vasey). JEFFREY'S PINE. Tree, to 120 or occasionally to 180 ft., with short spreading or often pendulous branches, the uppermost ascending, forming an open pyramidal and sometimes narrow spire-like head: young branches glaucous, fragrant when broken: winter buds oblong-ovate, not resinous: lvs. stout, acute, pale bluish green, 5-8 in. long; cones conic-ovate, light brown, 6-12 in. long; apophysis depressed, keeled; umbo elongated into a slender recurved spine; seed about ½ in. long. Ore. to Calif. S.S. 11:562, 563. G.C. II. 9:797. M.D. 1912, p. 364. Somewhat hardier than the type.—P. Malletii, Mott., is probably a form of this species with more ascending branches forming a rather narrow pyramidal head. R.H. 1913, p. 265. Fig. 2970 is adapted from Pacific R. R. Report.

32. echinata, Mill. (P. mitis, Michx.). SPRUCE PINE, YELLOW PINE. Tree, to 100 or 120 ft., with slender often pendulous branches in regular whorls: winter buds oblong-ovate, brown: lvs. slender, acute, dark bluish green, 3-5 in. long; cones short-stalked or almost sessile, conic-oblong, dull brown, 1½-3½ in. long; apophysis flattened; umbo little elevated, with short straight or curved prickle;
seeds 3/4-1 1/2 in. long. N. Y. to Fla., west to Ill. and Texas. S.S. 11: 557. — Handsome tree, with broad, oval head, hardy as far north as Mass.

33. Taeda, Linn. LOBLOLLY PINE. OLD FIELD PINE. FRANKLIN KNEE. Figs. 2971 (adapted from U. S. Forestry Report). Tree, to 100, occasionally to 170 ft., with spreading branches, the upper ascending, forming a compact round-topped head: branchlets yellowish brown, sometimes slightly bloomy; winter buds oblong, resinous; lvs. slender but stiff, acute, bright green, 6-9 in. long; cones sessile, spreading, conic-oblong, light reddish brown, 3-5 in. long; apophysis flattened or depressed-pyramidal; umbo small, with short triangular, recurved spine, lower scales not elongated; seed 1/2 in. long. Del. to Fla. and Texas. S.S. 11: 577, 578. — Not hardy N., and rarely cult. for ornament.

34. Palustris, Mill. (P. australis, Michx.). LONG-LEAF PINE. SOUTHERN PINE. Figs. 2965, 2972-2974. Tree, to 100 or 120 ft., with ascending branches forming an oblong open head: branchlets orange-brown; winter buds white, oblong, lvs. crowded, forming tufts at the end of branchlets, dark green, 8-18 in. long, with internal resin-duets: cones almost sessile, cylindric, dull brown, 6-10 in. long; apophysis flattened; umbo brown, with triangular, reflexed short spines; seed almost 1/2 in. long. Va., with a trac Flba., to Miss., along the coast. S.S. 11: 589, 590. G.F. 10: 115. — Very important timber tree, but rarely planted for ornament.

Branches are imported in great quantities into the northern cities in midwinter and used for decorations on account of their large handsome foliage. Figs. 2972-2974 are adapted from U. S. Forestry Report.

35. Caribba, Morelet (P. cubensis, Griseb. P. heterophylla, Sudw. P. Elitiodii, Engelm.). SLASH PINE. SWAMP PINE. Figs. 2975, 2976. Tree, to 100 or 120 ft., with horizontally spreading branches forming a round-topped broad and compact head: branchlets orange-brown; winter buds cylindric, light brown; lvs. dark green and lustrous, acute, in 3's and 2's, 8-12 in. long, with internal resin-duets: cones short-peduncled, conic-oblong, dark brown and glossy, 3-61/2 in. long; apophysis flattened, keeled; umbo small, with minute recurved prickles; seed 1/4-1/2 in. long. Ga. to Fla.; near the coast. Cuba. S.S. 11: 591, 592. G.C. II. 35: 179. G.F. 8: 223 (adapted in Fig. 2966). — Handsome pine, with compact broad head, hardy only S. Fig. 2975 is adapted from U. S. Forestry Report.

Group 11. INSIGNES.

36. Halebos, Mill. (P. alepensis, Poir.). ALEPPO PINE. Tree, to 60 ft., with short branches forming an open round-topped head: branchlets slender, yellowish or light greenish brown; winter buds small, cylindric, not resinous; lvs. sometimes in 3's, slender, light green, 23/4-4 in. long; cones short-stalked, spreading or deflexed, usually 1-3, conic-ovate or conic-oblong, yellowish brown, unarmcd, 23/4-31/2 in. long; apophysis flattened, keeled; transverse line and slightly or not elevated obtuse umbo; seed 1 1/2 in. long. Medit. region.


37. Pinaster, Ait. (P. martima, Poir.). CLUSTER PINE. Tree, to 100 ft., with spreading or sometimes pendulous branches forming a pyramidal head: branchlets bright reddish brown; buds oblong-oval, brown, not resinous; lvs. stiff, acute, usually twisted, glossy green, 5-9 in. long; cones short-peduncled, clustered, conic-oblong, light brown and glossy, 4-7 in. long; apophysis pyramidal, conspicuously keeled with prominent triangular, acute umbo; seed grayish brown, 3/4 in. long. S. Eu., near the coast. Ga. 14, p. 20. G.W. 9, p. 470. H.W. 1, pp. 168, 169. — Handsome pine of regular, pyramidal habit and rapid growth, but not hardy N. In England it is much used for seaside planting and the vars. Hamiltoni, Parl., var. Leominæs, Endl. (P. Pinaster Abarbíonis, Loud.), and var. minor, Loisel., are occasionally cult. in English gardens.

38. Pungens, Lamb. TABLE MOUNTAIN PINE. POVERTY PINE. Tree, to 30, occasionally to 90 ft., with stout spreading branches forming a broad open often flat-topped head: branchlets light orange; winter buds oblong, obtuse, dark chestnut-brown; lvs. stout; twisted, sharply pointed, dark green, 1 1/4-2 1/2 in. long; cones conic-ovate, oblique at the base, light brown, 2 1/4-3 1/2 in. long; apophysis pyramidal and conspicuously keeled, the conical elongated umbo ending in a stout curved spine; seed light brown.
branches: branchlets red-brown: winter buds oblong, obtuse, not or little resinous: lvs. slender and flexible, acute, dark green, 2-3 in. long: cones short-stalked, often oblique at the base, cone-ovate, dark reddish brown, 2-3 1/2 in. long, remaining closed for 3 or 4 years after ripening and occasionally becoming enveloped by the growing wood of the st.; apophysis depressed-pyramidal, conspicuously keeled; umbo with a small slender prickle; seeds with the wing about 3/16 in. long. N. C. to Fl. S.S. 11:580.-Not hardy N.

40. virginiana, Mill. SCRUB PINE. Jeussey PINE. Tree, to 40, or sometimes to 100 ft., with slender horizontal or pendulous branches in remote and irregular whorls, forming a broad open pyramid or sometimes flat-topped: winter buds oblong, dark brown: lvs. stiff, twisted, spreading, acutish, 1 1/2-2 1/4 in. long: cones conic-oblong, reddish brown, 1 1/2-2 1/2 in. long; apophysis little elevated, with a broad depressed-pyramidal umbo ending in a short recurved prickle; seed pale brown, 3/16 in. long. N. Y. to S. C., west to Ky. and Ind. S.S. 11:581.—Hardy as far north as Mass., but of little ornamental merit. Valuable in the middle states for covering dry and barren soil.

41. Banksiana, Lamb. (P. deauricuata, Dum.-Cours.). JACK PINE. Tree, to 70 ft., usually lower, sometimes shrubby, with slender spreading branches, forming broad open head: branchlets yellowish to purplish brown: winter buds oblong-ovate, light brown, very resinous: lvs. stiff, twisted, spreading, acute or obtuse, dark or bright green, about 1 in. long: cones conic-oblong, usually curved, pale yellow-brown and lustrous, unarmcd, 1 1/2-2 in. long, remaining on the tree for 12-15 years; apophysis flattened, with a transverse line and a small dark obtuse umbo; seed black, 3/16 in. long. Hudson Bay to N. Y., west to Minn. S.S. 11:588.—The most northern of all American pines and quite hardy, but not of much ornamental value.

42. contorta: Douglas (P. Boldneri, Parl. P. contorta var. Boldneri, Kochne). SCRUB PINE. Fig. 2979 (adapted from Pacific R. R. Report). Tree, to 20, occasionally to 30 ft., with rather stout branches forming a round-topped compact or open head: branchlets light orange or orange-brown: buds ovate, dark chestnut-brown, resinous: lvs. stiff, twisted, acutish; dark green, 1-2 in. long: cones ovate or conic-ovate, very oblique at the base, often remaining closed for several years after maturity, 1-2 in. long, light yellowish brown and lustrous, scales of the upper side with elevated, pyramidal apex, the dark umbo ending in a slender incurved spine. Alaska to Calif., and the variety east to Mont. and Colo. G.C. II. 19:45. S.S. 11:567. Var. latifolia, Engelm. (P. contorta var. Murrayana, Engelm. P. Murrayana, Balfour. P. Borealis, Carr.), Lodgepole PINE, is the form in the Rocky Mts. and a taller tree of pyramidal habit, to 80, or occasionally to 100 ft., tall, with longer, lighter green, 1 1/2-3 1/4 in.-long lvs., less oblique cones. S.S. 11:528. G.C. 1869:191 and R.H. 1860, p. 278 (as P. Tamara). R.H. 1854, p. 226.—In cult., it is usually a bushy low tree and is hardly N., while the typical form is tender.

43. muriicata, Don. PRICKLE-CONE PINE. Tree, to 50, occasionally to 90 ft., with stout spreading branches forming a regular pyramid in young trees, in old age usually round-topped and compact: branchlets orange-brown: winter buds ovate, dark brown, resinous: lvs. stiff, usually twisted, acute, dark green, 4-7 in. long: cones usually clustered, oblong-ovulate, oblique at the base, chestnut-brown, 2-3 1/2 in. long: scales of the upper side with elongated conical apex terminated by a dark triangular spiny umbo, scales of the lower side more flattened, with slender straight spines; the cones usually remain closed for several years after maturity; scales thin with depressed apophysis and a small slender, mostly deciduous prickle; seeds with the wing about 3/16 in. long. Calif. S.S. 11:585, 586. G.F. 10:235. F.S. 8, p. 517. G.C. II. 21:45, 49, 53; III. 48:259-61. Gn. 59, p. 129. G.M. 54:977.—Handsome pine, with regular, pyramidal head; not hardy N.

44. serotina, Michx. POND PINE. MARSH PINE. Tree, to 50, or occasionally to 80 ft.: branchlets dark orange-color: lvs. 3, rarely 4, slender, dark green, 6-8 in. long: with stomata on all 3 faces: cones subglobose to ovate, short-stalked or nearly sessile, rounded or pointed at the apex, light yellow-brown, 2-2 1/4 in. long, remaining closed for one or two years after maturity; scales thin with depressed apophysis and a small slender, mostly deciduous prickle; seeds with the wing about 3/16 in. long. N. C. to Fl. S.S. 11:580.—Not hardy N.

45. rigida, Mill. PITCH PINE. Figs. 2980-2983. Tree, to 80 ft., with horizontally spreading branches forming an open irregular pyramid: branchlets light brown: winter buds oval or ovate-oblong, chestnut-brown: lvs. stiff and spreading, acuminate, dark green, 2-5 in. long: cones almost sessile, often in clusters, 1/16 in. long, N. to N. C. and Tenn. S.S. 11:584.—Hardy as far north as Mass., but of little ornamental value.
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ovate, light brown, 2-4 in. long; apophysis little elevated; umbo triangular, ending in a slender, recurved prickle; seed dark brown, 3/4 in. long. New Bruns. to Ga., west to Ont. and Ky. S.S. 11:579. G.F. 4:402; 10:195. G.C. III. 44:178. Gn. 31, pp. 128, 132. M.D.Q. 1898:301.—Hardy pine of rapid growth when young and easily raised from seed; grows on dry and sterile soil. As an ornamental plant it may be used on dry and rocky slopes, where it becomes often very picturesque when older. It sprouts readily from stumps if cut down or destroyed by fire, but the sprouts are short-lived and never develop into trees.

46. radiata, Don (P. insigne, Douglas. P. monterey­ensis, Horta.). MONTEREY PINE. Fig. 2965. Tree, to 80 or 100 ft., with stout spreading branches forming an irregular open, round-topped head; bark thick, furrowed; branchlets brown; buds ovate, bright chestnut-brown; lvs. acute, bright green, 4-6 in. long: cones short-stalked, conic-ovate, upper scales with flattened, rounded, almost hemispherical and obscurely keeled apex; umbo small, with minute straight or recurved prickle, lower scales with almost flattened apex; seed black, 3/4 in. long. S. Calif. S.S. 11:573, 574. F.B.6, p. 44. G.C. III. 9:336, 341; 38:435. G. 12:263; 22: 131. R.H. 1906, p. 154. Gn. 36, p. 47; 49, p. 312.—Handsome species with bright green foliage and of rapid growth and bushy habit when young; valuable for seaside planting. Not hardy N.

47. attenuata, Lemm. (P. tuberculata, Gord., not Don. P. californica, Hartw., not Loisel.). KNOT-CONE PINE. Tree, usually 20, occasionally 60 ft., with stout branches ascending at the ends, forming a broad pyramidal, with open round-topped head in old age: bark thin, scaly: young branches slender, dark orange-brown; winter buds oblong-ovate, dark brown: lvs. slender, acuminate, pale yellowish or bluish green, 3-7, usually 4-5 in. long: cones short-stalked, usually in clusters, elongated-conical, 3-5/6 in. long, upper scales with pyramidal apex; umbo prominent, sharply pointed and recurved, lower scales with depressed apex and small prickly umbo; seed 3/4 in. long. Ore. to Calif. S.S. 11:575.

PINUS


50. Torreyana, Carr. SOLEDAD PINE. Tree, to 40, or occasionally to 60 ft., with spreading and sometimes ascending branches; branchlets greenish or purplish, bloomy, glabrous; lvs. rigid, dark green, 8-13 in. long: cones broadly ovate, 4-6 in. long, chocolate-brown; apophysis low-pyramidal; umbo elongated and reflexed with short spiny tip; seeds 3/4 in. long, short-winged. S. Calif. S.S. 11:557, 558.—Rarely evil.; not hardy N.


Group 12. MACROCARPÆ.

48. Coulteri, Don (P. macrocarpa, Lindl.). PITCH PINE. Fig. 2965. Tree, to 80 ft., with stout branches, pendulous below and ascending above, forming a loose pyramidal head: winter buds oblong-ovate, resinous: lvs. stout, acuminate, dark bluish green, 6-12 in. long; cones short-stalked, pendent, cylindrical-ovate, yellowish brown, 9-14 in. long; apophysis elongated-pyramidal, narrowed into the compressed spiny-tipped straight or incurved apex. Calif. S.S. 11:571, 572. G.C. II. 23:109, 413; III. 4:765.—Not hardy N. Old trees are often very picturesque and the large cones are conspicuous and ornamental.

49. Sabiniana, Douglas. DIGGER PINE. BULL PINE. Fig. 2984 (adapted from Pacific R. R. Report). Tree, to 50 or occasionally 80 ft., usually divided into several sts. with short crooked branches, the lower ones pendent, the upper ones ascending, forming a round-topped head: lvs. slender, flexible, pale bluish green, 8-12 in. long; cones pendent on about 2-in.-long stalks, oblong-ovate, light red-brown, 6-10 in. long; apophysis pyramidal, sharply keeled, flattened at the straight or incurved apex, the lower scales with much-recurved apex; seeds 3/4 in. long, short-winged. Calif. S.S. 11:559. G.C. III. 4:43; 5:45. F.B.6, p. 150. F. S. 9:964.—Not hardy N. Distinct pine of loose habit and with sparse pale foliage. The seeds are edible.
PINUS

PIPSISSEWA: Chimaphila.

PIPTADENIA (Greek, falling gland; meaning obscure). *Leguminosae.* About 45 species of shrubs or trees, mostly native to S. and Cent. Amer., a few in the tropics of the Old World, similar to Mimosa and Acacia. Inflorescences with numerous small, barely visible, with few and large lfts.: fls. small, white, in axillary globose heads or cylindric spikes; petals small, equal, connate to the middle; stamens 10, free; pod broadly linear, 2-valved, not septate, and not pappose. The following species has been intro. to Calif. by Franchescoichi for its economic interest; in its native country it is valued for tanbark. Prop. by seeds. P. Cebi, Griseb. (P. macracarpa var. Cebi, Chodat & Hauser). Trees, to 80 ft., glabrous; lvs. with 10-16 pairs of opposite pinnae, each with 24-40 pairs of linear-oblong acute lfts. about \( \frac{1}{4} \) in. long; petiole about 1 in. long, with a conspicuous gland near the middle; fl.-heads globose, axillary, 1-4, \( \frac{1}{4} \) in. across, on slender pedicel \( \frac{3}{4} \) in. long; stamens long-exserted; pod 0-5 in. long, about \( \frac{1}{4} \) in. wide, simuate between the seeds. Argentina.

The following three species have been recently intro. by the Dept. of Agric.: P. commersonii, Benth. (Acacia concanensis, Mart.). Prickly tree or shrub sometimes sarmentose; branches puberulous, angled, older branches sometimes developing corky wings; petals small, equal, connate; stamens 10, free; lvs. with 3-12 pairs of pinnae, each with many oblique, falcatate, linear lfts.: fls.-spikes 2-3 in. long, solitary or 2 in. long; calyx downy, deciduous from the site-connate instead of free or wanting as in those of the same species of herbs or bushes, all of Trop. Amer. They have already been mentioned under the name of *P. angustifolius.*

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Other species, known as acacias, are likely to appear in cult. under the names of: *P. gynaptosperma,* Benth. (Acacia stenocarpa, Benth.); *P. anacides,* Benth. (Acacia gonoacantha, Mart.). Unarmed tree: branchlets and peduncles grayish tomentulose; lvs. about 6 in. long, with 10-25 pairs of opposite pinnre, each with many oblique linear lfts. scarcely 1 line long; fls.-spikes double, axillary, or terminal panicles. Brazil. Fl. Brasil. 15, 2. 1914.

**PIPTEROSIS** (Greek, fallen tail; in allusion to the florescence of some species). *Urticaceae.* Erect, deciduous trees or shrubs, alternate or opposite pinnate, rarely 3 obovate-elliptic lfts.: fl.-spikes axillary, or terminal panicles. Brazil. Fl. Brasil. 15, 2.

**PIPYRUS** (Greek, fallen tail). Shrub 3-7 ft. tall: young branches tomentose, brownish glabrescent with age; lfts. ovate-to ovate-lanceolate, before flowering silky-white above, beneath pale reddish tomentose, nearly glabrous above with age; fls. similar to the above species but calyx with long silky hairs and sepals more acuminate; pod narrowly linear, about \( \frac{1}{4} \) in. wide and 2-3\( \frac{1}{4} \) in. long, at maturity densely short-tomentose, 5-seeded. Wooded mountain slopes of Yunnan, China. More beautiful and much more hardy than *P. nepalensis,* producing an abundance of fls. in April to May in the Middle States. Its white silky hairs give it a distinctive silvery appearance. P. L. Ricker.

PIQUERIA (A. Piquer, Spanish physician of 18th century). *Compositae.* Under the name of *Senna serrata* or *S. serratifolia,* florists grow *Piqueria trinervis,* Cav. (Fig. 2985), for its small white fragrant fls. and for bedding. It is native in Mex, Cent. Amer., and Hayti. It is perennial. The genus contains about 20 species of herbs or bushes, all with exsiccant tubular fls. in dense cymose heads, the heads containing 3-5 whitish fls.; torus plane or convex, naked; pappus none or very short: achenes 4-5-angled. It resembles a small eupatorium in foliage and fls. The small heads are borne in small panicled oryams, each cluster terminating a slender axillary branch or peduncle. The lvs. are opposite, lanceolate to oblong-lanceolate, serrate-dentate, very short-stalked. There is a dwarf, compact form, var. *nana,* Hort., and also one with broadly white-edged lvs., var. *variegata,* Bot. Gaz. 2986, which are much used for bedding out. The Cent. American var. *luxiliana,* O. Kuntze, has slightly larger leaves, but does not appear to have been intro. into the tropics of the Old World, similar to Mimosa and Acacia. Inflorescences with numerous small, barely visible, with few and large lfts.: fls. small, white, in axillary globose heads or cylindric spikes; petals small, equal, connate to the middle; stamens 10, free; pod broadly linear, 2-valved, not septate, and not pappose. The following species has been intro. to Calif. by Franchescoichi for its economic interest; in its native country it is valued for tanbark. Prop. by seeds. P. Cebi, Griseb. (P. macracarpa var. Cebi, Chodat & Hauser). Trees, to 80 ft., glabrous; lvs. with 10-16 pairs of opposite pinnae, each with 24-40 pairs of linear-oblong acute lfts. about \( \frac{1}{4} \) in. long; petiole about 1 in. long, with a conspicuous gland near the middle; fl.-heads globose, axillary, 1-4, \( \frac{1}{4} \) in. across, on slender pedicel \( \frac{3}{4} \) in. long; stamens long-exserted; pod 0-5 in. long, about \( \frac{1}{4} \) in. wide, simuate between the seeds. Argentina.

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PISCÍDIA (Latin for fish and kill). Leguminosae. One or 2 species, including the fish-poison tree of the American tropics, or Jamaica dogwood. The lvs., bark, and twigs of this tree when thrown into the water intoxicate or stun the fish so that they can be caught readily. (For the plant used in China for this purpose, see Coicis.) The bark has also been used in medicine for its hypnotic effect. Botanically this genus is close to Lonchocarpus, differing mainly in the pod, which is long, thickish, and longitudinally 4-winged: calyx-teeth 5, short, broad: wings adhering to the falcate keel; vexillar stamen free at the very base, but grown together at the middle with the others into a closed tube; ovary sessile, many-ovuled.

Erythrina, Linn. (P. piscipula, Sarg. Erythrina piscipula, Linn. Ichthyomethia piscipula, Hitchc.). Fish-Poison Tree. JAMAICA DOGWOOD. Lfts. 7–11, opposite, oblong or elliptical, pointed or blunt; lvs. purplish white, ½ in. across: pod 2–4 in. long, 4-keeled: seeds 6–8, black. Trop. Amer., especially common in Jamaica.

PISÓNIA (named after Willem Fiso, a physician and naturalist of Amsterdam, who died in 1648). Nyctagináceae. Erect or rarely subscandent trees and shrubs: lvs. opposite or subverticillate: infl. terminal, axillary or lateral clusters; lvs. dioecious, rarely monocious or hermaphrodite, pink, greenish or yellow; perianth 5-toothed; stamens 6–10; ovary elongate-ovoid, sessile: fr. an elongated utricle often bearing at its base the persistent filaments enveloped in the calyx and becoming fleshy, smooth or covered with spiny glands. About 36 species, mostly natives of Trop. and Sub-trop. Amer., but a few in Asia, in the Mascarene Isls., and Polynesia. P. Brunoniana, Endl. A tree reaching a height of nearly 50 ft.; lvs. alternate, oval-oblong, up to 10 in. long and 4 in. broad, acuminate, entire or sinuate; petiole somewhat thick, up to 1 in. long: flowers inconspicuous in spreading terminal cymes. Tahiti and Marquesas Isls. Intro. in Belgian gardens. This species has been referred to both P. umbelífera, Forst., and P. intérnís, Forst. and Jacq. The most recent treatment by Rock, “The Indigenous Trees of the Hawaiian Islands,” regards it as a synonym of P. intérnís. The following species are also reported as having been in cult.: P. aculeáta, Linn., P. intérnís, Forst., not Jacq. (P. grandis, R. Br.), and P. obtúlulá, Jacq., but apparently are not now grown.

PISTACIA (derived indirectly from ancient Persian pistá, Anacardiáceæ). Trees or shrubs which exude turpentine or resin. One species of the genus, P. vera, produces the pistachio-nuts or pistache of commerce which are used in confectionery and flavoring, and some of the other species are used for ornamental planting as stocks on which to graft the commercial species. Leaves alternate, evergreen or deciduous, 3- or 5- or even- or uneven-pinnate: infl. paniculate or axillary, racemose; lvs. small, daisyefluous and without petals; males with 5-divided or -parted calyx and 5 stamens; females with 3–4-divided or -parted calyx, short 3-divided style and 1-celled ovary: fr. a dry drupe. About 20 species, Medit. region to Asia, with one species from the Canaries, and one from Mex., which has also been found in Calif. The so-called nut of Pistacia is really the seed or kernel of a dry drupe. The seed is green, and has a highly peculiar flavor. P. Terébithus excudes from its st. the fragrant Cyprian or Scio-turpentíne used in medicine as early as the time of Hippocrates.

Cultivation of the pistachio, or pistache. (G. P. Rixford.) Several species of Pistacia, P. vera, P. atlántica, P. lentícieus, P. mutíca, P. Terebithus, P. chinensis, P. mexicana, P. intergrímera, and P. verestína, a hybrid, have been introduced into this country by the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture and are being tested as stocks upon which to graft the commercial species. Leaves alternate, evergreen or deciduous, 3- or 5- or even- or uneven-pinnate: infl. paniculate or axillary, racemose; lvs. small, daisyefluous and without petals; males with 5-divided or -parted calyx and 5 stamens; females with 3–4-divided or -parted calyx, short 3-divided style and 1-celled ovary: fr. a dry drupe. About 20 species, Medit. region to Asia, with one species from the Canaries, and one from Mex., which has also been found in Calif. The so-called nut of Pistacia is really the seed or kernel of a dry drupe. The seed is green, and has a highly peculiar flavor. P. Terébithus excudes from its st. the fragrant Cyprian or Scio-turpentíne used in medicine as early as the time of Hippocrates.
Spain by Flavius Pompeius. The first introduction into the United States dates from an importation of nuts by the Federal Patent Office in 1855-1856. These nuts were widely distributed throughout the middle and southern states but do not seem to have attracted much attention until trees were introduced into California by the writer, from southern France in 1876, and subsequently by the United States Department of Agriculture.

The best named varieties, a half-dozen in number, have been imported from Syria, Sicily, and other Mediterranean countries and have been extensively propagated at the Government stations, chiefly at Chico, California. During the past seven or eight years, budded trees of the named varieties and seedlings of various species to the extent of 25,000 or 30,000 have been distributed to sections of the southwestern states, chiefly California. The best nuts in market are from the island of Sicily, where wild Terebinthus trees are thinned out and grafted with *P. vera* cions.

In this country, the trees are propagated by either budding or grafting. In nursery rows the stocks are budded when one year old. One experienced nurseryman has best success by the use of dormant buds from old wood inserted in April or May when the bark peels freely. He sometimes takes buds in winter and keeps them in cold storage in a slightly moist atmosphere. He mentions above are successfully used for stocks, some, however, give the preference to *P. Terebinthus, P. vera,* *P. mutica,* and *P. atlantica.*

The trees may be worked either in nursery or in the orchard when the seedlings are well established in California. In planting the orchard, it is best to put out trees one year from the bud or one or two years from the seed, as the tap-root is large and young trees are most successfully moved.

It is suggested that one form of the commonly cultivated pepper tree, *Schinus terebinthifolius,* is so closely related to the pistachio that it may be used as a stock for *P. vera.* The vigor, hardiness, and rapid growth of *P. chinensis* seemed to indicate it as an ideal stock upon which to work *P. vera;* but the growth of the bud the first year was a disappointment, as when it began to grow the stock in most cases stopped, resulting, at the end of the season, in a top-heavy tree, frequently 34 inch above and 34 inch below the union. However, the second or third year, the stock overtakes the bud, so that the only precaution required is to stake the tree the first year or two.

The pistachio is a dry-climate tree, somewhat hardier than the fig and olive. When once established in good soil, little irrigation is required. It flourishes in the southwestern states wherever the climate permits the growth of the olive. The trees are planted 25 feet apart, and one male to six or seven females must be put out as pollinizers. The males of *P. vera* blossom first and in some countries these flowers are gathered and preserved in a dry place until the female flowers open; the pollen is then dusted over them. Sometimes twigs of staminate flowers are cut from the tree and pushed into pots of moist earth where they will keep fresh a few days until the pistillate flowers open. *P. atlantica* male flowers open earlier than the female flowers of *P. vera* and have served as good pollinizers for the latter. In that case, of course, the seeds of such crosses, if planted, would produce hybrid trees. Sometimes the male cions are grafted into female trees. The male trees are invariably larger and more vigorous than the females.

The grafts begin to bear the fourth year, and at the age of eight to ten years, with good care, should yield twenty-five to one hundred pounds of nuts in the shell, of which it takes three pounds to make one of shelled kernels, in which form most of them are imported. There are seedling trees in California eight and nine years of age which are producing annually twenty to twenty-five pounds of nuts. It is the highest-priced nut in our markets, selling at wholesale from 35 to 75 cents a pound. It is a curious fact, not mentioned by botanists, that the shells grow to about normal size and remain empty if not pollinized. After pollination the ovule rapidly expands and fills the shell.

In central California, seeds are planted in March. The seeds should be soaked over night in water made with a can of lye to twenty gallons of water; then put into a coarse sieve and rub with a piece of burlap to remove the pulp. If this is not done, the seeds will be long in germinating. Plant in good soil in house or hotbed.

The pistachio nut is greatly appreciated in the countries bordering on the Mediterranean, especially in Syria, where it is extensively used, as is the almond and walnut in this country. In Syria it always forms an important ingredient of all wedding feasts. The parting guest after a social call is always provided with a bag of nuts. At present, in this country, owing to the high price, its use is restricted to confectioners who use it for coloring and flavoring. When processed as are salted almonds, but in the shell, they are readily liked. The dehiscent shell is penetrated by the salt-water, while the crack facilitates the opening by the fingernails.

It is not presumed that growing the nuts will become an important industry in this country. All the species here mentioned above are successfully used for stocks, some, however, have given the preference to *P. Terebinthus, P. vera,* *P. mutica,* and *P. atlantica*.
in several feet of water, it seems to do better when placed in shallow water where the roots may reach the soil. Larger-sized plants may be secured by using a thin layer of rich soil or well-rotted manure in the bottom of the vessel. Soft water is said to be essential. Running water is not necessary. The plants should be shaded during the middle of the day in summer, or the foliage is likely to become yellow and sickly-looking.

Stratiotes, Linn. WATER-LETTUCE. TROPICAL DUCKWEED. Tender perennial aquatic herb already described. The small white fls., though inconspicuous and borne at the bottom of the cup of lvs., are large enough to show at a glance their relation to the arum family. B.M. 45/4. F.S. 6:623. J.F. 2:137. Var. spatulata, Engler. Lvs. spatulate, velvety green, more deeply nerved than the type. S.E. U.S., Trop. Amer.

WILHELM MILLER.

Pistia (probably from Greek, pistes, watery; refering to its aquatic nature). Aracea. WATER-LETTUCE. TROPICAL DUCKWEED. A small tender, perennial floating herb desirable for aquaria. Flowers unisexual; spadix without appendage, adnate to the back of the spathe; male fls. in whorls, with spreading branches; lvs. pinnate, at first tonguetipped, then glabrous, somewhat coriaceous, borne on angular petioles; lfts. 1-5 pairs, ovate, obtuse, nearly sessile (in one variety in cult. in Calif. the lvs. have only 3-5 lfts.); drupe ovate, oblong pedicelled, reddish and wrinkled. Medit. region and Orient. — The heartwood is dark brown and very hard. Some cultivators dislike it as a stock for P. vera, finding difficulty in making the grafts take.

Vera, Linn. PISTACIA. Small tree up to 30 ft. high, with spreading branches; lvs. pinnate, at first tonguetipped, then glabrous, somewhat coriaceous, borne on angular petioles; lfts. 1-5 pairs, ovate, obtuse, nearly sessile (in one variety in cult. in Calif. the lvs. have only 3-5 lfts.); drupe ovate, oblong pedicelled, reddish and wrinkled. Medit. region and Orient. — The kernel has a rich, oily, agreeable flavor and in different varieties is either pale green or creamy yellow.

F. TRACY HUBBARD.

USA, PITCAIRNIA

Flowers unisexual; spadix without appendage, adnate to the back of the spathe; male fls. in whorls, with 2 very short stamens which are much grown together and inserted at the apex of the spadix; female fls. in axillary racemes. The monographer of the aroids (Engler, in DC. Monogr. Phaner. 2, 1879) makes Pistia the sole representative of a subfamily, one of his 10 primary natural divisions of the arum family. He regards the piastras as all one species, though 9 or more have been described. He recognizes 4 well-marked varieties, based upon the shape of the lvs., which he calls cuneata, spatulata, obcordata and linuiformis. After the continental fashion Engler takes no one of these as a type to which the others are referred. It is probable that the form with obcordate lvs. is the one chiefly cult. in American water-gardens. It forms a loose rosette of lvs. and has long slender featherly roots. The plants send out runners on which may sometimes be seen young plants in all stages of development. A healthy plant measures about 6 in. across. The lvs. are generally more or less wedge-shaped, 2-5 in. long, pea-green, velvety to the touch, and covered beneath with a sort of mealy down. The piastra rosette line has been compared to a half-grown lettuce plant before the head has formed. Like many other aquaticies, the water-lettuce has an immense range. It is found in fresh waters throughout the tropics, and in the U. S. is native from Fla. to Texas. Water-lettuce is commonly grown outdoors in summer in collections of tender aquatics, and also in aquaria. The summer temperature of the water should be 70° to 80° F. Although it grows well when floating free in several feet of water, it seems to do better when

placed in shallow water where the roots may reach the soil. Larger-sized plants may be secured by using a thin layer of rich soil or well-rotted manure in the bottom of the vessel. Soft water is said to be essential. Running water is not necessary. The plants should be shaded during the middle of the day in summer, or the foliage is likely to become yellow and sickly-looking.

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WILHELM MILLER.

Pistia (Greek and Latin name of pea). Legum. Mostly tendril-climbing herbs of the Medit. region and eastward, one of which is the common pea. Hardy annuals or perennials of easy culture, growing well in the cooler months: calyx-tube oblate at the base, the lobes more or less leafy; standard obovate or orbicular; wings adhering to the keel; style mostly rigid, widened above, bearing down the inner margin; lfts. 1-3 pairs, the fl endng in a tendril or point, the stipules conspicuous. — Species about a half dozen.

Var. sativum, Linn. GARDEN PEA. P. 2987. Annual, glabrous and glaucous, tendril-climbing: stipules large and leafy (usually as large as lfts.); lfts. oval or ovate, 2-3 pairs, the fl endng in tendril; fls. few, on an axillary peduncle, white: seeds globular. Eu., Asia. — The pea runs into many forms, which have been variously named. Two major types of garden peas are those grown for the seeds including peas with those grown for the edible pods (sugar peas). See Pea.

Var. arvense, Poir. (P. arvense, Linn.). FIELD PEA. Fls. usually bluish, light lilac, or dull white, with purple wings, and greenish keel, 1-3 on peduncle about as long or little longer than stipules: seeds angular, often gray. Grown for forage.

Var. saccharatum, Hort. SUGAR PEA. Fls. mostly in 2's: pod large and soft, more or less fleshy, sweet, not dehiscent, edible. L. H. B.

PITANGA : Eugenia uniflora.

PITCAIRNIA

(P. Pitcairn, a London physician.) Bromelidaceae. Billbergia-like very short-stemmed perennial herbs or subshrubs. Leaves in dense rosettes, narrow, often prickly-margined: inflo. a central spike or raceme of long-tubular red, yellow or nearly white fls.; fls. perfect; sepals 3, free; petals 3, unequalate, erect or spreading at the apex; usually with 2 small scales at the base; stamens 6, free, with linear antehirs: fr. 3-valved caps., with numerous seeds. — Mex., the recent monographer of the bromeliads (in DC. Monogr. Phaner. 9), admits 134 species of Pitcairnia. See also Baker in Journ. Bot.
PITCAIRNIA

1881. They are American, mostly tropical. In choice collections, various species of pitcairnia may be expected, but very few of them are in the American trade. For cult. of two Mexican species, P. jalisciense and P. palmensis (not cult.), see G.F. 1:197 and 211. P. farinosis is an undetermined trade name for other species, see Puya. For cult. of pitcairnias, follow advice given under Billbergia.

- Inf. on a scape.
- Fls. pendulous.

**cordilina**, Lind. & André. Stemless; outer lvs. hard and dry, without marginal spines, the inner ones with brown-spined petioles and broad plicate recurved blades which are somewhat scurfy on the back; peduncle about 3 ft. long, broad red, the raceome of about equal length and drooping; fls. coral-red, about 3 in. long, the calyx parting about one-third of this length; stamens as long as the petals, with white filaments; stigmas twisted. Colombia. R.H. 1875:250. B.M. 6600.—Perhaps the best species.

- Fls. erect.

**Moritziana**, Koch (P. Klotzschiana, Baker). Stemless; lvs. elliptic-obovate, 12-18 in. long, narrow, spineless and the petiole short or none; raceome about 1 ft. or less long, on a leafy peduncle of about the same length; fls. red or yellowish, usually not 3 in. long. Venezuela. R.H. 1903, p. 175.

- Inf. sessile.

**heterophylla**, Beer (P. Marshalli, Lem. Puya heterophylla, Lindl.). Stemless; lvs. of two kinds, the outer ones narrow and spiny, brown, and being the termination of bulb-like scales, the latter ones being longer (10 in.) and green and entire; fls. rose or white, in a close oblong spike that is shorter than the green lvs., the latter arising, however, from separate shoots. Mex. to Venezuela and Ecuador. B.R. 26:71. J.F. 3:291.—Odor.


- P. alpina—Puya—P. cerrulenta—P. echinata, Hook. Lvs. of two kinds, the one scale-like, the other normally developed, up to 3 ft. long and 2½ in. wide, spiny; panicle bipinnate; sepal acute, keeled, cobinate with succulent hairs; petals yellow. Colombia. B.M. 4709. J.F. 4:407.—P. esculenta, Hook. Lvs. up to 3 ft. and 1½ in. broad, linear-lineariform, entire; raceome densely many-flowered, on a stemless peduncle; sepal acute; petals red. Brazil. B.M. 7175 (as P. Roedel).—P. funckiana, A. Dietr. Lvs. 1-2 ft. long, 2 in. wide. lanceolate, minutely serrulated toward the tip: base, glabrous: raceme few- to several-flowered, on a manifest scape; sepal obtuse; petals white. Guiana and Colombia. Gt. 4:141. Sepals: 1½ in. long, 735 (as P. macrolepis).—P. Jacksonii, Hook.=P. clematideum, DC. Lvs. up to 1½ ft. long, 2 in. wide, broadly lanceolate, minutely serrulated toward the tip: base, glabrous; sepal acute; petals red. Mexico. R.H. 1901:376.—P. pumila, Schied. Lvs. up to 1½ ft. long, less than ½ in. wide, narrowly linear-lanceolate, long-cuneate toward the tip; fls. in dense raceme, 4-6 in., light milk-white. Brazil.—P. rospig, Klotzsch & Link. Lvs. of two kinds, the one brown, awl-shaped, the other grass-like, 2½ ft. long, about ½ in. broad, unarmed except at base; glabrous; raceome few- to several-flowered, on a manifest scape; sepal acute, petals red. Mex. Guat. 2:253.—P. spathacea, Koch. Lvs. up to 1½ ft. long, 1½ in. broad, lanceolate, minutely serrulated toward the tip: fls. in dense raceme, 4-6 in., light milk-white. Brazil.—P. spathacea, Mez.—P. spathulata, Lind. Lvs. up to 1½ ft. long, about ½ in. broad, narrowly ensiform, unarmed, green; raceome sessile, on a manifest scape; sepal acute; petals red. B.H. 9:190.—P. tubiflora, Lindl. Lvs. up to 6 in. long, 1½ in. wide, obovate-spatulate; indument, head-like, sessile; sepal acute; petals red. B.H. 9:314. P.M. 3:697. B.M. 6800.—P. undulata, Schied. Outer lvs. triangular, brown, entire, the inner ones linear, to 2 ft. long, ½ in. wide, unorned, unedulate, pale scaly on back; raceome many-flowered, on a manifest scape; sepal entire, lobed; petals red. S. Brazil. F.S. 2:163 (as P. Altemeiti). Giit. 781.

**George V. Nash.**

**PITCHER PLANTS** are various carnivorous plants bearing pitchers which in some cases contain a secreted liquid by the aid of which the plant digests the bodies of insects. The native pitcher plants of the

northern and southern states are Sarracenia. The California pitcher plant is described under Darlingtonia. The favorite pitcher plants of greenhouses are Nepenthes. All these plants have a morphological resemblance in their pitcher-bearing foliage, but bearing flower seeds are so apparently unlike that they suggest derivation from widely different parts of the vegetable kingdom. The genus Nepenthis may possibly be derived from the Arisaema family, being a derivative of one line, while the parasitic Cyntaceae might be regarded as having degenerated along another line from the same source. The Australian genus Cephalotus, which has a pitcher strikingly like the pitchers of Nepenthis, may be an outlying relative of the saxifrage family. Sarracenia, Darlingtonia, and the Venezuelan genus Heliamphora seem to be more closely allied to one another than to the others, and they make up the Sarraceniaceae. See the different generic entries for fuller accounts.

**PITHECOCTENIUM** (Greek, monkey's comb; alluding to the spiny fruit). *Bignoniaceae*. Ornamental vines cultivated for their showy flowers.

Evergreen shrubs climbing by leaf-tendrils: young branches ribbed: lvs. opposite, 3-foliolate or the middle leaf replaced by a filiform 3-lobed tendril; fls. in terminal racemes or panicul-like; calyx tubular, truncate or with small teeth; corolla campanulate, tubular at the base, curved, leathery, white or yellowish; stamens included; disk large; ovary warty, with many seeds in several rows; caps. broad, densely covered with prickly warts; the persistent septum with elongated enlarged margin.—About 20 species in Cent. and S. Amer. From the allied genera Bignonia and Anemopaema it is easily distinguished by the prickly caps. and the ovary with the seeds in several rows. Adapted for cult. in subtropical and tropical countries only. For cult. and prop. see *Bignonia*.


**murichama**, De Wild. (Bignonia echinata, Jacq.). Glabrous: lfts. ovate, acute or acuminate, rounded or subcordate at the base: fls. in terminal many-flowered racemes; corolla about 1 in. long, white with yellow throat: fr. oblong, 2-5 in. long, densely covered with prickles. Mex.

**P. bacciflorum**, Maire.—Phredranthus bacciflorus.—*P. cinea*, DC.—Discitus cinea. ALFRED REIDEN.

**PITHECOLOBIUM** (Greek, monkey, and ear-ring). *Lupinioidae*. Tropical shrubs or trees planted for ornament and shade.

With or without axillary stipular spines: lvs. bipinnate, fls. at first small, many pinnate or large, 1-3-pinnate, rarely with 1 ft.; petal glands rarely wanting; stipules small and inconspicuous or persistent, another than to the others, and they make up the Sarraceniaceae. See the different generic entries for fuller accounts.
PITHECOLOBIUM

pulpy, short, often dark-colored, ovate or orbicular, compressed; funiculus filiform or with variously expanded feathery arils.—About 125 species. The subgenus Samanes of Bentham is of generic rank. See Samanes, Vol. VI. It is distinguished from Pithecolobium by its straight indehiscent sepaloid petals, and from Enterolobium by its straight, more or less constructed instead of short thick circinate or reniform pods.

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A. Stipules mostly spiny: lvs. 1- or rarely irregularly 2-pinnate; lfts. 1- or few-pinnate; pod spirally twisted; seed with funiculus dilated at apex into a fleshy aril. (Unguis-cati.)

a. Heads with short peduncles.

1. dulce, Bentham. (Mimosa dulcis, Roxb. Inga dulcis, Wild.) Guatmociel, Humuchil, or Manilla Tamarindo. Large stately trees: lvs. and lfts. 1-pinnate; lfts. obovate or oblong, obtuse, very oblique, about 1 in. long; heads short-peduncled, the upper pedicellate-racemose; fls. finely pubescent; calyx 1 line, corolla 1½-2½ in. long, white; pod twisted, 5-6 in. long, 1½-2½ in. broad. Mex., Philippines. Blanco Fl. Filip. 257. Beddome, Fl. Sylv. 188.—Widely cult. in the tropics as an ornamental. The pulpy aril of the seed is eaten by the poorer classes as food. The bark yields a yellow dye. It is said not to have fruited in S. Calif.

b. Heads with long slender peduncles.

2. guadalupense, Champ. (Inga guadalupensis, Desr. An unarmed shrub or small tree, 3-7 ft. high: lfts. 4, obliquely obvate, ½-1½ in. long, leathery, mucronate, undulate, delicately nerved, shining above; petioles shorter than the petiolaris: heads small, solitary; calyx campanulate, pubescent, triangular lobes shorter than the tube; corolla pubescent, stamens 3-4 times longer than the corolla; pods 2-4 in. long, contorted. Fls. and W. Indies.

cc. Lfts. membranous; ovary glabrous.


AA. Stipules inconspicuous; spinless: lvs. 1- to several-pinnate; lfts. 1- to several-pinnate, large or many-pinnate and small; heads small, pubescent; pod spirally twisted; seed without apex of funiculus dilated. (Clipearia.)

b. Lfts. mostly few, sessile, in heads.

4. scutiferum, Bentham. (Mimosa scutata, Blanco. P. loxos, Bentham.) A small tree or large shrub, 1-2-pinnate; lfts. 2-3-pinnate, ovate or oblong, acuminate, 3-6 in. long; lfts. in heads, few (often 2-3) sessile, glabrous, or puberulent; calyx ½-1 line long; corolla up to 2 lines long; pod twice or irregularly twisted, often nearly a foot long, 1-2 in. diam.; often constricted between seeds; seeds large, compressed, orbicular. Trop. Asia, Java, Borneo, Philippines.

PITHECOLOBIUM

bb. Fls. many, in heads, distinctly pedicelled.

c. Branches terete: lvs. large, few-pinnate.

5. prunius, Bentham. (Abeláza pruniosa, F. Muell.) A slender tree, brownish puberulent or glabrous: lvs. 1-2-pinnate; upper lfts. 3-4-pinnate, broadly ovate or suborbicular, large acuminate, 2-3 in. long; fls. in heads in the upper axis or in short corymbose terminal panicles, pedicellate, glabrous; calyx ½ line long; corolla 2 lines long; pod spirally twisted or long-constricted, glabrous, deeply constricted, about ½-½½ in. broad. E. Austral.—Intro. in 1901.

cc. Branches angular: lvs. several- to many-pinnate.

6. angulatum, Bentham. (Inga angulata, Graham. Mimosangulata, Roxb.) An ornamental small tree: branches and petioles at first brownish, puberulent, becoming glabrous: lvs. 2-4-pinnate; upper lfts. 4-8-pinnate, oblique, ovate-oblong, acuminate, 3-5 in. long, lower shorter, ovate-ribbose; panicle terminal; fl. few, in heads, pedicellate, conical, not shorter than a line long; corolla about 3 lines long; pod circular or elongated, constricted, about ½-½½ in. broad. Trop. Asia, Borneo, Philippines.

AAA. Stipules present: shrubs (or rarely trees): lvs. 1- to several-pinnate; lfts. small or rarely 1 in. long. (Orieolobium.)

b. Spines straight.

c. Lvs. 2-6-pinnate.

d. Lfts. 5-10-pinnate.

7. mexicanum, Rose. Chino. A small tree, 15-20 ft. high, 1 ft. diam.: lvs. with straight stipular spines (sometimes wanting) 1 line long, 2-5-pinnate; lfts. 5-10-pinnate, oblong, 2-4 lines long, midrib a little excentric, puberulent, as are also the rachis and branches; inf. racemose; fls. in heads, pedicellate; pedicels 1-2 lines long; calyx ½ line long; corolla 1½ line long; petals spreading or reflexed; stamens long, numerous: pods oblong, somewhat constricted, 3-4 in. long, 1 in. broad, straight, its valves not elastic nor revolute; seeds 2, oval, 2-4 lines long. Mex.—It has the habit of mesquite and is valued for its wood. Rare, and rapidly becoming exterminated.

bb. Lfts. 3-6-pinnate.

8. flexicaule, Coult. (P. tezénea, Coult. Acalía flexicaûls, Bentham.) Ebony. A shrub or small tree, 20-30 ft. high: trunk 2-3 ft. diam., branching 8-10 ft. from ground, with short stipular spines: lvs. 4-6-pinnate, long-pedicellate; petioles slender, puberulent; lfts. 3-6-pinnate, lower pair shortest, ovate-oblong, rounded at apex, glabrous, membranaceous or subcoriaceous, dark green, shining on the upper surface, paler below, ½-½½ in. long on short broad pedicels; fls. in cylindrical dense or interrupted spikes, 1½ in. long on stout pedunculate pedicels, fied in axils of lvs. of preceding year, sessile, yellow or creamy, fragrant; stamens exerted; corolla 4-5 times longer than calyx, puberulent; ovary glabrous, sessile; pod flattened, turgid, straight or falcate, sessile, obtuse to several-pinnate, large or many-pinnate and small; heads small, pubescent; pod spirally twisted; seed without apex of funiculus dilated. (Clipearia.)

c. Fls. mostly few, sessile, in heads.

4. scutiferum, Bentham. (Mimosa scutata, Blanco. P. loxos, Bentham.) A small tree or large shrub, 1-2-pinnate; lfts. 2-3-pinnate, ovate or oblong, acuminate, 3-6 in. long; lfts. in heads, few (often 2-3) sessile, glabrous, or puberulent; calyx ½-1 line long; corolla up to 2 lines long; pod twice or irregularly twisted, often nearly a foot long, 1-2 in. diam.; often constricted between seeds; seeds large, compressed, orbicular. Trop. Asia, Java, Borneo, Philippines.
especially in California and Florida. Several species are
excellent hedge plants, much preferred to privet and
box in some localities; many are useful ornamentals
for lawns and shrubberies; a few are used as avenue
trees; nearly all have fragrant flowers.

Shrubs and trees: lvs. simple, exstipulate, alternate or
apparently whorled; fls. regular, the parts in 5's; sepals
distinct or connate at base; petals distinct or lightly
united, tips often recurved; ovary incompletely 2-celled
(rarely 3-5-celled); style 1; stigma 1: fr. a globose, 
ovate or obovate caps., 2- to many-seeded; valves
leathery or woody.—About 100 species, chiefly of the
warmest parts of the western hemisphere and
largely Australian.

Pittosporum are usually propa
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B. Spines recurved.

10. Sonora, Wats. UNA DE GATO. A shrub or
small tree 15-20 ft. high, armed with short recurved
spur; foliage, infl. and branches canescent
with very short spreading pubescence: lvs. 1-pinnate
on a short (1-2-line) or very short raci; fls. 10-15-
pinnate, oblong-ob lanceolate, about a line long; petu
mostly solitary (1-3) in the axis, 6 lines long or less;
hed, leaves; fls. white, finely pubescent, nearly 2
lines long; pod rather thin, short-stipitate, flat, straight,
dehiscent, puberulent, 2-4 in. long and 1%-2 in. wide,
3-6-seeded. Wood.—Very hard and takes a fine
polish. A good hedge plant for the Southwest
if trimmed. A decoction of the branches is used for
sours in horses.

AAA. Stipule spines absent: lvs. 1- or rarely 2- or more-
pinnate; fls. 1- to several-pinnate, large; fls. usually
short, in heads or spikes at nodes of leafless branches:
pod stiff, leathery. (Caulanthus.)

11. latifolium, Benth. (Mimosa latifolia, Linn. Inga latifolia, Wild. Calliandra latifolia, Griseb.). A small
tree or tall shrub, entirely glabrous; stipules persistent,
hirsute-acuminate: lvs. 1-pinnate; fls. often 2-pinnate,
ovate or obovate-oblong, acuminate, 3-6 in. long;
fls. in loose nearly sessile or short-peduncled heads;
calyx very small; corolla about 1 in. long: pod curved,
if, flat, straight, 1-2 in. long, dark above, pale beneath, costa excentric: heads
about 6 in. long, %2 in. broad. Brazil to Panama

AAA. Stipules fascicled: lvs. 2- to several-pinnate; fls.
5-9-pinnate; ovate, acute, acutish, reticulated beneath: panicles
also grafted upon this stock. Seedlings should be repot-
ED. Fls. chocolate to black: seeds black.

1. crassifolium, Soland. KARO. Tall shrub or small
tree, 15-30 ft.; young parts densely clothed with white
or buff downy pubescence: lvs. 2-3 in. long, narrow-
oblanceolate or oblong, obtuse, narrowed to a short petiole,
very leathery, dark green above, downy beneath, the
margins revolute: fls. % in. long, terminal clusters;
fr. %--1-4 in. long, short-hairy, with 3 or 4 thick
woody valves; seeds ripen in about five months. New
21:2151. B.M. 5978.—Suitable for windbreaks and
shrubbery near the sea; said to resist gales and salt spray;
too coarse and rigid for ordinary yard planting. Wood
white and tough; used for inlaid work; difficult of
combination.

2. tenuifolium, Gaertn. (P. nigricans, Hort.). TAW-
HRUA. Shrub or small tree, 20-40 ft., of symmetri-
cal and compact growth; lvs. 1-3 in. long, oblong or
somewhat obovate, mostly acute, thin, dark green,
glabrous and lustrous when mature, the margins
undulate: fls. %--1 in. long, solitary in the H-axis,
rarely fascicled; ovary silky: fr. % in. thick, globose,
3-valved, glabrous and minutely roughened when mature. New Zeal. Kirk, Fl. N. Z. 46.—One of the best for clipped hedges, and for screening off undesirable views. Occasional pruning is necessary if a dense foliage is desired. Both this and No. 1 have yellow-fld. forms but these are not in the trade.

a. Fls. white, greenish, or yellow.

b. Lvs. very obtuse, thick and leathery, but less so in P. erioloma.

3. Tobira, Ait. Tobira. JAPANESE PITTOSPORUM. Winter-flowering shrub, 6-10 ft.: lvs. 2-3½ in. long, 1-1½ in. wide, obovate, very obtuse, narrowed to the short petiole, thick and leathery, perfectly glabrous, margins revolute: fls. white or yellowish, fragrant, ½ in. long, in terminal umbels: fr. ½ in. long, ovoid, angled, densely short-hairy. China and Japan. B.M. 1396. Var. variegatum, Hort. (Fig. 2988), has lvs. (often thinner) variegated with white. —In the K. this variety is the favorite pittosporum, as it makes a good house plant: both forms are cult. in Fla. and Calif. as lawn plants and for shrubberies: the deep green foliage and fragrant fls., the latter resembling orange blossoms, are very agreeable. Withstands violent saline winds better than most other shrubs, according to Franceschi.

d. Young lvs. very pubescent, as also the fr.

4. erioloma, Moore & Muell. Tall shrub, 10-12 ft. or more, branching close to ground: lvs. 2-3 in. long, ⅓-1 in. wide, oblong-lanceolate to obovate, obtuse, short-petiolate, leathery but not so thick as in P. Tobira, deep green, paler beneath, glabrous at maturity, margins revolute: fls. yellowish, often in small terminal umbels, ½ in. long, equaling the pubescent pedicels: sepals 1⅞ in. long, pubescent within: fr. globose, glabrous, ⅛-⅜ in. across. Lord Howe’s Isl.—Resembles P. Tobira, but differs in its much pubescent seeds, P. erioloma.


—One of the best of the larger pittosporums, scarcely known as yet; intro. by Franceschi.

bb. Lvs. acute, thin.

c. The fls. in terminal clusters: lvs. lanceolate or broader.

d. Young lvs. glabrous or nearly so.

e. Petals about ⅜ in. long.

6. undulatum, Vent. VICTORIAN BOX. MOCK ORANGE. Fig. 2989. Tree, to 40 ft. or more, but often pruned as a shrub: lvs. crowded on the branches, 3-5 in. long, 1-2 in. broad, oval-oblong to lanceolate, abruptly acute, deep green, coriaceous and shining, entire, undulate or flat. fls. white; sepals more than half as long as corolla, acuminate; fr. scarcely ⅜ in. long, nearly globose, smooth; seeds numerous, light brown. Jan.—July. Austral. B.R. 16.—Suitable for large broad hedges with dense foliage; when well spaced makes a large tree: used as an avenue tree in S. Calif., where it attains stately dimensions. Often selected for planting near summer-houses and dining-porches because of the rich odor of the bloom, resembling that of orange blossoms.

ee. Petals less than ⅜ in. long.

7. eugenioides, A. Cunn. TARATA. Tall shrub or small tree with sparse and glossy light green foliage: lvs. 2-4 in. long, ½-1¼ in. wide, elliptico-oblong, acute, undulate: fls. greenish yellow, numerous; sepals minute, acuminate; fr. slightly exceeding ¼ in. long, ovate, pointed at each end, ribbed, glabrous when mature. New Zeal. Kirk, Fl. N. Z. 49—In Calif. the most extensively cult. species, much used for clipped hedges and ornamental shrubbery; hardy; growth rapid; grows in pure limestone shale (Brauntol); a variegated variety is cult. in Eu. Gn. 77, p. 277.

8. rhombifolium, A. Cunn. QUEENSLAND PITTOSPORUM. Pyramidal tree, to 80 ft.: lvs. 3-4 in. long, 1½-2 in. wide, rhomboid, acuminate, coarsely toothed: fls. white, numerous, in terminal corymbs: fr. berry-like, ½ in. long, nearly globose, becoming bright orange-yellow, glabrous; seeds 2-3, black. June—Sept. Austral. Hook. Icon. 621.—Sometimes grown as a pot-plant, more often as a tree for lawns and avenues. The bright berries persist through autumn and winter, making the tree very attractive.

9. revolutum, Ait. Tall shrub, rusty-pubescent on young parts: lvs. 2-3 in. long, 1½-2 in. wide, elliptic, glabrous above when mature, rusty-pubescent beneath, entire or undulate: fls. pale yellow, fully ½ in. long; sepals acuminate: fr. ½-⅜ in. long; seeds numerous, red or brown. Feb.—April. Austral. B.R. 186.

10. eriçárpum, Royle. Widely spreading shrub or tree, 10-20 ft., the young parts white-tomentose: lvs. 4-6 in. long, 1½-2½ in. wide, elliptic or oblong, narrowed to the ends, white-tomentose beneath: fls. yellow, ½ in. long, numerous in an oblong terminal raceme, fragrant: fr. ½ in. long. Himalayas. B.M. 7473.—Grown in S. Calif.; very useful when a mass of light-colored foliage is desired: fls. notably banana-scented.

c. The fls. axillary: lv. linear.

11. phillyraeoides, DC. NARROW-LEAVED PITTOSPORUM. Glabrous tree, to 20 ft. or more, with pendent twigs: lvs. 2-3¼ in. long, about ½ in. wide, entire; tips slender, recurved: fls. yellow, under ½ in. long, pedicelled in the fl.-axis: fr. about ⅜ in. long, oval, compressed, yellow, granular. Australian deserts. Maiden, For. Fl. N. S. W. 4.—Remarkable tree, resembling weeping willow but evergreen and suited to dry regions; root-suckers abundant.

PITTSPORUM

PITTSPORUM is a genus of flowering plants in the Pittosporaceae family. They are primarily native to Australia and New Zealand, with a few species occurring in South Africa, the Americas, and Asia. Pittosporum species are known for their glossy leaves, white to cream-colored flowers, and the fruit of some species is edible. The genus is divided into several subsections, each containing species with distinct characteristics. For example, P. ilexiflorum, a species often grown in gardens, has glossy, dark green leaves and white flowers. Some species are cultivated for their ornamental value due to their attractive foliage and flowers, which are suitable for various garden and landscape applications.
lichens, bacteria, and some flowering plants (e.g., dodder, Indian pipe, beech drops, and the like) .. Such small inconspicuous central flowers are fertile. 'Conception of the plant. While it is true that plants are dead or decaying organisms), which are also destitute of they are no longer green. Thus parasitic plants that plants which have so changed their food habits that sis), it may be used as a storage organ (as in cabbage leaves), or even for making the plant more conspicuous of showiness), which in more highly specialized forms are separated, as in the wild snowball where the large of plant-body composed of well-defined roots, stems, and water, and the same is true of some plants, as explained below.

Green plants absorb carbon dioxide from the air, and in the process of carbohydrate formation they give off a certain quantity of oxygen. However, in the further chemical activities of their cells, oxygen is absorbed and carbon dioxide is given off. In the plants which are not green (as in animals, also) the first process is wanting, while the second takes place. These facts have given rise to the view that plants and animals are quite opposite in their physiological relations to the surrounding air. They should not be contrasted, however, in this way; it is more exact to say that green plants have two important nutritive functions, namely (1) carbon absorption and synthesis), and (2) assimilation of food matters. Respiration—the process in which oxygen is absorbed and carbon dioxide is given off—occurs in all plants and animals.

With this general definition of a plant before us we may say that while some lower plants are minute single cells, or rows of cells, and others are flat, expanded and often irregular growths, in all of which there is a marked simplicity of structure, in higher plants we find the plant body composed of well-defined root, stem, leaves, flowers, fruits, and seeds. The lower plants referred to perform all the functions necessary for their continued existence, and are not in any sense "imperfect plants," as the older botanists used to denominate them. The difference between lower and higher plants is that the functions of the former are performed by fewer organs, while in the latter there is an approach to one organ for every function. Still it is true that some organs even in the highest plants have more than one function: so that it may be said that plants are theoretically capable of considerably higher development than they have yet attained. Thus while the chief function of the root may be for the absorption of food-matter, it commonly has in addition a holding function, and may become an organ of storage also. So, also, while the chief function of the leaf is to supply green cells for carbohydrate making (photosynthesis), it may be used as a storage organ (as in cabbage leaves), or even for making the plant more conspicuous (ornamental), as in many euphorbias. Even the flower usually unites two functions (that of fertilization and of showiness), which in more highly specialized forms are separated, as in the wild snowball where the large marginal flowers are for show but are sterile, while the small inconspicuous central flowers are fertile.

One more thing must be included in our general conception of the plant. While it is true that plants are mostly green in color, many plants which have so changed their food habits that they are no longer green. Thus parasitic plants that secure carbohydrates from living organisms, having no need of chlorophyl, are not green, and the same is true of saprophytic plants (those that get their food from dead or decaying organisms), which are also destitute of a green color. This is the explanation of the fungi, lichens, bacteria, and some flowering plants (e.g., dodder, Indian pipe, beeoh drops, and the like). Such plants are more or less degenerate, and in a physiological way like animals, but they still retain enough of the typical plant structure so that one is rarely at a loss where to place them.

C. E. Bessey.

PLANTÁGO (the Latin name). Plantaginaceae. A group of 200 or more species of annual and perennial herbs or subshrubs occurring in many parts of the world. It is a weedy genus, and only two or three species have any economic or ornamental value with meting. They are generally known as plantains, although this name is also applied to certain bananas (see Musa), which are plants of widely different kind. P. lanceolata, Linn., or ribwort, is sometimes used in pasture mixtures abroad, because it affords more or less spring pasture on dry and sterile soils. The seed is offered by American seedsmen for feeding birds, but not for sowing. In this country, however, it is one of the worst of lawn weeds, thriving in our hot dry soils when grass kills out. The best remedy for it is to secure a better stand of grass, and this is made possible by making the ground rich and so treating it that it will hold moisture. P. Coronopus, Linn., the back's-horn plantain, native to Eu., Asia, and Africa, being a tomentose (woolly haired) herb (see p. 1141). It is a low perennial, with linear-lanceolate often pinnatifid lvs. It is not in the American trade. P. cordata, Lam., of the E. U. S., has been offered by dealers in native plants as a subject for colonizing in bogs and margins of ponds. It is perennial, with a stout rootstock, large cordate- orbicular shining l-blades, and a slender spike rising 1-2 ft. high and bearing small brown berries with exserted style and stamens. P. major, Linn. (Fig. 2990), is a very common door-yard weed. Var. variegata, Hort., a variegated l-form, is offered in England. P. maxim, Duq., from Siberia, said to have white feathery spikes, has been intro. into England. There are about 20 native or naturalized species in N. Amer. Plantago is the typical genus of the Plantaginaceae, a family that contains two other genera, bitypic and monotypic,—Littorella in Eu. and N. N. Amer., and Bougeria in the Andes of Peru and Chile.

L. H. B.


PLANT-BREEDING: Breeding, p. 545.

PLANTING. This Cyclopaedia considers two classes or kinds of horticultural work, —the growing of plants, and the identifying of plants. The latter purpose runs through every generic entry, throughout the alphabet. The instructions for growing are combined with these generic entries, and are also extended in many separate articles, under the popular names of the plants themselves, as Rose, Strawberry, Cornation, Lettuce, Mushroom, and many others; and they are also displayed in class articles, as Alpine Plants, Kitchen-Gardening, Annuals, Biennials, Perennials, Herbs, Orchids, Palms, Arboriculture, and many others.

At this point, another set of class articles is assembled, with the purpose to bring together such instruction as is commonly associated with what is known as "planting," —with the use of plants in the open and particularly in relation to their uses as a part of a landscape development. In connection with this symposium, the reader will naturally give special attention to the assembly on
The relation of planting to the fundamental design.  

It is the business of the landscape architect to combine beauty and utility into a harmonious composition. The artistic aim in the practice of landscape architecture is to produce beautiful pictures. To achieve such pictures, the creative imagination must be controlled by familiarity with the accepted canons of design. Good design in landscape work must be based on the fundamental principles of art and the laws of nature. Fitness, proportion, variety, mystery or intricacy, unity, and harmony,—all these must be considered.

While it is the aim, in creating landscape gardens and parks, to produce natural effects, the best results are not necessarily secured by a mere imitation of nature as it happens to exist in a given locality. It is possible to modify nature to fit artificial conditions; and by changing the scale, by adding new features, or making different combinations, compositions may be produced which have all the charm of a natural scene, yet surpass nature in beauty and interest. Varied emotions are produced by different compositions. Sometimes the mood is gay, as in flower-gardens. Awe, wonder, and admiration are produced by the large natural features—rocks, cliffs, canons, waterfalls, the mountains, and the sea. Mystery and intricacy are conceived by rambles through the dense woods and jungles. Rest, peace, tranquility are suggested by certain woodland scenes, a sheltered lake, or a meandering stream. The sense of deliberation, dignity, and maturity is produced by the stately arched trees of avenue or mall, and by groves of matured trees.

Many laymen and artists think of landscape architecture only as a decorative art; and to their minds planting is of value only in so far as the foliage hides some ugly foundation, softens hard lines or relieves bare spaces, screens some unsightly view or forms a setting for an architectural feature. Sculptors and architects especially are prone to think that the most charming natural parts of our public parks are suitable sites for memorials in stone and statues in marble and bronze. They reason that the spreading branches of the trees and the background of foliage will enhance the beauty of their work of art. Their thought is of their own creation and they fail to realize that by introducing an artificial object, no matter how beautiful it may be in itself, the harmony and beauty of the natural scene may be destroyed.

From the point of view of the landscape architect, planting is not merely a superficial decorative process. He considers the arrangement and disposition of the foliage-masses as well as the modeling of the earth's surface to be fundamental in landscape design. Necessary buildings, roads, paths, and other artificial features must be provided for use and enjoyment; but the best design is the one that succeeds in effectively obscuring or subduing these necessary objects in the landscape and still provides fully the facilities required for use, shelter, and other enjoyments of the people.

While design is the main consideration in creating a landscape, nature, life, and time are necessary for the completion of the design and the full development of its beauty. The beauty of a landscape is dependent largely on the green living things, as trees, shrubs, grass; but the success of the picture is due more to the disposition and arrangement of the material than to the materials themselves. Therefore, it sometimes happens that a thorough knowledge of horticulture, especially when this knowledge is combined with great enthusiasm and, perhaps, with an added interest in botany, is a decided handicap to the success of the amateur designer. The horticultural features are overemphasized at the expense of the composition. Many places and parks that were originally well designed have been robbed of their charm and beauty and landscape effects, because of the interest and enthusiasm on the part of gardeners, owners of estates, and commissioners in horticultural things. In the conviction that they are embellishing the beauty of a glade, valley, lawn, or meadow, they proceed to cover these open spaces with rare specimens of trees and shrubs, thus
Village improvement, in relation to planting.

Village improvement is a branch of civic art. Civic art in turn may be defined as the conservation, improvement, and utilization of public property. Village improvement thus takes its place alongside of town-planning, country-planning, the development of garden cities, and other work of a similar nature.

The public-property test may be rather strictly applied to all branches of civic improvement, including village improvement, for while village improvement does in fact undertake extensive work upon private grounds, this is undertaken solely in the public interest.

In village improvement it is rather important to fix attention upon the village or small town as a permanent unit. For most of the small towns of America have had notable ambitions for growth. Each one has intended to grow up into a state capital or a large manufacturing center. On this account it has been impracticable to make intelligent plans for the actual circumstances, that is from an indefinite period of existence without further expansion. The growth problem, while it is largely a psychological factor, is a very important one in connection with village life and development.

It is a problem which should be seriously faced. Each community should understand its actual circumstances and its ambitions, if it is to make any real improvement in its condition.

Inasmuch as civic improvement is based upon public property, the scope of its work may be outlined rather strictly by the extent and character of property owned in any community.

The more important types of public property, with some discussion of the problems attached to their improvement, are taken up herewith.

The illustrations and plans (Figs. 2991-2996) suggest some of the important phases, particularly as related to planting.

Streets.—Streets and public roads constitute perhaps the most important mass of public property in each community. They are absolutely indispensable and have a very high monetary value judged by any scale whatever.

Road and street improvement is always looked upon as a practical benefit to the community and may, therefore, naturally and properly become the starting-point of general village improvement.

Village improvement should be studied with reference to (a) location, (b) design, (c) construction, (d) furnishings, (e) maintenance. (a) The location of streets and roads is generally looked upon as an invariable accomplishment, yet many roads and streets can, by proper direction and relocation, be made more pleasing.

(b) Some streets ought to be straight, some ought to be curved, some ought to be wide, some should be narrow. Some should be provided with wide grass verges, with rows of trees and with parkings. In other parts of the village, streets should have limited such furnishings. In fact, each street should be made a study by itself, and should be properly designed.
for its special conditions. (c) All streets, of course, should be well constructed. Macadam and tarvia are good materials. However, there are many streets which do not need such expensive improvement. The problems of street construction are generally fairly well studied, but of course, final and perfectly satisfactory results are nowhere achieved. (d) Besides the trees in the street, there are many other things to be considered, such as guide-posts, letter-boxes, and especially telephone, electric-light, and trolley poles. All these furnishings should be made as satisfactory as possible. Especially in the matter of poles the ideal is to reduce their number to the minimum. (e) All streets need to be kept in good repair and to be kept clean. These are always important matters, but they cost considerably more care, labor, and money than most persons imagine. Village improvement can nearly always make considerable progress in this one point of keeping the streets clean and in good condition.

Transportation may be reckoned as the second great problem of village improvement. The development of attractive railroad station-grounds, by proper planting of trees, shrubs, and grass is a matter always to be looked after. In rural communities, at the present time, the large development of trolley service, the design and location of first-class trolley waiting stations becomes a matter of great importance and should receive careful attention.

Schoolhouses and school-grounds constitute a very important type of public property, and every campaign of village improvement should look after them carefully. School-grounds should be kept clean and orderly and should have some tree plantings. Wherever possible there should be grass, but the improvement of school-grounds with flower-beds is almost out of the question. Perhaps the most insistent problem of the improvement of the school-grounds themselves, lies in securing adequate area, which should be from 2 to 5 acres for each school instead of the 1/2 acre commonly allowed.

Playgrounds are very much needed in every village and rural community. The problems connected with them are, (1) to secure the necessary allotment of land; (2) to have this ground properly planned and developed, (3) to have the play properly supervised. The establishment will consist chiefly of large trees for shade and to improve the appearance. Flower-beds and borders are quite out of place on playgrounds.

2995. Plan of country road, showing suggested arrangement of trees, shrubs, and flowers.

Reservations of several sorts are needed in every village. These should be primarily for recreation, but should include also places of historic importance or those of great scenic beauty.

Public buildings, including churches, libraries, grange halls, town halls, and the like, must be of the best character in order to secure proper results in village development. All these public buildings should be studied with reference to adaptation to use, proper location, grouping with other public buildings, good architectural design, and substantial construction. The grounds about these public buildings should be developed to the best possible advantage. As a rule, shady lawns with good substantial trees give the best result.

Home-grounds are of prime significance in every community and every village-improvement society should undertake to secure the best treatment of them possible. Neighborhood competitions are useful to this end but sound horticultural instruction is always necessary.

The more strictly horticultural phases of village improvement, therefore, are the planting and care of trees, the development of grass areas, especially lawns, home-garden improvement with some emphasis upon front yards, and school-garden enterprises of several sorts.

In the care of trees on public streets and grounds, a competent tree-warden is greatly to be desired. When state legislation provides for such an officer he should be chosen with great care and supported with reasonable appropriations of public funds; and in states where tree-wardens are not provided for by law such legislation should be secured as soon as possible. The Massachusetts law is perhaps as good a pattern as any.

Street trees are subject to severe injuries even beyond the liability of other shade trees, such as the damage from leaky electric wires and gas-pipes, gnawing of horses, and sometimes the attacks of ignorant linemen putting up wires. Add to these the usual menace of insect attacks, such as elm leaf-beetle, leopard moth, forest caterpillar, gipsy moth, and the like, and it will be seen that the protection of valuable street trees is a real undertaking. (See Diseases and Insects and Arboriculture.) The improvement of home-grounds and similar areas is treated elsewhere. (See Landscape Gardening.)

The peculiar agent of village improvement is the village-improvement society, but other organizations are equally useful. Woman's clubs and boards of trade are usually effective. Very often smaller groups which undertake to cover only a single street or a single small neighborhood accomplish the most intensive and satisfactory results. As a rule it is undesirable to form a new organization in any community for village improvement. It is better policy to seek the cooperation of the various existing societies. In certain circumstances these can be federated in a way to cover the problem satisfactorily.

Four factors must always cooperate in order to secure satisfactory results in civic improvement of any sort. These factors are (a) local initiative, (b) expert advice, (c) time, and (d) money. (a) It is always necessary to have some energetic local society or group of men and women who will stand behind any improvement proposition and sometimes the local initiative nothing can possibly be done. (b) In addition to this it is usually desirable and sometimes positively necessary to have work undertaken on the basis of practical plans drawn by experts and experts. (d) It is always necessary to have work undertaken on the basis of practical plans drawn by experts and experts. (c) It is always necessary to have work undertaken on the basis of practical plans drawn by experts and experts.
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plans are, however, always indispensable. (c) It then requires a considerable amount of time to carry out important improvement projects. It has been estimated that from six to ten years are always necessary in order to bring a community around to a proper understanding of its problems, and to secure sufficient unity of opinion to accomplish valuable results. (d) Money is

very important, but not one-half so important as persons usually suppose. As a rule the money can be raised whenever the community is convinced, as a whole, that the proposed improvement is worth while. It is best under all circumstances to have public property paid for and improved from public funds. This means that the money should be voted by the people themselves from the public treasury. The ordinary way of raising money for village improvement, by raffles, fairs, and other voluntary means, is wholly unsatisfactory. It can accomplish only trivial results.

FRANK A. WAUG.

Shrubbery in the landscape.

Shrubs and bushes have two values: an intrinsic value as individual or single specimens; a value as part of the structure or design of an ornamented place. As individual specimens, they are grown for the beauty of the species itself; as parts of the landscape, they are usually grown in masses, constituting a shrubbery. It is often advisable to plant shrubs as single specimens, in order to produce the characteristic beauty of the species; but the temptation is to plant exclusively as isolated specimens, and the emphasis needs, therefore, to be placed on mass-planting.

Plants scattered over a lawn destroy all appearance of unity and purpose in the place (Fig. 2997). Every part of the place is equally accented. The area has no meaning or individuality. The plants are in the way. They spoil the lawn. The place is random. If the shrubs are sheared, the spotted and scattered effect is intensified. Rarely does a sheared shrub have any excuse for existence, unless as a part in an artistically designed formal garden.

A mass or group of planting emphasizes particular parts of the place. It allows of bold and broad contrasts. It may give the place a feeling of strength and purposiveness. The shrubbery-mass usually should have an irregular outline and it often contains more than one species. Thereby are variety and interest increased. Fig. 2998 suggests the interest in a good shrubbery-mass. The shrubbery-masses should be placed on the boundaries; for it is a concept of landscape gardening that the center of the place shall be open. (Fig. 2999: also Figs. 2076, 2077, and others in Vol. IV.) The boundaries are the lines between properties, the foundations of buildings, the borders along walls and drives. Judicious planting may relieve the angularity of foundations and round off the corners of the yard. (Fig. 3000.) Individual specimens may be used freely, but only rarely should they be wholly isolated or scattered. They should be planted somewhere near the borders, that they may not interfere with the continuity of the place and that they may have background to set them off. The background may be a building, a bank, or a mass of foliage. In most places, the mass or border-planting should be the rule and the isolated specimen the exception; but, unfortunately, this rule is frequently reversed. It is not to be understood, however, that boundaries are always to be planted or that foundations are always to be covered.

L. H. B.

The chief value of shrubbery comes from its use in an artistic way, although some shrubs have edible fruits. Many shrubs, such as lilacs, some of the spireas, gooseberries, and currants, produce leaves very early in the season and some, like forsythia, daphne, and the juneberry are covered with a profusion of blossoms at this time. From early spring until November in temperate latitudes leaves and flowers are to be found on deciduous shrubs, and from June until the following spring ornamental fruits can be seen on their branches, the red berries of the elder beginning and barberries ending the list. Some of these fruits are so richly colored and so abundant that they can be seen from a long distance. Many shrubs, like some of the viburnums and dogwoods, attain a height of 10 to 15 feet, while others, like bunchberry and Daphne Cneorum, grow to a height of only a few inches. The leaves of some,
so that there is room for about two years' growth before spaded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared like a miniature forest, instead of grass.

Space over a lawn is an important feature of a landscape, to be occupied by such a group should be entirely open space were produced by a broad mass of shrubbery, that covering of low woody plants. Often a broad open face too steep to walk upon with comfort. The foliage of shrubs that are well established remains green when dry weather turns grass brown. The broad mass of shrubbery will take care of itself when the grass needs frequent attention. Even some level surfaces might be improved in places by exchanging a lawn covering for the covering of low woody plants. Often a broad open space over a lawn is an important feature of a landscape, since it allows extended views. Many times a landscape would be more interesting if the green underneath this open space were produced by a broad mass of shrubbery, like a miniature forest, instead of grass.

In planting borders or groups of shrubs, the ground to be occupied by such a group should be entirely graded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should then be planted so that there is room for about two years' growth before their branches intermingle. If placed closer they would have a crowded appearance from the start and would not join their branches as harmoniously as when the new growth is allowed to choose its own position. If placed farther apart the effect is also bad. Occasionally a single shrub at the margin of a belt may stand out almost by itself, but generally the effect of a group should be that of a continuous mass of varying foliage.

In arranging different shrubs, the taller-growing kinds should generally be placed in the center of the group, and the lower species along the border, the space being graded from the highest to the lowest. The reason for this arrangement is that the lower plants would be killed by the shade of the larger ones if placed back of them, and moreover would not be seen; but one should avoid too uniform a slope. For example, in a continuous border there should be places where shrubs of larger size occupy the full width so as to bring growth of considerable height into the lawn. The arrangement should be varied so as to avoid all monotony, but in securing this variation a mixture of miscellaneous shrubs of all kinds does not give so good an effect as broader areas of single species or genera slightly interspersed at the margin with shrubs of another kind. Straight rows should be avoided. A laborer or a novice when told this will arrange the plants in a zigzag manner, thinking that he is placing them irregularly, the result often being almost the same as that of two rows. If the group is being planted along a straight line, as the boundary of a lot, the distances of the successive plants from this line might be somewhat as follows: 2 feet, 4 feet, 5 feet, 3 feet, 1 foot, and the distances apart, measured parallel with a fixed line, should vary also.

The ideal condition of a group of shrubbery is to have all the individual plants healthy, so that the foliage will appear fresh and of good color. This foliage should extend down to the surface of the adjacent lawn or walk, and shade the ground underneath so completely that nothing will grow there. The leaves which fall with the approach of winter should be allowed to remain as a perpetual mulch. The desired result cannot be secured the first year the shrubs are planted unless they are of large size and moved but a short distance.

The aim in caring for a new plantation should be to secure thrifty plants, and this care, like the preparation of the soil, should be such as is given to a field of corn. Very little trimming should be done. If a bush is tall and spindling it may be well to cut it off next to the ground and allow it to sprout again. If there is any dead wood it should, of course, be cut off. But when a shrub is healthy and vigorous, let it grow in its own
The value of shrubbery is not appreciated, either as part in a landscape design or as furnishing for a place. In combination with trees and woods, it ties the planting together, providing easy gradations from greensward up to the tops of trees. Merely to relieve bareness, shrubs are of singular value, as in the suggestion in Fig. 3000, and again, even when slight in quantity, in Fig. 3001. The background in Fig. 3002 is brought down to the ground-line by greenery, mostly of shrub growth. The beauties of Fig. 3005 are in large part the shrub forms and colors, and the arrangement insures much of the general effect. The reader will find that most verdurous landscapes that please him will have their furniture of shrub and bush.

O. C. Simmons.

Woods in the landscape.

The principal elements of landscape are atmospheric conditions, irregularities of the earth’s surface, water, artificial constructions, herb and shrub ground-cover, and the woods. In the United States the great areas east, west, north, and south of the treeless prairie regions were mostly in evergreen or deciduous woods. Industries, habitation, and cultivation have divided the great wooded areas into small wood-lots and into forests that are for the most part broken into sprout- and tree-growth areas as the cordwood or timber is harvested in thirty- to sixty-year periods. The corresponding landscape modifications to that offered by this cutting of thirty- to sixty-year periods. The corresponding land­growth areas as the cordwood or timber is harvested in such surveys land that is ill fitted for cultivation should be outlined and set aside in public reservation, with a view to maintaining it largely in forests. Land that is suitable for cultivation, habitation, and industries should be set aside for these purposes, and the forests stripped therefrom as the land is needed. This country-side planning is already being worked out in the study of city and county. The plans of the regions about Boston, Massachusetts, in Essex County, New Jersey, and Cook County, Illinois, and of such towns as Hope­dale, Massachusetts, represent studies in which forest areas are set aside, in public reservations, and the forest growth encouraged there.

It is not to be assumed that such forests are without other economic values than the recreation they offer to many persons. It has been found possible in the development of such areas to increase the beauty of the forests and to secure a money-return that will nearly, if not quite, cover the cost of the cutting from the sale of forest-thinning products. It is likely that under wise management such forests can be constantly increased in beauty with little or no burden of cost.

In the arid regions of the West, the woods are con­ fined to a meager growth in places made moist by springs, streams, or by irrigation, to mountain slopes and valleys, and to the humid regions and mountain valleys of the Northwest. In this last section, the region of sequoias, pines, spruces, and firs, are the state­liest cone-bearing forests of the continent. The white and Norway pines of the Northeast and the long-leaf ‘pine of the Southeast, only approach the Pacific Coast Range trees in grandeur.

In the development of woods in landscape, the work can be performed in such a way as greatly to increase the beauty of the existing growth, which now is seldom the primeval growth, by thinning to develop the finest specimens and the finest groups of trees. A selection can also be made in the cutting to increase the domi­nance of different species in different localities. Cut­ting may often be made to open vistas and wide views from particularly attractive viewpoints. It can also be made to develop more attractive sky-lines and foliage­masses as seen from valley viewpoints or from hilltop and ridges to distant hills and ridges.

The larger factors of beauty in land­scape and the economic values of woods are of interest to the general public. To the individual owner of estates and home­grounds the woods have a more intimate and personal interest. Such owners are concerned about the protection against drifting snow, bleak wind, and hot sun, a shelter for the bird-life that protects the crops, a setting and a background for their home buildings to merge them into an agreeable landscape picture, a ramble and picnic place where the wild flowers, the fruits, and the autumn leaves can be found by the children who love the woods. The wood-lot is also a place where many sticks of timber for special purposes and some
cordwood will be secured in the cutting from year to year of the weaker trees that are overtopped by their neighbors, and from thinning that must be made if the highest types of woodland beauty are to be developed. Bear in mind that the wood-lot in good soil may produce a cord of wood to the acre each year.

As woods would be included the thicket of few trees in the little town lot as well as the acres of trees on the large estates, because in the cool shade and leaf-mold soil of each the same plants and bird-shelters may be established. When there is no wood-lot one must plant either evergreen or deciduous trees to make one. If the home lot is a small one and it is desired to have a little wood-lot high enough to walk under at once, at reasonable cost, tall slender collected or nursery-grown trees may be planted close together and then thinned as they grow.

If a shelter-belt for winter is the most important consideration, use such cone-bearing evergreens as the pines, spruces, hemlocks, junipers, arbor-vitae, cypress, the last three for a narrow belt, or in the South and on the Pacific coast, such broad-leaved evergreens as the magnolia, eucalyptus, camphor tree.

It should be known that undergrowth and ground-cover plants with attractive flowers cannot be so easily established under evergreens as under deciduous trees; also that among the deciduous trees are more rapid-growing species with attractive flowers and fruit.

To grow a very interesting wood-lot in a few years from the small seedling plants that can be secured in large quantities at low cost, such plants would be set from 5 to 6 feet apart. At this distance they soon shade the ground so much with foliage as to kill out ordinary weeds and give encouragement to the more attractive woodland plants. Furthermore, close planting will force a rapid growth in height. In the selection of plants, about a third would be made up of the quick-growing low-cost species such as poplar, soft maple, angusdo, catalpa, locust, and in warm sections the eucalyptus, pepper tree, grevillea. Another third would be made up of the slower-growing more permanent trees, such as oak, maple, and magnolia. The last third would be of such undergrowth, shrubs, and small trees as the flowering dogwoods, red-bud, benzoin, viburnums, white fringe, rhododendrons, azaleas, callicarpa, manzanita, and madrona. Woodland ground-cover plants may be established by bringing them in from the woods with an abundance of the natural leaf-mold soil retained about their roots.

The location for the wood-lot is at the point near the home buildings where it will best serve such purposes as are referred to early in this article, but as open land in this position is very valuable for farm uses the lot should not be large; elsewhere on the farm the wood-lot should occupy land least suited for annual crops, such as the very steep slopes and the rocky or barren areas.

Aside from woods themselves, tree forms have their special values in providing structural features in a landscape, combining well with architectural forms and affording good backgrounds and boundaries. Strip the trees from such constructions as shown in Figs. 3004 and 3005 and note the effect.

WARREN H. MANNING.

Wild-gardening.

Wild-gardening is the art of arranging and growing colonies of hardy plants, native or foreign, so that they will look like wild flowers, multiplying with little or no care after planting. A wild-garden is not a garden that has run wild, reminding us of man's neglect; it is a poetic suggestion of the beauty of nature untouched by man. Beginners commonly suppose that wild-gardening is merely the cultivation of native flowers, as in a small border. Such an effort is worth while, but it is rarely artistic and can hardly be called wild-gardening. The main idea of the latter, originally, was to naturalize foreign flowers in larger masses than those of the garden. Wild-gardening is, therefore, a branch of landscape gardening which aims to reproduce the largest floral effects of nature with the least suggestion of man's interference.

The large facts in wild-gardening are: (1) the place or location for it; (2) the composition, as part of the landscape; (3) the kinds of plants; and (4) the small
or incidental effects of clumps and nooks here and there. Fig. 3006 shows a wild-garden composition; ordinarily, a wild-garden is supposed to be merely "wild" or growing at random, as in Fig. 3007, and this effect is sometimes much to be desired. The nook or corner effect of planting (4) is shown in Fig. 3008, representing a rear screen.

Wild-gardening as a distinct department of floriculture first came into popularity about 1870, when "The Wild Garden" was written by William Robinson. Robinson's first aim was to introduce more variety into English gardens, which were monotonously gaudy in the Victorian era. Because of their greater showiness, tropical bedding-plants had driven hardy perennial flowers out of fashion. Robinson put the border on an artistic plane by paying more attention to grouping, color schemes, and new varieties; he popularized the rock- and water-garden; and he created the wild-garden. His second aim in wild-gardening was to reproduce some of the loveliest floral pictures of the North Temperate zone which demand freedom from the garden inclosure. A third aim was to make a place for thousands of plants worth growing that are banished from conventional gardens because they have small flowers, a short season, or are unsightly when out of bloom. A fourth aim was to satisfy the universal craving for wildness.

The areas most commonly used for wild-gardening are woods, meadows, and orchards. Unfortunately, orchards cannot usually be kept in grass for many years, as in Europe. Those who are the fortunate possessors of waterside, bluffs, rocks, or sandy wastes have special opportunities for wild-gardening. Those who are confined to city lots can merely suggest the spirit of wild-gardening in lawns and borders.

The finest effects in wild-gardening are suggested not by book-study but by nature-study, paying special attention to grouping and massing. For example, if the planting is usually made near the trails, from which the colonies are generally expected to spread gradually into the remotest parts of the wood. The finest effects, however, it is necessary to plant the outlying masses, therefore, follow one general direction (without being in straight lines), and they decrease in number, size, and density as they recede from the largest mass.

Design in wild-gardening.

In the woods one generally has the greatest opportunity for intensifying the feeling of wildness, because it is often possible to shut out all suggestion of the outside world—including even the sounds of civilization. Therefore, woods into garden-surrounded by an irregular belt of native shrubs dense enough to hide artificial objects from the interior of the wood, leaving openings only for the main trails. The entrances can be marked without making them too gardenesque by saving or planting any trees that naturally form a good arch or frame, as white pine often does, by planting some accent marks, such as red cedar, arbor-vite, canoe birch, and mountain-ash, or by training into abower vines such as wild grape, Clematis, Bittersweet, or Virginia creeper. A system of trails is next established and the planting is usually made near the trails, from which the colonies are generally expected to spread gradually into the remotest parts of the wood. The finest effects, however, it is necessary to plant the dramatic, or picturesque places, such as spring, brook, rocks, glades, hilltop, or outlook with the wild flowers appropriate to each situation. Wild-gardening in the woods is also known as landscape forestry.

In meadows it is possible to allow daffodil bulbs to multiply for many years, since they may not interfere with the hay crop. The foliage ripens and falls to the ground before harvest. Bulbs that bloom after harvest-time, like Lilium superbum, are best restricted to the edges of the meadow. But the sunny meadow generally offers the greatest canvas for painting floral pictures—daffodils by the 10,000 and narcissi either in sheets or colonies.

In fields, however, wild-gardening involves serious economic loss. Despite this fact, many efforts have been made to imitate the European grain-fields made glorious by Papaver Rhoas, the scarlet annual weed which is the parent of the Shirley poppies. The seed is cheap but the poppies bloom in a half-hearted fashion and vanish after a year or two.

In permanent pastures wild-gardening is limited to species that are not eaten by cattle, and the effects are necessarily scraggly or spotty. On a hillside at Graveley, Robinson has naturalized the oriental poppy in isolated clumps of about a dozen plants. This is perhaps the most pleasing feat with which a wild-gardener may hope to succeed, for foreign flowers as good as this cannot pass themselves off as wild flowers. The
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distant effect, however, is very spirited, and the green background saves the effort from vulgarity.

On rocks the arrangement is largely determined by the position of soil-pockets large enough to grow plants. Soil can be added, but at great expense.

The waterside offers chances for unique effects, because the boldest tree-forms and colors have a mirror,

There are three principles that grow out of the aim of wild-gardening, which is to grow self-supporting colonies that will look and act like wild flowers. (1) The esthetic principle is that all materials in landscape wild-gardening shall be primitive species or slightly improved varieties. This rules out all flowers that have been profoundly modified by man, such as double and round-petaled flowers of all kinds. Double daffodils thrive permanently in some meadows, but they do not look like wild flowers, as single daffodils do. May tulips and Darwins are permanent, but these also do not look like wild flowers, as do tulips with pointed petals. Cottage tulips look wilder than other late tulips, and the wildest of all is Tulipa sylvestris. The magnificent red flower, Tulipa Gesneriana, which somewhat resembles the prototype of garden tulips, is too gorgeous to look like a wild flower in the woods, but it might be used for distant effects in the meadow, if oriental poppy is considered permissible. (2) The cultural principle demands permanence in wild-gardening. Shrubs may obscure the line where land and water meet, and amphibious plants, like the aquatic buttercup, may swim out a few feet. Also the grace of falling water can be suggested by shrubs with arching branches, or vines planted at the top of the bank. Some of the best colonies of wild flowers are those formed by seeds falling from the top of a bank.

In roadside planting, ideals have changed greatly since 1900. Then the standard of beauty was the shrub-lined roadsides of New England. That type is rapidly vanishing from the main roads, owing to the laws against the gipsy moth and the use of the stone walls for road-making. No two miles of roadside planting should be alike. There should be shrubs enough to bring back the birds; and wild flowers arranged and maintained according to the principles of wild-gardening.

On city lots, the wild-garden shrinks merely to a border of wild flowers but differs from the hardy border of mixed perennials. The latter is a conventional arrangement of flowers, mostly of foreign origin, selected for their showy forms, colors, and succession of bloom. The border of wild flowers may become an artistic wild-garden by directly imitating some natural effect, especially a local combination or plant association. For example, in the shady border the flood-plain may be recalled by hepatica, bloodroot, meadow rue, and trillium; the swamp by cinnamon and royal fern and marsh marigold; the swamp by boneset, joe-pye, and blue lobelia; the riverside by mist-flower (Eupatorium clevelandii) and sneezeweed; the dry roadside by butterfly weed and wild bergamot.

On city lots, also, the free meadow contracts into a close-cropped lawn, but the wild-gardening spirit is expressed in numberless attempts to naturalize crocuses and the March-blooming bulbs—snowdrop, Siberian

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3006. A wild-garden composition, showing the landscape effect.

3007. A wild-garden.
ites for wild-gardening. Dutch hyacinths are inappropriate in long grass, and they soon perish. The Roman hyacinth looks more like a wild flower, but it is better to plant English bluebells or wood-hyacinths, known to the trade as Scilla caerulea and S. hispanica, and the prairie hyacinth, Campanula esculenta. In addition to the foreign species commended, the lemnis lily (Hemerocallis) is also adaptable, as its foliage harmonizes with long grass. This species looks much better beside the water than the long day lily, which is better suited to the roadside. The most beautiful group for the water-side, probably, is the genus Iris. The famous iris meadow of the Royal Horticultural Society at Wisley, which has inspired much American wild-gardening since 1908, is a standard for combining the maximum of splendor with good taste. There is no difficulty in making the Siberian iris look wild, or the tall yellow iris of Europe, but the German and Japanese must be used with restraint, if at all.

It is safer to use large masses of native varieties than of foreign ones, but it is easy to overdo bee-balm, New England aster, butterfly weed, blue flag, and purple coneflower, unless they are softened by shade, mellowed by distance, or veiled by long grass. Other American plants that are generally easy to manage on a large scale are marsh marigold, large-flowered trillium, wild buckwheat, spiderwort, Lilium superbum, boltonia, sneezeweed, sunflower, swamp rose mallow, and cardinal flower.

The ideal in the planting and after-care of a wild-garden is to betray no evidence of man's work. In planting bulbs, a good way is to scatter them on the ground, arranging them with the feet in cloud-like outlines containing about fifty bulbs, and then plant them where they lie, using a dibber or bulb-planter when the ground has been softened by the rains. Another method is to cut three sides of a sod with a spade, raise the grass, and insert five to seven bulbs at irregular distances. In the border the common unit of planting is a dozen plants; in the wild-garden fifty is a good unit. This is about the minimum that can be called a colony.

Wild-gardening was formerly considered essentially cosmopolitan in its spirit, as it still is in England. In America, however, wild-gardening commonly means the cultivation of American wild flowers, and the number of pure American compositions has greatly increased. Over $6,000,000 worth of work done in the Middle West since 1901 has been inspired by the idea of restoration.

Gardening within an inclosure is a matter of personal privilege, but wild-gardening has developed a distinct code of ethics, due largely to the Wild Flower Preservation Society of America and walking clubs, like the Appalachian and Prairie, that do not permit their members to pick flowers, and a growing appreciation of wild life.

Wilhelm Miller.

Bog-gardening.

Bog-gardening depends for success on the distinction between bogs and other wet or swampy places (Vol. V, p. 519). In the marsh or swamp, drainage is usually fairly regular and free; in the true bog, drainage is practically lacking or free only during the spring thaw. Because of this lack of drainage there is in all bogs an accumulation of souredness in the bog-water, which is strongly acid and dwellings are not, it will form peat-holes, more moderately so in some of the partly drained bogs of the coastal plain regions of the country. There is usually, but not always, a deficiency of lime in bogs, and in nature there is a very large percentage of mycorrhizal plants in them. The mycorrhizal habit of obtaining food and the acidity of the bog is a very delicate and complex one and little is actually known of it; but experience has shown such a relation to exist.

Bog-gardening is to make the bog-gardener in possession of all the suggestions needed. Bog-gardening depends for success on the distinction between bogs and other wet or swampy places (Vol. V, p. 519). In the marsh or swamp, drainage is usually fairly regular and free; in the true bog, drainage is practically lacking or free only during the spring thaw. Because of this lack of drainage there is in all bogs an accumulation of souredness in the bog-water, which is strongly acid and dwellings are not, it will form peat-holes, more moderately so in some of the partly drained bogs of the coastal plain regions of the country. There is usually, but not always, a deficiency of lime in bogs, and in nature there is a very large percentage of mycorrhizal plants in them. The mycorrhizal habit of obtaining food and the acidity of the bog is a very delicate and complex one and little is actually known of it; but experience has shown such a relation to exist.

The reason for having a bog-garden is that in it many very interesting plants may be grown that could not thrive in any other situation, and many ordinary swamp plants can also be grown along its edges. For those who have an undrained area or one poorly drained, the problem of having a bog-garden almost solves itself. But the demands of others who wish to grow the many beautiful species that will become naturalized only in such places, has led to the construction of artificial bogs. These may be of any size from a few square feet to comparatively large areas, and methods of construction must vary according to the nature of the subsoil. In places where there is a layer of hard-pan and the downward drainage is poor, it will be necessary only to dig out the desired amount, fill in enough blue clay to make the basin water-tight and then put in the mixture described below.

A more permanent and satisfactory type of construction is to make the basin first and then put in the mixture described below. One should be sure, before filling with the mixture, that the tank is water-tight, as though it were for a lily-pond. The shape of the structure, whichever type of construction is used, must be a matter of individual taste. While informality is the essence of bog-gardening, a "regular irregularity" is most to be fought against. Observation of natural bogs, their shapes and shorelines, will put the imaginative bog-gardener in possession of all the suggestions needed. As an important feature, it should be remembered that the drainage from the surrounding region should be all in, not out. The mixture to go in the bog-garden is preferably one that has come out of a cranberry or natural bog—muck, twigs, water, slime and all. From such a mixture, a host of very interesting bog-plants will spring up the first year and these may be isolated in clumps after the first season. A good plan when following this procedure is to let the inner part of the bog run wild, clearing a strip of a foot or two all around the edges for the cultivation of species needing, for exhibition purposes, more open spaces. Provision should be made, either in this strip or in any other open place in the bog for: (1) a place where only sand and peat soil, mixed about half and half, is found, to be used for certain plants that are described in the lists following; and (2) some small space of practically open water where the very interesting bladder-worts may be grown. The latter situa-
Many conspicuous white flowers; the black-bean is a valuable addition. Potentilla palustris, like flower-cluster; the root is the medicinal calamus. In any open part of the bog, there are many others to be found.

Plants for the bog-garden.

Many bog-plants are very showy and worthy of cultivation. Others, such as the insectivorous kinds, are among the most wonderful plants in nature, for they have the unique distinction of being able to digest animal matter directly, a habit otherwise unknown in the realm of vegetable life. In the following account of bog-plants many are necessarily omitted, and it should be remembered that a number of purely swamp species, not mentioned here, can also be grown in bogs.

I. SHRUBS.

Rhodora (Rhododendron canadense), purple flowers before the leaves in April and May; 3 to 5 feet.

Swamp azalea (Rhododendron viscosum), white or pink flowers, the leaves in May or June; 5 to 8 feet.

Sheep-laurel (Kalmia angustifolia), purplish p bog flowers, summer; 1 to 2 feet; also Kalmia polifolia in northern regions.

Leather-leaf (Chamaedaphne calyculata), small white flowers along one side of the branches, May; 1 to 2 feet.

Labrador tea (Ledum groenlandicum), white flowers in terminal clusters; leaves russet-brown below; 2 to 5 feet.

Wild rosemary (Andromeda polifolia), drooping white flowers, early spring; leaves silvery below; under 2½ feet.

Creeping snowberry (Chionoecetes hispidula), prostrate, with tiny white flowers and snow berries; leaves dark, evergreen.

There are many others, but these are the best for the temperate regions of the United States. In the South many others are to be found.

II. PERENNIALS, grown chiefly for their flowers.

In any open part of the bog.

Calopogon pulchellus, pink-purple flowers about an inch in diameter, June and July; leaves grass-like.

Cypripedium parviflorum, a small-flowered yellow lady's slipper; raise up so that the roots will not be too wet.

Cypripedium spectabile (C. reginae or C. hirsutum), showy lady's slipper; beautiful rose-purple or nearly white flowers; better for a little shade.

Habenaria biflora, a showy orchid with a showy spike; 1 to 2 feet; does splendidly in the open sun.

Habenaria labiata, yellow fringed orchid; very showy spike; 1 to 1½ feet.

Arctopus bulbosa, beautiful purplish pink flowers, about the last of May; 3 to 6 inches.

Spiranthes cernua, white, slender spikes; the ladies'-tresses; several others, even more slender species are known.

Besides these there are over forty other species which may be collected by the enthusiast. Nearly all of our most beautiful native orchids are bog-flowers. Most of them can be grown in pure sphagnum moss.

III. BOG ORCHIDS.

Many native orchids can be grown only in bogs, and from them the following have been selected, as the most noteworthy. All are perennials and may be secured from the dealers.

Cypripedium arietinum, pink-purple flowers about an inch in diameter, June and July; leaves grass-like.

Cypripedium parviflorum, a small-flowered yellow lady's slipper; raise up so that the roots will not be too wet.

Cypripedium spectabile (C. reginae or C. hirsutum), showy lady's slipper; beautiful rose-purple or nearly white flowers; better for a little shade.

Habenaria biflora, a showy orchid with a showy spike; 1 to 2 feet; does splendidly in the open sun.

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IV. INSECTIVOROUS PLANTS.

Grown more for their peculiar habits of getting food and for their odd form than for beauty. They are of several types; some catch insects in a tube-shaped leaf, drowning them at the bottom of the cup, others have sticky hair to which the insect becomes fastened, and the most wonderful of all, the diornes, actually traps its food by a contraction of its jaw-like, prickly leaves. The best insectivorous bog-plants are as follows:

With pitchers.

Sarracenia purpurea, having short purplish red pitchers, quite hardy northward, but not easy to maintain in an artificial bog.

Sarracenia rubra, the red trumpet-leaf, with tall pitchers; does very well in artificial bog.

Sarracenia flava, also with tall pitchers but yellow.

Sarracenia Drummondii, with variegated pitchers, the largest and most showy of all.
The last three must be taken during the winter, north of Washington, D. C.; all of them grow rapidly and, if the season is favorable, will color up beautifully. With sticky hairs.

All the species of Drosera have the curious habit of catching and digesting insects. They are all small plants which should be planted in masses on sphagnum moss. All native species are quite hardy and many can be secured from dealers in bog-plants. D. rotundifolia is the best; and D. capensis is a good species, but hardy only South. With contracting leaves.

The Venus fly-trap, a low perennial with two valve-like leaves that contract whenever an insect or other irritation comes between them. Closing up rather rapidly these leaves are among the most interesting objects to see in the bog-garden. Not hardy north of Washington, D. C.

The darlingtonia, a Californian insectivorous plant allied to the eastern sarracenia, can be grown along the Atlantic coast only with protection, but south of Washington it should be hardy. One of the most striking allied to the eastern sarracenia, can be grown along the Atlantic coast only with protection, but south of Washington it should be hardy. One of the most striking bog-plants. See Vol. II, page 964. N. TAYLOR.

Water-gardening.

Water-gardening is the cultivation of water-lilies and the other aquatic plants, those that grow in water rather than in bogs or wet soil, particularly those that have floating parts. Water-gardening is such a special form of plant-growing that it should be attempted only in the personal parts of the grounds, and where all the conditions of control can be secured. The species formerly known were mostly collected from tropical climates and were adapted almost exclusively for warm greenhouse culture and were to be found solely in botanic gardens and homes of the wealthy. However, the idea that our central Atlantic states were sufficiently warm to grow some of the tropical varieties out-of-doors in summer was tested in the early eighties of last century by the successful flowering out-of-doors without artificial heat of a plant of Victoria regia.

For many years the aquatic gardens in Lincoln Park, Chicago, the Shaw Botanic Garden in St. Louis, Missouri, the New York Botanical Garden at the Bronx, and Prospect Park, Brooklyn, as well as in other cities, have paved the way for the advancement of this popular and most interesting phase of gardening.

But it was not until Latour-Marliac, of France, conceived the idea of crossing species of the hardy nymphae of the United States, notably the southern species N. mexicana (N. flava) and N. tuberosa (Fig. 3009, from G. F.), that a great impetus was aroused in the cultivation of water-lilies. The cost of maintaining a high temperature for the cultivation of the tropical lilies, besides the necessity of having a glass structure and water-tight tanks, cisterns, and so on, seemed still to impress the public generally that it was too costly to construct artificial pools and fountain basins. The products of Latour-Marliac found a ready market in England and as rapidly as he introduced a new hardy water-lily the more enthusiasm was aroused and the more the demand increased; and their popularity naturally spread to the United States. See also the discussion under Nymphaea.

It has been demonstrated that water-lilies can be grown successfully in the United States; not only the hardy varieties and the hybrids but the tender tropical nymphae, the victorias, the Egyptian and Japanese lotus are to be seen, during our summer parts.

Many gardens and plantings of water-lilies and aquatic and subaquatic plants are too stiff and formal. Nothing is so inartistic as regular lines on the margins of some ponds and again of crowding too many varieties in one small pond. Natural planting is in masses and groups, and single plants are admissible only in small ponds or artificial basins in small and limited gardens.

Since it is found that reinforced concrete is the simplest means of construction and that water-tight and frost-proof receptacles can be secured at moderate expense, water-gardening is rapidly developing. Also the number of species has so rapidly increased that it is no longer difficult to select water-lilies for a miniature garden, tubs, small pools, fountain basins, ponds, and lakes; also for all seasons of the year, as it has been demonstrated that these charming flowers can be had in the depth of winter.

For the small garden where there is but a limited space, a miniature artificial stream terminating in a small pool could be constructed; on either side of this streamlet may be planted moisture-loving plants such as calamus, calthas, Calla palustris, rushes of various kinds, menyanthes, sagittarias, lobelias (cardinal flower), Myosota scorpioides, and iris in variety; and in the pool the miniature water-lily, Nymphaea tetragona (N. pygmaea) (white) and Nymphaea tetragona helvola (yellow). This style of water-garden can be carried out on a much larger scale where space will permit and a much larger collection of subaquatic and moisture-loving plants can be used as well as more nymphaeas and of larger dimensions.

Water-gardening on a small scale can be most successfully carried out with the use of tubs, half-barrels sunk in the ground, two, three or more placed as thought best! In the rear of the tubs plant Japanese iris, flags, and moisture-loving plants, making a pleasing background, and between the tubs if ground can be kept moist, parrot's feather (Mertensia ciliata prostrata), or Myosotis scorpioides (M. palustris), or Lythrum salicaria, or dwarf trailing plants. For tub culture nymphaeas of moderate growth are preferable. N. Laydekeri var. rosea and N. Laydekeri var. lutea are both charming varieties of pink rose lilac, changing to rose and carmine, very free flowering. There

3009. Nymphaea tuberosa, a native water-lily readily grown in ponds. The rootstock is shown in Fig. 2535 in Vol. IV. (X 14)
are several other nympheas of moderate growth and pleasing shades of color suitable for tub culture. Many persons make serious mistakes by selecting strong and vigorous plants suited only for large ponds or even lakes. The plants may live and be very thrifty but will not flower.

A better and very satisfactory water-garden for a small place can be had by constructing a concrete pool 4 to 5 feet, or any size desired, bearing in mind that a large pool in a small garden is inconsistent. A pool or basin 4 to 5 feet in diameter and 2 feet deep will accommodate three nympheas. The surroundings may be similar as recommended for tubs, but no two gardens are alike.

Other aquatics may be found under the genera Alisma, Aponogeton (Ouviranda), Azolla, Brasenia, Butomus, Cabomba (Fig. 3010), Ceratopteris, Eichhornia, Elisma, Elodea, Euryale, Hottonia, Hydrilla, Hydrocharis, Hydrocleys, Lemna, Limnobium, Limnocharis, Ludwigia, Myriophyllum, Nymphaea, Nuphar, Nymphoides (Limnanthemum), Pistia, Potamogeton, Riccia, Ricciocarpus, Sagittaria, Salvinia, Utricularia, Valleria. See also the articles, Aquarium, Aquatics, Nympha, Victoria; also Bog-gardening, page 2666.

WILLIAM THICKER.

Subtropical-gardening.

Under this denomination are included all those gardening efforts that aim to introduce into cool or cold climates the forms and the foliar luxuriance of tropical and semi-tropical regions. The subtropical garden may be permanent if it is under glass; but the term is usually employed to denote the summer effects secured by transferring glasshouse plants to the open and combining them in such a way as to produce a harmonious composition. It is not often that an approach to real tropical effects can be made in a northern garden, and yet it is well to have these effects in mind; Figs. 3011, 3012, reduced from Garden and Forest, show real tropical vegetation.

Subtropical plants are represented by the luscious leaved caladiums and cannas, the brilliant-colored foliage of crotons and dracenas, the towering plumes of palms, the succulent leaf or stem of century plant or cactus, and the dense rank ground-cover of selaginellas and todeas. The interest in such plants is chiefly in the foliage, rather than in the flowers. In the plant groups they stand at the opposite extreme from the rock-garden plants with tufts, cushions, and mats of miniature foliage that in the blossoming season are nearly covered with flowers, and thin films of mosses, lichens, and algae on the rock and earth surface.

The subtropical plants of each of the climatic regions of the United States are usually from a warmer region, although natives having a like character may well be represented by one or a few plants, all grouped together in a crowded mass. Such a collection is not a subtropical garden and does not represent the most effective use of the material.

The potted plants that have foliage tough enough to withstand summer winds and sun, such as palms, cyans, ficus, and crotons, are often used in the garden in summer, or under the protection of trees, as subtropical beds or garden compartments. Each plant is valued for itself, just as it is in the greenhouse in winter, size and perfection of form being its chief attractions. Each has no relation to the foliage about it, except that its unusual character of leaf and growth makes a striking contrast to the normal native vegetation. For this kind of planting a few well-grown specimens give the desired summer appearance to the garden.

One of the very best of indoor subtropical gardens in America is the tropical house at Garfield Park, Chicago, where a comparatively few species, such as the treefern overhead and selaginellas as a ground-cover, are used in large numbers to make bands of foliage to arch paths and hide the glass roof, and to frame in glimpses of water, with carpets of green below. Here is a consistent and exquisite example of subtropical-gardening, the dominant note is light with the artificial construction that supports and protects it all, so cleverly disguised as to make it appear like a real glade in the

3010. The native fish-grass, Cabomba caroliniana; sometimes confused with Myriophyllum. (X 1/2)

3011. A tropical planting.—Entrance to the botanic garden, Peradenia, Ceylon.
tropics. There is an effect of airy lightness to it all that is a thrilling surprise as one passes in from the snows of winter out-of-doors. Equally as distinctive and effective results would be secured by the use of such greenhouse vines as tasmania, allamanda and bouganvillea, or by the use of the smaller plants.

In the open air, the use of palms, tree ferns, dracenas, crotots, caladiums, and fucis for summer decoration is not widespread. On large estates and in parks that can boast of greenhouses, a group planting of these subjects in the summer in the open is often to be found. In this case the outdoor use of the plants is more or less for the good of the plants and therefore little care or study is given to the grouping. The plants are "turned out to pasture" to rest up from the strenuous winter and stiffen their stems and roots for another year. Their winter appearance is their main purpose. Sometimes, especially in parks and botanic gardens, the plants are grouped by family or ecology, as a succulent group, desert group, or palm group, keeping closely to their winter arrangement under glass. More to put them under somewhat natural conditions for their best growth that they may require less personal attention from the gardener, than from a desire for any definite landscape effect.

The nearest approach in the United States (outside the very southernmost parts) to the true palm vegetation of the tropics and subtropics is in the palmetto (Fig. 3013; also Fig. 3516, Vol. VI), which is native as far north as North Carolina, and is very useful as a decorative plant.

The smaller-growing subtropical plants are much used in the production of the most studied designs in planting, namely in the construction of floral patterns, the very precise designs of city seals and the emblems of the many secret orders, "floral signs," and rarely, as in Regent Park, London, in the making of floral clocks. In these plantings, use is made of colseias, alternarias, roes, and echiverias and other tender succulents. This use of plants is decidedly on the wane now that the pots plunged or planted directly in the soil. For this purpose the plants must be given conditions under glass to keep them alive all winter, but not necessarily in active growth, or kept in a dormant condition in pits or stored as tubers. Plants for this purpose may be in the ground—some of the evergreen fucis to give height of green foliage to the group, low tender flowering herbs to give color from leaf or flower, and bulbous plants for bold foliage or bright flowes as fillers among the foliage plants.

Plants of this kind involve considerable yearly cost for storage of potted plants or tubers, and great expense of annual planting and digging. Then there is a comparatively short season of foliage and flowers, from the time that the semi-dormant vegetation gets under way in July until cut down by early frosts. Yet effects not otherwise to be secured by plant materials can be given gardens and parks in this way. This is a use of tender plants that will be greatly developed in the future, by park superintendents and owners of large estates who have the courage to break away from the usual bed or jumbled planting, and make real garden pictures. There is very little of this kind of gardening as yet. The temporary tropical foliage of our summer gardens is much more effectively used today than it was a few years ago, but the problem must be studied more carefully before the best possible use is made of this material.

The ideal subtropical garden gives in a small compass the feeling of the wonder and luxuriance of the vegetation of the tropics, and suggests some of its pictures, whether under great glass roofs or in the open ground in the summer.

WARREN H. MANNING.

Plants for the seaside.

Very distinctive types of American scenery are to be found along our seashores. The very dark green mangrove thickets come to the salt-water's edge on the Florida and the Gulf coasts with a backing of ravennas of tall grasses, fringes, and islands of palms, and gloomy thickets of cypress trees draped heavily with the hanging gray moss-like tillandsias. Further north on the Atlantic coast are great hills and sweeps of sand-dunes, constantly shifting, overgrown with the stunted growth of pine, oak, and maple. Here the sand-reeds push out their long fingers of undergrowth and roots to hold the sand in place, and they establish conditions for shrubs of huckleberry, rose, deciduous holly, 3012. A tropical growth—Giant bamboo in the Botanic Garden of Ceylon, Gigantochloa atter.
baccarhis, and iva, and give protection to the young forest trees. Along the rock-bound New England coast are wind-swept compact masses and distorted-individ-
uals of cedar, pitch and Norway pine, corresponding in a way to the similar Monterey pine and cypress of the Lower California shore. With the pines and oaks of New England are maple and shad-bush with ground-cover thickets of bayberry, rose, beach plum, huckle-
berry, and bearberry, and hanging curtains of the pro-
strate juniper over faces of ledges. In the salt-marshes are great patches of the rich green sedges, and in the
flats the brilliantly colored samphires.

The main thing to be considered in the development of this native growth is to let it alone when it is well established. On the drifting sands of the dunes and plains of the seashore, plantations of the beach-grasses are made and protected as well as plantations of
pines and shrubs. In California certain lupines and acacias have been successful, together with the reed, in holding the drifting sand.

There are two kinds of seaside planting: the adapta-
tion of the usual species used in the lawn and garden to
seashore conditions for effects like the usual refined
planting; the other the planting for definite seaside
effects by the almost exclusive use of typical maritime flora. This second kind of seaside planting is rarely attempted, as natural seaside picture are hard to
imitate. The problem as usually conceived is one of
finding plants that will endure seaside conditions.

The tidal marshes are always fully planted by nature,
and man can add little to good purpose. In sheltered
bays, especially where the soil is good, the existing flora usually differs little from that common to the
region inland, and it is no great problem to add to it.
Even on the most exposed sites there is a low herbage
and stunted undergrowth while a few picturesque
wind-twisted trees give special distinction to the land-
scape. Even evergreen trees are often found near the
shoreline, and the black spruce on the Maine coast,
pitch pine and red cedar in southern New England,
Jersey pines on the sandbarren coast of the middle
states, and farther south bald cypress, until this gives
way to the tropical palmetto and mangrove.

Given partial shelter near the taller woody plants,
many low shrubs and herbs may be grown near the
seacoast. There are many showy natives in the marit-
time flora and many more may be brought from Europe,
though few have been tried as yet. The salt in the soil
or water is rather a minor factor to many plants. More
important than this is the lack of good roots, and
the clay soil on the seashore above the tide-line. For
the woody plants, the great factor is the high wind
which stunts the branches and foliage. Though the winds are high, yet the temperature is more even and usually higher than at the same latitude inland. This is a
favorable factor.

Since the sheltered nooks are not at all difficult to
plant, it is on the exposed sites where the soil is poor
that the problem is usually specially considered. If
the soil is wet just above the tide-line, the beaches need
no planting to hold the soil in place. When the soil is
light and dry and shifts with the wind; not only is root-
hold for the plants difficult, but the wind-driven sand
cuts the twigs and foliage. It is here, where wind and
wave meet, that several grasses do good work in hold-
ing the shifting sand in place until larger-growing
plants can get a foothold. Two good sand-binders are
the beach-grass (Ammophila arenaria) and sea lyme-
grass (Glymus arenarius). These can be set out as small
plants or the seeds sown upon the sand. Immediately
branches or heavy straw should be thrown on to hold
the sand for a time until the grass takes hold. When
these young grasses are established, they may be rein-
forced by other beach-grasses, such as Silene or dog-whelk and sea-meal grasses and stipa.

Immediately back of this line of exposure should
begin the shelter-belt of trees and shrubs. This would
consist of quick-growing trees, such as some of the
willows, poplars, locusts, and some of the native cher-
ries (Prunus serotina, P. pennsylvanica, P. virginiana,
and the like). These are to be followed by more
permanent material, such as the stiff thick-growing thorns and native crab-apples, and the species of oaks
and other native forest trees that will live in light soil.
Treed with large or compound foliage are to be added.
Several coniferous evergreen trees thrive in conditions
close to the salt-water, particularly the white spruce,
pitch pine, red cedar, and their geographical relatives.
A great many trees, even the sturdiest natives, cannot
thrive under extreme conditions along the seashore.

Beneath the partial shelter of groups of trees, a great
many shrubs will thrive under the handicap of sand
and salt and wind. Particularly worthy of note are such
common shrubs as Baccarhis halimifolia, Lycum
halimifolium, Ligustrium vulgare, Shepherdia canadensis, Hippophae rhamnoides, Salix viminalis, Rhhamnus
Frangula, Cornus panculata, Rhus copallina, and the
like, and among the beach-grasses Prunus pumila, P.
maritima, Myrica carolinensis, Cytisus scoparius, and
the species of Tam-
arii. To tie the
shrubs together, several vines, as the native species
of grapes, co-
strastrus, and
small, are very useful.

For details of color, masses of native or exotic peren-

nials may be grown. In dry soil select some of the
species of Ar-
meria, Sedum, As-
clepias, Liatris, Silene, Statice, Opuntia, and so on. In wet soil
try the native species of Hibis-
cus, Iris, Aco-
rus, Stellaria, Typhina, Lythrums, Soli-
dago, and their
near exotic relatives. The splash of salt-water is often
fatal to many annuals, but those hardy annuals that
like light warm soils, as portulaca and the Shirley
poppy, will give masses of bright summer color. In the
planting of herbs, there would be no special soil-
preparation, or after-care, as refined garden effects
are here out of place.

Three distinct purposes are served by a judicious
seaside planting: shelter from strong winds to benefit
the crops and man, checking of shore erosion and sand
movement, and definite landscape effects. One should
not so much strive to secure gardenesque effects but
rather to intensify the natural features of the land-
scape.

Examples of successful seaside planting are numer-
ous along the coast of New England where summer
colonies of the wealthy have been established, parts of
Long Island, and in many places along the coast of the
Middle Atlantic states. The first work in seaside plant-
ing in this country was to prevent shore erosion, and
from this work have developed the fine shelter and
landscape effect. The problem of the shore of the Great Lakes is very similar, and much excellent
work has been undertaken along the shore of Lake Michigan, just north of Chicago. A consistent plan for the development of this particular shore has been advocated.

There are few books devoted wholly to the problem of seashore planting, and much experimenting is yet to be done. See "Seaside Planting of Trees and Shrubs," by Alfred Gaut (England) and "Gardens Near the Sea," by Alice Lounsberry. WARREN H. MANNING.

Succulent plants and their culture.

Succulents are fleshy plants of many kinds, but forming a cultural group well known as such to gardens. They are grown mostly for their striking or grotesque usually condensed form, and not for the verdurous character of foliage and spray; and some of them are notable for their showy bloom.

This aggregation of plants is comprised of genera and species of several very remotely related families. Cactaceae, perhaps, contains the largest number of genera and species belonging to this group, although not all members of the family are strictly succulent in habit. Next in point of number is undoubtedly Amaryllidaceae, represented by Agave and Furcraea, with Euphorbiaceae as a close third, represented almost wholly by the great genus Euphorbia, although a few species of Pedilanthus are to be included. Crassulaceae comprises a large number of genera and species, nearly all of which are succulent in habit of growth, although comparatively few genera are common in cultivation. Conspicuous among these crassulaceous things may be listed Bryophyllum, Cotyledon, Crassula, Echeveria, Kalanchoe, Sedum, and Sempervivum. In Asclepiadaceae the group is represented chiefly by Stapelia, although, to a limited extent, one finds in cultivation representatives of Calliopsis, Cereus, Dorea, Euphorbia, and Heurnia. Bromeliaceae gives two genera, Dyckia and Hecchis. Liliaceae contributes Aloe, Apica, Gasteria, Haworthia, and a comparatively small number of species of Yucca. The great family of Compositae has representatives in a section of the genus Senecio. By some authors this group of senecios is considered as having generic standing under the name Kleinia.

In their wild forms, succulents are native to widely separated geographical areas, for the most part being indigenous to the arid or semi-arid regions of Asia, Africa, North and South America, and the West Indies. They have this in common, however, that the climatic and soil conditions of these remote habitats are comparable and such as to induce just the characteristics of growth that these plants exhibit. For this reason they are usually brought together, in cultivation, and given the same or very similar treatment.

The use of succulents.

Many of the succulents are very attractive and ornamental grown either as single specimens, in groups of one class, or when different genera and species are brought together in mixed planting. For the most part the agaves are too large and bulky to be used to advantage other than as single specimens and a few species are not uncommonly employed in this way. Among these may be mentioned Agave plicata, the variegated forms of A. americana, A. atrovirens, and A. Milleri. They are commonly grown in tubs to facilitate handling. Thus treated, they are housed in winter and in summer are placed in some favorable location on the lawn. Some of the best genera are undoubtedly the New England and the lake region. Yucca filamentosa, Y. gloriosa, and Y. glauca have received considerable attention. They are attractive as single specimens, in small groups on the lawn, or when used as border plants with a shrubbery background. In summer they produce large panicles of showy white waxy flowers which are very striking throughout the daytime and are especially so by twilight. The foliage being evergreen gives an added value to the plants in winter effects. A considerable number of this group of plants is well adapted for use in window-gardens. The very grotesqueness of some and the remarkable symmetry of others appeal to one's interest as much as do many gaudy and highly colored flowers of other classes of plants. Furthermore, a large proportion of these plants produce very excellent flowers, and frequently the resulting fruits are equally showy. Among the species valuable for individual pot-plants may be mentioned the following. Nearly all the echeverias are attractive in both foliage and flower characters. The globose and stemless rosette forms of sempervivum, commonly known by the name hen-and-chickens, are especially noteworthy. The production of numerous offsets and these appearing from beneath the foliage of the parent are very interesting and suggest the application of the term "propagation".

A very large number of the smaller cacti deserve consideration. The crown of flowers, followed by a like crown of colored fruits, is particularly pleasing. The numerous species of stapelias are easily grown and in the autumn produce a variety of strikingly showy flowers. Their one objectionable feature is the disagreeable odor of the freshly opened flowers, but this passes away in a very short time, while the flowers remain open for several days.

Not all the succulents lend themselves well to ornamental planting, although many can be thus used and very pleasing effects are produced. The small globular and short cylindrical cacti, with their great diversity in color of the plant-body and of the spines, are material for very effective combinations in design work. They have this advantage over foliage plants used in such work, inasmuch as their growth is so slight that the plants may be placed close together at the beginning and, without any special subsequent care, the design thus formed will retain its full outline throughout the season. A suggestion of the possibility of using cacti in this way is to be seen in the accompanying illustration (Fig. 2014). For this class of planting echeverias are undoubtedly the best material to obtainable. The individual plants are equally as symmetrical and pleasing as the cacti, and the range of color variations among the species is fully as great. They have the added advantage that they can be propagated more easily and more abundantly than is possible with cacti.

When a large number of mixed genera and species of succulents is available, exceptionally attractive plantings may be produced by a combination of these in more natural rather than formal designs. (Fig. 3015.) These appear to best advantage when planted among rocks and the soil surface covered over with gravel and sand. Such treatment not only gives a more natural appearance to the planting but is advantageous because it keeps the plant-bodies from coming in contact with the soil.
the earth, which to most of them is very injurious if the soil is wet for any considerable time. In northern climates these beds must necessarily be but temporary combinations, to receive the plants for the summer months. In the south and southwest regions, where most of the succulents are quite hardy, the planting may be made permanent. In such cases very pleasing effects are produced by planting on a sloping surface, in more or less raised beds or, better still, in rockeries.

**The cultivation of succulents.**

For a general rule, it may be stated that all succulents require an open porous sandy soil and perfect drainage. Other conditions, such as watering and atmospheric humidity and temperature, must vary somewhat with individuals or with special groups. Nearly all the species are very easily grown from seed, although in many cases vegetative reproduction is more available. In fact, some species have natural adaptations for propagation in this way as well as by seeds, and quicker returns may be had from the vegetative methods. The method employed in propagating cacti from seed has given equally excellent results when applied to all other genera of succulents and is therefore given in all essential detail.

Cacti are especially easy to start from seeds and with proper care may be readily brought to maturity. Experience teaches that such plants are better adapted to greenhouse treatment than those brought in from their native wilds. The latter suffer from the shock of radically changed conditions. For a germinating vessel, nothing can be more convenient than a 3- or 4-inch pot. If not fresh from the pottery, this should be thoroughly sterilized. Sterilization can be accomplished by soaking and washing in a dilute solution of copper sulfate (blue vitriol) and subsequently rinsing well; or the pots may be placed in a furnace till all organic matter has been destroyed. This sterilization is necessary for the reason that the seedlings must remain in the seed-pot for a considerable time before it is possible to transplant them. If not sterilized, the pot is likely soon to be covered with algae or other organic growth and this, spreading over the surface of the soil, will quickly smother the young plants. For the same reason also, the soil should be thoroughly sterilized. This seeding soil should be very sandy with only sufficient humus mixed with it to furnish food for the young plant, of which a very little is sufficient. To insure perfect drainage, the pot is filled at least one-fourth full of broken bits of pots or charcoal, on top of which is placed the soil up to about ¾ inch from the top. This is jarred down lightly and the surface leveled. The seeds are then scattered evenly over the surface and firmed down with a flat-faced cylindrical block. Over the seeds is placed a layer, about ½ inch deep, of fine gravel not larger than a small pea. One of the chief drawbacks in growing cactus seedlings is their susceptibility to "clump off" in their younger stages. The protection afforded by this layer of gravel removes that danger. It also prevents any baking of the surface of the soil. The pots are then placed in a pan of water and allowed to remain until the water shows on the surface of the soil. Subsequent watering can be accomplished with a fine spray, applied to the surface of the gravel.

After planting, the seed-pots should be placed on a bench which is insolated in vessels of water or, better, in water with a surface coat of oil. This oil is to exclude ants, which have an especial liking for cactus seeds. Best results are secured in a humid atmosphere and a temperature of at least 70° F. The seedlings of most genera ought to appear within ten days, but opuntia may require a little longer. When the seedlings begin to show spines, they may be transplanted into small flats of earth into which a little more humus or sod soil has been mixed. They may remain in these flats for one to several years, depending on the rapidity of growth in different species. Eventually they are potted off as individual specimens or placed in the open ground.

It is only in the southwest states that many of the cactus plants are hardy enough to be permanently planted out-of-doors. Throughout the greater part of the United States they are tender and require greenhouse protection in winter. In this colder region they may be planted in the open ground of a conservatory, where they thrive excellently, or they may be kept in pots in winter and, in the hottest part of summer, be removed to the outside and the pots plunged in beds. Almost any cactus will readily strike root from cuttings. The cut surface must be allowed to dry for several days, until a corky layer has formed over it. The cutting may then be placed in sand to root, its base but little below the surface. If slender, the cutting should be tied in position to a supporting stick.

Grafting of cacti is almost unlimited in its possibilities, although employed only in particular cases. Small globose forms, such as mammillaria (Fig. 3016), echinocactus, echinopsis, and others, are frequently grafted on some abundantly rooting cereus. Good stocks are provided by Cereus Bonplandii and C. tortuosus, though almost any of the smaller columnar forms may be used. With these stocks and stocks, it is necessary only to make a smooth horizontal cut across each and place the two flat surfaces together. The union is held in position by placing soft strings or raffia over it and tying the ends firmly about the stock or to sticks thrust into the earth. Zygocactus (the old epiphyllum), rhipsalis, and...
Aporocactus (or Cereus) flagelliformis, which are epiphytic species, are well when grafted on slender upright species of cereus, but are more commonly placed on pereskia. If zygocactus is used as a stock, cleft-grafting is usually employed; if rhipsalis, either the cleft- or saddle-graft. Cacti grafted as cuttings usually develop normal-formed new growths, but when grafted will continue the cistate character.

Although it is possible for cacti to survive a drought in nature, yet when grown in pots they are seriously injured if their roots remain dry for any considerable time. They should not be placed on benches over the heating-pipes, where the soil soon dries. It is desirable to have the soil cool and the air overhead warm and rather dry for all desert forms. Contrary to a prevalent opinion, they require water. This should be applied in sufficient quantity only to keep the soil moist. A saturated soil quickly induces a soft watery rot which is fatal to the plant. This is especially likely if the soil contains any organic matter that has not been thoroughly decomposed. A small amount of lime in the soil is desirable, and soil should never be sour. Perfect drainage is necessary at all times.

Many species of cereus and phyllocaustus (now properly epiphyllum) climb over trees or rocks by means of aerial roots. These are indigenous to the more tropical regions and should be grown in a separate room where the soil soon dries. They should not be placed in bassets in the way in which orchids are treated.

Agaves and furcresas, although readily grown from seeds, are more commonly propagated from suckers, or from the bulbets produced in abundance in the inflorescence of many species. For these plants a good soil is one of half soil and half sand. In nature they do not form deeply penetrating roots but widely spreading horizontal feeders. In pot or tub culture, the roots quickly reach the walls of the container and the plant very soon becomes pot-bound. Furthermore, if the container is allowed to remain dry for any time the roots are seriously injured thereby. When possible, it is better to plunge the pots or plant directly in open ground.

Euphorbias and pedilanthuses are best treated in every way as are the cacti. Their cultural methods differ but very little. While it is possible to grow them from cuttings, it is less easily accomplished than with cacti. The cut surface should be placed immediately in powdered charcoal to check the flow of milky sap. When the surface is thoroughly dry, the cutting may be rooted in finely broken charcoal or in sterilized sand. These plants are very susceptible to bacterial rot. Grafting is possible but difficult. It is sometimes employed to preserve a cistate growth of the cion.

Most genera of Crassulaceae are propagated more readily from seeds or from a cutting of the parent plant. As soon as these have formed rosettes of about an inch in diameter they, too, may be removed and will readily grow as cuttings.

Many Crassulaceae, and echeverias in particular, suffer severely from attacks on their roots and the base of the stem by nematodes. For this reason only clean fresh or sterilized soil should be used in growing them. The various genera and species may be grafted back and forth but no special advantage is to be gained by the process. It is also possible to hybridize between the genera and the species, and a number of interesting results have been obtained. Some of the echeveria hybrids have proved to be valuable additions to the group used in design work or for bordering other beds.

Aselephiacaeae is most commonly represented in collections by the genus Stapelia. These plants fare excellently when given the treatment recommended for cacti. The chief difficulty in growing them, in the past, seems to have been their proneness to decay at the surface of the soil, especially in winter time. This is easily prevented. See that the drainage is perfect and use porous sandy soil. Spread the roots out on the surface of the soil and cover not more than 1/2 inch deep with more soil. Over this place an inch layer of gravel about
the size of peas. Their susceptibility to decay at the surface is comparable to the damping-off of seedlings. The mulch of gravel is invaluable in remedying both maladies. Keep the soil moist but never saturated, and do not permit the roots to become excessively dry. This treatment will insure good continuous healthy growth and, in autumn, a reward of many attractive flowers.

The other genera require like treatment. Graffiti of genera and species is easily effected but of no special cultural value. Owing to the highly specialized structure of the flower in Asclepiadaceae, it has thus far been impossible to effect artificial pollination, although natural hybrids, through the agency of flies, are very common. This is especially true in stapelias. Bigeneric hybrids have been reported.

Lychnis and helianthus in the Compositae, may be propagated either by seeds or by cuttings. With them, also, grafting is possible. C. H. THOMPSON.

Topiary planting and garden architecture.

Topiary work includes sheared hedges, pollarded trees, clipped individual shrubs, whether shaped into simple, rounded, or pointed form, or into more elaborate designs. Among the more intricate are the trimming of masses of foliage into the form of birds, beasts, furniture, architecture, and other conceits. The more intricate designs are usually attempted in evergreen plants. Garden architecture comprises all structural or architectural elements introduced into the landscape except the main buildings that are to serve the primary uses of a property. This definition thus includes all walls, inclosing and protecting walls, a practice made necessary by the uncivilized conditions. In general, such inclosures are rectangular or geometrically regular, and comparatively small. They existed in immediate proximity to the owner’s dwelling or adjacent to the building. The necessity of conserving ground and of utilizing it efficiently led naturally to arrangement and planting in straight lines and rows. Utility having thus first determined a regular arrangement of plant-materials in close proximity to architecture, esthetic composition, in its turn, attracted the attention of more cultured man and formal design in landscape gradually evolved.

Both garden architecture and topiary are attributes of the formal in landscape design, which is determined by lines, axes, and balance of parts. The inappropriate use of either results in inharmonious and bad design and constitutes an esthetic abuse.

The following plants are well adapted to topiary treatment:

**Note:**
- **E** means plants evergreen.
- **P** means plant must be protected in climate of Boston.
- **S** means plant is semi-evergreen.
- **N** means plant is non-hardy.
- **G** means plant is grown in greenhouses.
- **H** means plant is hardy.

**E- Taxus cuspidata var. brevifolia.**
**E- Taxus cuspidata.**
**E- Taxus brevifolia.**
**E- Taxus baccata.**
**E- Taxus media.**
**E- Taxus canadensis.**
**E- Taxus cuspidata var. brevifolia.**
**E- Taxus cuspidata var. napina.**
**E- Taxus cuspidata var. nana.**

**E- Ilex opaca.**
**E- Ilex verticillata.**
**E- Ilex glabra.**
**E- Ilex opaca var. nana.**
**E- Ilex opaca var. regeliana.**
**E- Ilex opaca var. nana.**
**E- Ilex opaca var. angustifolia.**

In the growing of the plants for topiary use, special care is required except to be sure that the plants are well grown in the nursery, vigorous, and naturally thick-topped and fine-twiggled. If the piece
Topiary work, as well as architecture, appears in gardens of many different ages. In fact, the whole history of gardens but emphasizes the continued use of formal foliage and architecture as essential elements in their design. As stated by Blomfield, “The word ‘garden’ itself means an enclosed space, a garth or yard surrounded by walls, as opposed to an unenclosed field or woods. The formal garden, with its insistence on strong bounding lines, is, strictly speaking, the only ‘garden’ . . . ; and it is not till the decay of architecture, which began in the middle of the eighteenth century, that any other method of dealing with a garden was entertained.” The common use of hedges for the inclosing of gardens doubtless came into use when the more settled conditions made it unnecessary to retain masonry walls for protection.

In the writings of Pliny the Younger, who was born A. D. 62, is the most complete description of the Roman gardens. In a letter addressed to his friend Appollinaris, he describes the garden attached to his Tuscan villa: “In front of the Portico is a sort of Terrace, embellished with various figures, and bounded by a Box Hedge, from which you descend by an easy slope, adorned with the representation of divers animals in Box, answering alternately to each other; this is surrounded by a walk enclosed with tonsile evergreens, shaped into a variety of forms. Behind it is the Gestatio, laid out in the form of a Circus, ornamented in the middle with Box, cut into numberless different figures, together with a plantation of shrubs prevented by the shears from running up too high; the whole is fenced by a wall, covered with Box rising in different ranges to the top . . . .” After describing several summer-houses he proceeds: “In front of these agreeable buildings is a spacious Hippodrome encompassed on every side by Plane Trees covered with Ivy. Beneath each Plane are planted Box Trees, and behind these, Bays which blend their shade with that of the Plane Trees. This plantation forms a straight boundary on each side of the Hippodrome. . . . Having passed through these winding alleys, you enter a straight walk, which breaks out into a variety of others divided off by box hedges. In one place you have a little meadow; in another the Box is cut into a thousand different forms; sometimes into letters expressing the name of the master; sometimes that of the artificer; whilst here and there little Obelisks rise intermixed alternately with fruit Trees; when on a sudden you are surprised with an imitation of the negligent beauties of rural Nature, in the center of which lies a spot surrounded with a knot of dwarf Plane Trees. Beyond these is a walk . . . where also Trees are cut into a variety of names and shapes . . . . At the upper end is an Alcove of white marble shaded with Vines, supported by four small Pillars of Corystian Marble. From this bench the water, gushing through several small pipes, falls into a stone Cistern beneath, from whence it is received into a fine polished Marble Basin, so artfully contrived, that it is always full without ever overflowing . . . Corresponding to this is a fountain, which is incessantly emptying and filling; for the Water, which it throws up to a great height, falling back again into it, is, by means of two openings, returned as fast as it is received. Fronting the Alcove stands a Summer House of exquisite Marble, whose doors project into a green enclosure; as from its upper and lower windows the eye is presented with a variety of different Vistas. Next to this is a little private closet . . . . Here also a fountain rises and instantly disappears; in different quarters are disposed several marble seats, which serve, as well as the Summer House, so as many reliefs when one is wearied by walking. Near each seat is a little fountain, and throughout the whole Hippodrome, several small Hills run murmuring along, whereby the hand of Art thought proper to conduct them, watering here and there spots of verdure, and in their progress refreshing the whole.”

The Romans, establishing themselves in England, built gardens in which topiary work was doubtless to be found. Otherwise, in England prior to about the eleventh or twelfth centuries, gardening as an art of design and taste can scarcely be said to have existed. It is recorded, however, that in 1123 Henry the First formed a park at Woodstock, and it is the first of which authentic record has been preserved. It was probably intended chiefly as a game-preserve but contained, however, a labyrinth. And it is recorded as the custom of the times for the nobility to develop pleasure-gardens in the orchards beyond the walls of their castles, the chief embellishments of which consisted in “plants cut into monstrous figures, labyrinths, etc.”

It is in the gardens of England of the early Renaissance periods and shortly before this time that the most extensive use of topiary work is found, in the greatest variety and elaboration of form. Topiary art was practised, however, in all European countries for centuries. It has been given particular and peculiar expression in each of several countries. The Dutch developed the art of carving in verdure at an early date and many strange and curious forms in box, along with many rare and flowering plants, were introduced into England from Holland. In France and Italy it was not so much a large variety of elaborate and intricate topiary as an extensive use of the simpler forms of clipped foliage as a means of gaining effect in larger, more monumental, and pretentious landscape arrangements than were elsewhere undertaken. The architectural gardens of the Italian Renaissance exemplify the effective and appropriate use of architecture in the garden. Here trees, naturally formal in habit, are combined with sheared hedges and edgings. These wonderful gardens teach the remarkable effectiveness.
of such method in design when executed by the master hand.

The designers of the tremendous and monumental landscape arrangements executed in France in the later Renaissance periods gained distinctive effects by the very bold use of sheared foliage; they virtually carved their broad axially related plans out of the woodland. The "Bosque" in French design is comparable to the "Topiary grotesque" in the English. The French parterre gardens, in which initiate and elaborate geometrical designs are worked out in low sheared foliage or bed edging and white or colored gravel, are another expression developing from the same original motive as produced the topiary bird. In the colonial gardens in America topiary work was common, mostly in the simpler form of clipped hedges, generally of box, and boxed edged parterre gardens. Remains of many of these old gardens are still to be found in the Atlantic states, and a few old gardens are still in a good state of preservation and cultivation. The box-garden at Mount Vernon is perhaps the most noted, and is in an excellently preserved and restored state at the present time. See Plate XLVI, Vol. III.

A moderate amount of interesting and good topiary work is under way in gardens in this country today, and a few nurserymen are in position to furnish good clipped specimens in a variety of designs. The use of topiary work other than simple clipped hedges should be carefully and advisedly undertaken, however, for it is appropriate only when the whole architectural style of a property makes it suitable and when it becomes an inherent part of the scheme as a whole.

Garden architecture.

Any structure or structural element placed out-of-doors in nature takes on the significance of architecture, and must bear judgment as such. Landscape as such is either nature's work or man's work with nature's materials in their natural form. The placing of architecture in the landscape is always the combining of the obviously artificial with the natural, and the two must be brought into harmony. It is a deplorable fact that when, with the exercise of judgment and good taste, it is possible to attain harmony in the least costly as well as in the most expensive, so much bad and inharmonious architecture encumbers the landscape.

Under any circumstances, architecture becomes to some extent a feature of accent in the landscape, at least within its immediate surroundings. It is emphatic in contrast with its setting and always functions as focalizing the composition of which it forms a part. In general, it is wiser to attempt a simple design and insure its substantial construction than to undertake the ornate in garden architecture. There is a world of interesting precedent in simple designs for the many smaller architectural embellishments of the garden, such as summer-houses or pools, pavements, seats, fountains, boxes, tubs, jars, and other ornaments and accessories. The use of simple boxes or ordinary pots for flowers and specimen plants is to be encouraged, and the conversion of such inappropriate materials as plumbing fixtures into garden ornaments is to be condemned. The usual cast-iron vases and the like are marks of a passing era of bad taste. In lawn pottery, in the form of pots and vases, excellent designs are now to be had, as also of sundials.

No one consideration is more important than that the architectural style of even the simplest seat or sun-dial be similar to that found in the larger architecture of the buildings to which the landscape development may be related.

A number of reputable firms now produce substantially made garden furniture in considerable variety of good designs and in many different materials. Particularly good garden seats and garden pottery are now obtainable at reasonable prices and may be found in shops in some of the larger cities. The advertisements and trade catalogues of the manufacturing concerns are interesting and instructive.

However, the obtaining of individually well-designed and substantial articles having been assured, there remains still the selection of appropriate patterns. Garden architecture should correspond to the style, architectural and otherwise, of a property as a whole. Its appropriate use is its justification.

Rustic work is fitting and often most appropriate in a naturalistic setting. It is, however, architecture and should be so designed as to bear analysis as such. It should be structural in its line, and substantial. It is best when simple and unobtrusive in design. It is seldom appropriate when fantastic or whimsical. The occasional use of rustic work in such way that in its rough character it appears almost to have grown up with the surrounding wild conditions is very pleasing, particularly good unobtrusive seats, bridges, and shelters.

EUGENE D. MONTILLON

Planting for winter effect.

Winter is the season when there is the least sunshine, and the least sign of life and color in vegetation. As a floral festival, Christmas ranks second to Easter, owing doubtless to the relative scarcity and higher cost of materials. The ideal is for every family to grow its own flowers for Christmas gifts, but most persons have to content themselves with less personal products purchased from the florist. Holly is the symbol of Christmas as
the lily is of Easter, each exemplifying the dominant color of the season. The popular demand in winter is for signs of hope and courage—hence the red berry, flower, or ribbon.

The phrase “winter-garden” has been used for a great variety of projects, indoors and out, ranging from the metropolitan restaurant with a few bay trees in tubs, to a winter home in Florida where one may work outdoors every day and all day. Notable progress has been made along many lines since 1900 in the art of living the year round amid beautiful vegetation.

**Indoor winter-gardens.**

Perhaps the oldest use of the phrase winter-garden refers to a type of unheated or little-heated greenhouse which was popular in England when plants from the Cape and Australia were fashionable, but was generally a museum of potted plants rather than a garden. A new stage began in America about 1905, when Mrs. J. W. Stewart, of Glen Ridge, New Jersey, made a real garden under glass. (C. L. A. 13: 168–70.) It has a broad lawn to tread upon, instead of narrow concrete walks, and in place of potted plants raised in tiers for show, there is a continuous border 3 to 4 feet wide, with bulbs and other flowers growing out of the earth at the familiar garden level. The temperature is that of a living-room. Another new stage began in 1906 when the conservatories in Garfield Park, Chicago, were completed. These were not the first attempts at landscape gardening under glass on a large scale, but they are believed to be the most impressive series of indoor nature-pictures in the world. Portable greenhouses and window-gardens now make it possible even for renters to have something more than a few potted plants on the window-sill. Those who can afford no glass may at least force twigs in water, preferring the early bloomers, like peach, plum, and forsythia to the late bloomers, like lilac and dogwood. In this line, the most notable achievement, of late, is the forcing of stems 6 to 8 feet high, by keeping them in a slightly heated attic until wanted for the living-room.

**Outdoor winter-gardens.**

The southern states have a winter climate that makes outdoor work pleasant, and a landscape rich in types of beauty, as evergreen magnolias, long-leaved pines, and winter roses. Southern winter-gardens have their most impressive series of indoor nature-pictures in the world. Portable greenhouses and window-gardens now make it possible even for renters to have something more than a few potted plants on the window-sill. Those who can afford no glass may at least force twigs in water, preferring the early bloomers, like peach, plum, and forsythia to the late bloomers, like lilac and dogwood. In this line, the most notable achievement, of late, is the forcing of stems 6 to 8 feet high, by keeping them in a slightly heated attic until wanted for the living-room.

**Types of winter-gardens.**

Evergreen winter-gardens. — Perhaps the oldest type of winter-garden is the pinetum, which is primarily a collection of evergreens, but is also full of beauty during the period when other trees are leafless. One example is the Hunnewell collection at Wellesley, Massachusetts, part of which is doubled in beauty by reflection in a lake. Another example is the conifer valley in the Arnold Arboretum, which has a brook meandering through the center, while the heights are crowned by trees, the cultivated specimens on one side being balanced

3025. A winter-garden, presenting evergreen forms in tree, bush, and box borders.

3026. A good winter form.—One of the retinisporas.
by a noble hemlock forest on the other. In the planum at Highland Park, Rochester, New York, the walk runs through the grassy center of the valley, with dwarf evergreens ascending the banks, these being disposed at convenient levels and distances for the eye, so that the different textures may be enjoyed to the full. The apparent height of this shallow valley is increased by planting the ridges with the tallest evergreens.

Shrubby winter-gardens. — Every arboretum or botanical garden is likely to have a fruticetum, or collection of shrubs. A garden composed almost exclusively of shrubs is attractive throughout the growing season, as well as during winter. There is a naturalistic winter-garden at Llyndanwalt, Abington, Pennsylvania, where a wood of about an acre near the house has been provided with features of year-round interest, including a rhododendron collection, a dense underplanting of young hemlocks, and a border of shrubbery selected with special reference to winter beauty. From the outside, these shrubs give privacy, shelter, and color in delightful contrast to the ordinary wooded pasture, which is rather colorless. From the interior these shrubs animate the trails and enliven the outlooks that have been purposely left toward the best features of the landscape.

Skating-ponds. — It is now the fashion to border skating-ponds with shrubs that have brightly colored twigs. On sunny days these furnish bold masses of color that harmonize with the vigorous mood and gay costumes of the skaters. After providing for the casino and for the snow that must be removed from the ice, there is generally ample room for a collection of showy dogwoods, willows, and wild roses. At Rochester, New York, is a charming example, the shrubs being allowed to interlace like an old woodland border, so that the color of the twigs steals upon one unconsciously.

Gardenesque effects. — That it is possible to spoil even a winter landscape by overdoing color has been much demonstrated recently in parks, where nurserymen and gardeners have been allowed to plant large masses of Siberian dogwood and salmon-barked willow, the brightest of all winter reds. Such swamp-type plants are particularly inappropriate and gaudy on hilltops. A more poetic effect is produced by the "sunset willow," Salix longifolia. A bi ngton, Pennsyl vania, where a wood of the prairie states, a species of uncertain botanical status known to collectors as Salix longitudinal. It is common along middle-western streams. The most brilliant but least tasteful effects produced with shrubs that have brightly colored bark are in reality the carpet-bedding system. The willows and dogwoods are cut to the ground every year or two, in order to produce the greatest number of showy shoots, which are kept at a height of about 3 feet. This system sacrifices height, habit, and dignity to display. A standard park effect is white pine bordered by Siberian dogwood, which is about the strongest contrast that is in good taste on lawns. Perhaps the strongest contrast furnished by nature in the North is hemlock and evergreen conifer, or cedars, and this is very popular. A more practical standard for our climate is furnished by American holly, laurel, and rhododendron. In nurseries where both classes of plants may be observed, the European kinds are unquestionably rich and aristocratic, but sound a foreign note, while the native kinds have a cheery, sunny color that is eloquent of adaptation to our climate and

Materials for winter-gardening.

One hundred and twenty-eight trees and shrubs that have pronounced winter beauty were listed by John Dunbar from the Rochester parks, not including the evergreens or plants that lose their vivid color before the end of the holidays. With such a wealth of material there should be little excuse for bare and ugly surroundings. Only the classes of materials may be mentioned and exemplified here.

Broad-leaved evergreens. — These are often more expensive than the narrow-leaved evergreens, and of smaller stature, but they have more ample foliage and frequently shower flowers or fruits. All require special care. Examples are American holly, mountain laurel, Rhododendron catawbiense and R. maximum, evergreen thorn, trailing myrtle, evergreen bitter-sweet, box, and its substitute, Illicium verticillatum var. microphylla. The English standard of beauty is American holly, laurel, and hybrid rhododendrons, because the darkest and shiniest foliage is commonly thought to be more beautiful than the duller and yellow-green type. A more practical standard for our climate is furnished by American holly, laurel, and rhododendron. In nurseries where both classes of plants may be observed, the European kinds are unquestionably rich and aristocratic, but sound a foreign note, while the native kinds have a cheery, sunny color that is eloquent of adaptation to our climate and

Scenery. The same principle applies to the narrow-leaved evergreens, Irish yew being commonly but mistakenly preferred to Canadian or Japanese yew. Semi-evergreens, like Hall's honeysuckle, are listed in this work under Autumn-Gardening.

Narrow-leaved evergreens. — The European standards are Scotch and Austrian pine, Norway spruce, silver fir, Irish juniper, and Irish yew. These are climatic misfits in America and constitute the bulk of the evergreen planting east of the Rockies that proves unsatisfactory. The American standards are white pine, hemlock, Douglas spruce, concolor fir, red cedar, and Canadian yew. The types of beauty represented in the two lists are not closely comparable.

Deciduous trees and shrubs. — Though lacking in brilliant color, the following are standards of quiet beauty.

3020. Attractive winter objects. — Cones of white pine.

3021. Great subject in the winter-garden. — Fruits of the barberry.
Marked for their outline or habit are pin oak, sweet gum, white birch, pepperidge, sassafras, tulip tree, white oak, and sycamore. Noted for their winter buds are flowering dogwood, beech, shagbark, balm of Gilead, honey locust, swamp bay, sassafras, and pussy willow. Familiar by their trunks are beech, birch, shagbark, sycamore, white oak, tulip tree, sweet gum, flowering dogwood, and mountain-ash.

Shrubs with brightly colored berries.—These materials do more to transform ordinary city lots than any others here mentioned. Shrubs cost less than evergreens, mature more quickly than trees, are fairly permanent, and are cheap. Of the shrubs with decorative fruits, there are two main groups based on duration. Those which are attractive all winter, like barberries, must be reckoned more valuable than those which drop by New Year's or cease to be attractive then, like snowberry and Indian currant. Each of these groups may be divided again on a basis of color. Red is the favorite color, because it seems to give the most warmth at the time it is most needed. Consequently the most popular shrubs for winter berries are the common and Japanese barberries, the multiflora and prairie roses, and the high-bush cranberry, all of which retain their red berries until spring. Of the other red berries, Viburnum dilatatum lasts until April; Japanese bitter-sweet until March; Viburnum Sargentii until February; while the following are attractive until February: Most species of Evonymus and Cotoneaster, Hex verticillata, and red chokeberry (Aronia arbutifolia). The red-barked species tend to produce yellow varieties, but they have less popular appeal. Blue berries of great beauty are borne by the familiar white fringe and the little known symphloes. Theoretically black is an unattractive color, yet practically the black fruits appear well, especially against the snow, the most familiar example being the massive cluster of California privet, while the open cluster of Regel's privet has more grace. Viburnums furnish many dark berries, as do the following choice plants: Acanthopanax sessiliflorus, Rhamnus cathartica, rhodotypos, Phellodendron amurense, Rhamnus daphyca, and Aronia melanocarpa. Theoretically white should be the chilliest and least attractive color in winter, yet the snowberry is probably the only bush that is planted almost wholly for its winter berries, and its popularity continues although it often loses its attractiveness before Thanksgiving. The small waxy berries of candyberry (Myrica) are an agreeable sight till January, but this plant is more famous for its fragrance.

Shrubs with brightly colored twigs.—These materials are even more brilliant than shrubs with brightly colored berries. The ordinary 2- to 3-foot bush of barberry has few berries, when planted in the fall, while a Siberian dogwood of the same size is a consistent mass of red from planting day in October until April. These materials are showier on sunny days than clouded ones, and look best when the sun is at one's back. They do tolerably in the smallest yards of large and smoky cities but do not develop the brightest colors in dense shade.

In this group, also, red is the favorite color, the most popular being Siberian dogwood, with the Britzeni willow a fair second, the latter being unsuitable for foundation planting. Vivid color is often confined to twigs or wood a year or two old, as in the lindens, but a four-year-old Siberian dogwood is showy from the ground up. Those who like a change from the Siberian sometimes plant the silky dogwood, which has purplish red wood, or the quieter-toned stolonifera, but the latter needs a moist situation and is too scaly for foundation planting. Yellow branches are more popular than yellow berries. Willows furnish half a dozen yellow kind, dogwood two good ones, and yellow poplar one. Vivid green wood is furnished by kerria, Forsythia viridissima, sassafras, Colutea arborescens, and a Variety of Cornus sanguinea.

Winter flowers.—The only hardy winter flower of importance is the Christmas rose (Helleborus niger), which blossoms in the North amid or under the snow any time from November to March. Winter crocuses are merely a coldframe hobby for enthusiasts. Sistrah and the other March-blooming bulbs are often seen blooming in the snow, but they are essentially spring flowers. A unique and wonderful winter beauty is Pieris floribunda, which seems to be crowned by white flowers, but these are really buds. They are all the more wonderful because naked, and all the more beautiful because set off by evergreen foliage.

Wilhelm Miller.

Planting on walls. (Fig. 3030.)

Wall-gardening and walled gardens are two different departments of horticulture. The walled garden is an old English development based on the need of protecting fruit from thieves and on the fact that grapes and peaches do not ripen in the cool summers of England without extra heat, such as a south wall gathers. Out of these conditions have grown high brick and stone walls aggregating hundreds of miles in extent and forming a familiar sight in the English landscape. The walls have come to be covered with all sorts of fancy fruits trained like vines. They also shelter many subtropical shrubs trained as climbers, which otherwise could be grown only under glass. Although these walls are often crowned with broken glass or spikes, they are generally beautiful in themselves, or are made so by a clothing of vines. Moreover, earth-filled holes are often purposely left on top for the growing of rock-loving flowers, such as wallflowers, snapdragons, wall pepper, Kenilworth ivy, houseleeks, and wild pinks. Time adds the crown-
material that will expand too much, but the aim should flowers by the heaving action of frost. However, the walled and stonecrops spread over large areas. Other suc-

coses are rock cress (Arabis alpida), woolly chickweed (Cerastium tomentosum), snow-in-summer, woodruff, wild pinks, alpine forget-me-nots, Renoultrich and

perennials are equal to the choicer alpines. Analysis of the four largest

numbers, for \( \text{Celastrus scandens (twining).} \)

houseleeks (Sempervivum), which has thirty-three plates illustrating

The popularity of this type of garden is attested by Gertrude Jekyll’s “Wall- and Stone-Gardens,” which has many deciduous

which will find the moisture, coolness, and drainage that are roots through the walls into the earth banks where they

roots tthroughly mulched and the ground shaded by low growth about its base; climbs by root-like holdfasts.

be to give the plants as little root-room and food as possible in order to encourage their rooting outside the stonework.

unwise to have wide spaces between stones filled with

unfavorable to the choicer alpines. Analysis of the four largest

unfavorable; but, whatever is used, the denser its habit of growth, the better screen it will make. Other things being equal, evergreens are better than deciduous plants. For the latter lose their leaves in winter. However, if evergreens are not available, there are still many deciduous plants whose dense habit of growth make a good screen even after the leaves are gone. A border plant, as in Fig. 2099, is really a screen against objects beyond; so also are such cover-plantings as those in Figs. 3000, 3001, 3031 and others. The real screens, however, are those plantings made for this particular purpose, mostly narrow in form but dense.

Vines for screen-planting.

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**Deciduous:**

Hydrangea petiolaris (climbs by root-like holdfasts).

Parthenocissus quinquefolia var. Engelmanna. A variety of Virginia creeper with diads, or suckers, on the ends of the tendrils, which enable the plant to fasten itself to a surface.

Parthenocissus tricuspidata var. Verticalis.

**Evergreen:**

Eryngium radicans var. vegeta (climbs by root-like holdfasts).

Holodora helix. Somewhat tender; in the N. should be planted where it will be shaded from winter sun or at least have its roots thoroughly mulched and the ground shaded by low growth about its base; climbs by root-like holdfasts.

Rapid-growing vines for banks or unsightly objects.

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Boissiaceae basellae. Twining tender perennial treated as an annual, growing from 10 to 15 feet a season; roots must be taken up and stored away from frost.

Calystegia sepium (twining).

Echinochloa indica (self-seeding; tendrils)

Humulus japonicus (twining).

Ipomoea purpurea (twining).


Herbaceous perennials (dying down to the ground but springing up again from the root):

Ipomea purpurea (twining).

This and next have fleshy roots and may become a nuisance if allowed to spread.

Pueraria heritiana. This is known also in commerce as Dolichos japonicus; grows 40 feet in a season; twining

Woody perennials (woody stem persisting above ground):

Actinidia arguta (twining).

Aratocochia macrophyllo (A. Sipo) (twining).

Colus acaule (twining).

Lonicera japonica var. Halliana (twining).

Lythrum salicaria and L. halimodendron. Both are shrubs with recurving trailing stems which do not twine. Plant must be fastened to its support. Excellent to hold banks, but very vigorous and may become a nuisance.
Tall-growing vines reaching cases of the house.

Actinidia arguta (vigorously; dark glossy foliage; twining).

Aristolochia macrophylla. Twining; large heavy foliage; should not be used unless very desirable.

Campsis radicans. This is a heavy vine climbing by root-like holdfasts which are too weak to hold it in storm or wind; must be fastened to its support. Somewhat tender in the North, it usually has more or less dead wood. Better when used as a porch, where it can be reached and pruned easily.

Celastrus scandens (twining).

Parthenocissus. All kinds; tendrils with or without disks.

Wisteria chinensis. The finest of tall-growing vines; vigorous and hardy at all times.

Vines for foliage only. All in the following list are deciduous, i.e., drop their leaves in winter. The only evergreen vines which can be used in the North are Evonymus radicans and Hedera helix. Even the foliage of Evonymus radicans will occasionally burn in winter although it is harder than English ivy in this respect. *Vinea minor and Pachysandra terminalis are good creeping plants for evergreen ground-cover and Hall's honey-suckle is semi-evergreen, holding foliage until Christmas. Other flowering vines also good in foliage are Clematis paniculata, Forsythia suspensa, which is a shrub with recurring and trailing stems excellent for running over a bank or hanging down a wall, Rosa Wichuraiana and some of its many hybrids, and Wisteria chinensis.

Actinidia arguta.

Akebia quinata. Very graceful vine with delicate five-parted foliage, Parthenocissus. All kinds; tendrils with or without disks.

Vines for foliage only.

Campsis radicans. This is a heavy vine climbing by 2682 PLANTING Clematis Jackmani. Climb by twisting leaf-stems. Flowers large and purple. C. Jackmani var. alba is also, similar, but the flowers are creamy white. Both of these are good vines for bloom in July and August.

Clematis paniculata. Climb as does the preceding species.

Flowers small and white, covering plant with a mass of bloom in September and October. Foliage remains glossy green, good until December. The best fall-blooming vine.

Forsythia suspensa. Yellow flowering, appearing before the leaves, covering plant with a mass of bloom in April. Flower-buds often killed by cold in the northern tier of states.

Loniceria Herbstkäufer. Climb by twining. This is a hybrid which blooms in June and July. Leaves alternately, compound. The flowers are rose outside and yellow inside, and as open and closed flowers are present at the same time they make a very handsome showing. The only objection to the plant is that it is badly infested with aphids or green-fues.

LDora japonica var. Haliana. Bloom profuse and fragrant; flowers white, fading yellow in June and July.

Rambler roses, in order of bloom, June and July. These must be tied up, but are hardly without protection except possibly in the northern tier of states. In such cold places one must be content with the upright shrubly Rosa rugosa in white, and red varieties, both single and double, beginning in early June; with the white Rosa multiflora, beginning from middle to late June; and with the pink Prairie, or Michigan, rose (Rosa prunifolia) which does not begin until the second week in July. R. multiflora and R. setigera are both shrubs with an arching habit and have produced many Rambler roses. Of the varieties following, those marked with a dagger (†) are the best: †Austromelania, middle June, double, delicate pink; †Leda Dunstan, single, rich salmon-pink; †Excess, late June, or early July, a long-season rose, double, rich crimson, a new variety, blooming at the same season as the old Climbing Ramblerr-Variegated, but a better color, Dorothy Perkins, early July, double pink; white Dorothy Perkins, a white variety of the preceding. Alfred Storey, middle July, semi-double or double creamy white, yellow in center, dark yellow in bud, excellant glowing foliage. Avatar Blirex is a new variety of the storey. Very similar to Alfred Storey, middle July, middle June, or early July, a long-season rose, single, bright red with white center and yellow stamens; *Mrs. H. M. Walsh, middle July, double, white, same long season and good foliage as Rosa Wichuraiana, the Memorial rose of which it is practically a double form; *R. Wichuraiana, which is blooming at this time, is the parent of many of the varieties named above, and to itself a very attractive rose.

Vitis chinensis. A strong, twining vine, with long, hanging clusters of white or purple flowers, according to variety, in middle and late May. Leaves alternate, compound, large, loose, and feathery. Beautiful in flower, graceful in habit, satisfactory in foliage, and vigorous and hardy at all times.

Large trees for wind protection and for background setting to the house.

Deciduous: These deciduous types are dense and compact in habit and make a good screen or background even after the leaves are gone in winter.

Acer platanoides.

Acer saccharum.

Aesculus Hippocastanum.

Fagus sylvatica.

Quercus alba.

Thuja occidentalis.

*Vines sylvestris.

Norwegian spruce (Picea abies), and Colorado blue spruce (Picea pungens) are probably the three most commonly planted evergreen trees. The Scotch pine is the best of the three for neutral mass planting but none is so satisfactory as the hemlock or the pines listed below. The Scotch pine has an irregular spreading habit with bluish green foliage, salmon-colored limbs and trunk and nectar-suckle habit when old. It grows rapidly but is short-lived in America. The Norway spruce and Colorado blue spruce are both conical evergreens and for this reason alone they are always preferred and conspicuous. Even when planted in mass they are excellent for use in that it requires years for them to merge into a uniform solid mass. Comparing a solid planting of Norway spruce with the hemlock mentioned in the same list, it is seen that in the former individual species are set and remain and remain so for years, while the hemlocks with their yellowish-brown foliage have lost their individuality and merged into one indeterminate mass. The Norway spruce is also too somber and funeral for cheerful home-garden planting. It is also short-lived in America and while hardy and rapid-growing it begins to go back and die at the top after forty or fifty years except in very sheltered locations. The Colorado blue spruce is also short-lived in the eastern states and it altogether too conspicuous and emphatic both in form and color for neutral background planting.

Pinus austriaca.

Pinus resinosa.

Pinus Strobus.

Pseudotsuga taxifolia.

This is a large conical tree like Norway spruce and therefore not so good for neutral background planting just as either the pines or the hemlock mentioned in the same list. But it is the best of the conical spruce or fir type because more graceful in habit, with soft, more flexible foliage which is green or gray-green in color. It is a vigorous grower and though little known it is a very promising evergreen tree. Only the Rocky Mountain form is hardy in the East.

Tuga canadensis, the common hemlock.

Rapid-growing trees for screens. As a class, the rapid-growing trees are weak-wooded and transient. They are cheap and are usually thought of as fillers for temporary or quick-effects until more permanent trees can be established.

Deciduous:

Acer Negundo.

Acer saccharum.

Populus, Carolina poplar.

Acer:

P. ecesia.

Pinus sylvestris.

Pinus Resinosa.

Pseudotsuga taxifolia.

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Acer saccharum.

P. ecesia.

Pinus sylvestris.

Pinus Resinosa.

Pseudotsuga taxifolia.
Shrubs for screen border-planting.

B. Overgreen:

Deciduous:

*Thuya occidentalis var. pyramidalis.*
*Taxus baccata var. hibernica* (not quite hardy above *Juniperus Virginiana.*
*Juniperus communis var. hibernica.* This should be trained in *Carpinus Betulus var. globose.*


Deciduous:

*Achinospora ponypallata.*
*Acer palmatum (often larger but slow-growing).*
*Berberis vulgaris.*
*Cerutus paniculata.*
*Evonymus alata.*
*Forstythia suspensa.* Good definite form and best for individual specimen planting.

Evergreen:

*Taxus cuspidata. Has more definite and graceful form than *P. coronarius* and dark green almost glossy foliage.
*Rhododendron koreense.*
*Spiraea betacea.*
*Spiraea japonica.*
*Salix Vossii.*

Evergreen:

*Taxus baccata var. hibernica* (not quite hardy above *Juniperus Virginiana.*
*Juniperus communis var. hibernica.* This should be trained in *Carpinus Betulus var. globose.*

Small (2 to 4 feet) (other native plants not so dense in habit but with good foliage will make very effective screen-planting when massed together):

Deciduous:

*Berberis Thunbergii* (occasionally 6 feet).
*Catalpa Bungei.* This is the trade name for *C. bigelowii var. nana.* It is a rather small variety of the southern catalpa and makes a dense round bush when growing on its own roots. It is often gathered high on upright stems and planted as a substitute for bay trees.

*Chimonanthus praecox.*
*Kerria japonica.*
*Ligustrum ovalifolium var. Regelatum.*
*Ligustrum ovalifolium var. pfitzger. This is not hardy north of Philadelph-
Phila and can be used only for low hedge in the North. May be cut to the ground and will spring up vigourously every year.
*Lonicer Thibetica.*
*Lonicer chinensis.*
*Lycium chinense.*
*Lycium halimifolium.*
*Philadelphus coronarius var. nanus. (2 to 3 feet).* This is simply a dwarf variety of the southern philadelphus and makes a dense round bush when growing on its own roots. It is often gathered high on upright stems and planted as a substitute for bay trees.
*Rosa rugosa.*
*Kerria japonica.*
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*Ligustrum ovalifolium var. Regelatum.*
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*Lonicer chinensis.*
*Lycium chinense.*
*Lycium halimifolium.*
*Philadelphus coronarius var. nanus. (2 to 3 feet).* This is simply a dwarf variety of the southern philadelphus and makes a dense round bush when growing on its own roots. It is often gathered high on upright stems and planted as a substitute for bay trees.
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Winter protection of planting.

Winter protection is the preparing of plants to withstand the winter (Figs. 3032–3047). All plants are usually hardy in their own habitat, but many become tender when removed to a colder climate, requiring artificial protection. A permanent covering of snow furnishes ideal protection, but unfortunately the American winters are very changeable. Continued steady cold is seldom injurious, but the alternate freezing and thawing toward spring are often fatal, the damage varying according as the situation is wet or dry and the soil light or heavy. For example, shallow-rooted plants, as Lobelia cardinalis, will often be thrown out of the ground in clayey soil. Such damage may be prevented by placing sods over the plants. Galliards will winter safely in light well-drained soils with ordinary protection, but perish if wet and heavy. The remarks in this article are meant to apply in the vicinity of Chicago.

Winter-covering intercepts the sun’s rays and retards premature activity. It is as essential “to keep in the cold” during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but any plants of an herbaceous nature may be covered much earlier. Where field-mice are troublesome it is well to defer covering until after a good freeze, so that these nibblers may seek other winter quarters. Rabbits are fond of the Japan quince, Spiraea Vanhoutti, Evonymus alata, and some others, and often damage newly planted material the first winter. When the branches are beyond their reach, protect the trunk with straw, tar paper, or burlaps, which will also prevent sun blistering. If the shrubs are in groups or low-branched, run wire netting around them. Fall-planted material should be better protected against frost than established plants of the same species. All the Japanese flowering forms of the plum, peach, and cherry tribes should have their roots mulched 4 or more inches deep.

The fatal damage in the winter of 1898–1899 was at the roots, not overhead. Figs. 3032, 3033 show protection by means of straw and boughs; Figs. 3034–3036, protection inside of boxes, barrels, and wire netting.

Plants with evergreen foliage, like Heuchera sanguinea, are safer with a covering that will not mat down and rot the foliage or injure the crown. The danger is in open, wet seasons. Forest leaves are excellent for winter covering, provided they do not mat down. Oak leaves are good, but those of elm, maple, and other trees that shed their foliage early are soft and mat too much. Leaves may be held in place by evergreen boughs, brush, or tops of bushy perennials like the native asters, or coarse strawy material. When leaves are used in barrels or boxes, the top of the package should be water-tight, and the leaves dry when put in. This precaution is not essential in all cases, but it is a safe rule to follow. Tar paper is comparatively cheap and comes handy in many phases of winter-covering. Gather the leaves when they are dry, and store under shelter until wanted. Save vines like those of Clematis paniculata and pole limas; they are good for covering climbing roses that are almost hardy. These keep off the bright sun when the plants are in a semi-frozen condition, shield them from the drying winds, and retard premature starting of the flower-buds. Forsythia suspensa trained as a climber on a south wall is benefited by such covering, or by burlaps, as its sheltered position induces activity too early and its flowering buds become a victim to late frosts. Any rhizomatous iris, such as the German iris, should be planted where surface drainage is ample, and in the case of young plants, or those recently divided, not covered with heavy manure or they are likely to decay in wet weather. Cover such plants with tight material. Old established plants seldom need protection. Chrysanthemum coccineum requires similar conditions and treatment. All lilies except the hardiest, such as L. tigrinum, L. elegans, L. candidum, L. superbum, L. philadelphicum, L. speciosum, L. tenuifolium, and so on, are best covered by a mound of ashes—wood or coal—which retains an even temperature. The other lilies may be mulched with manure and L. candidum with leaves. Eremurus in all its species, and Alchemilla auriculata, require a deep box of leaves and the surrounding soil well mulched. An inverted V-shaped trough placed over such low edging plants as Veronae circinoides and Thymus Serpyllum var. montanus, is beneficial. It is well to take up a few plants of Monarda didyma, the double perennial sunflower, and Thymus Serpyllum, and winter them in a frame, over which place a wooden shutter to shed rain, placing leaves or manure on those that remain.
Where permanent windbreaks, such as plantations of evergreens, buildings or solid fences, do not exist, temporary ones should be made of boards, evergreen boughs, corn-stalks, and the like, to protect arboreal plants that are not quite hardy, e.g., in this climate Halesia carolina, and in the eastern states Magnolia grandiflora, hollies, and the like. Place the windbreak at the sides toward the prevailing winds, generally north and west, and at the sunny side of any evergreen that brown. The boughs or stalks may be attached to wire netting or to cords fastened to stakes.

The so-called retinisporas may have placed over them an empty box open at the top. Shrubs that are still more tender should be boxed having a tight top and ventilation at the sides. In all cases much well at the roots. Magnolia Soulangeana, M. speciosa, and plants of similar degrees of hardiness may have their branches tied in and empty casks placed over them, one sitting partially inside the other, and held in place by stakes. Put a cone-shaped covering over the top to shed the snow. Or poles may be set close to the tree, wigwam fashion. Wrap these with burlaps, or wind string around them for the straw to lean against, and in both instances wrap with straw.

The so-called hardy climbing roses, such as the Seven Sisters and Prairie Queen, which are hardy without protection, but are benefited by it, Wichurana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Penzance Sweetbrier Hybrids, if against a wall, may have clematis or other vines placed thickly over them; or if in an open exposed situation, they may be wrapped in straw. (Fig. 3033.) Better still, hill up the soil rather high at the roots, —to prevent breaking and to afford protection and drainage,— and then take the trouble to extend the mound in the form of a gradually diminishing ridge. Bend the canes along the ridge, choosing a time when there is no frost in them; then cover the canes with tar paper, over which place straw, strawy manure, or any warm covering. If the presence of a lawn prevents this method, lay on the grass and cover with a water-tight box filled with leaves. Canes will rot directly under an open knothole. In the spring allow them to remain prostrate some time after uncovering to inure them gradually to the change and to induce the lower buds to strengthen. Hybrid Perpetuals, or in fact any semi-hardy rose of low growth, may be protected as above. In most winters the Hybrid Teas can be safely carried over in their boxes. In those winters when late frosts come lift up the table carefully, so as not to spill the, drain-tile. Place these tiles in the frames or among the roses, using ten grains of wheat to a tile. When spring comes lift up the tile carefully, so as not to spill the wheat and count the grains; by the use of the tiles one keeps track of the wheat and does not endanger the birds.

Field-mice or the smaller moles are troublesome sometimes where any open or loose material like leaves or straw is used for winter protection. Plants in cold-frames are often destroyed. This may be prevented by the following method: Procure some poisoned wheat and place in the interior of a 4- or 5-inch common base of their neighbors, lead tags bearing numbers fastened to each plant, and a record taken of their names, and all summer labels stored to prevent loss when removing the leaves in the spring. Make a solid frame around them, higher at one end, and fill with leaves so as to cover the plants. Lap the roof-boards; they will shed water and allow ventilation. In the spring remove the leaves, replace the top for a few days, but let the sides remain for a week or so to shield from cold winds. Keep the plants prostrate until cut back.

The tender Hybrid Teas require special attention. Cultivation and watering should be discontinued in September in order to retard a late growth, but if the fall is a dry one, they should receive a thorough soaking late in October. Early in November hill up the soil around the plants to a height of 6 to 8 inches. After there is a crust of frozen soil a few inches thick, fill up with dry leaves to a little over the height of the hills or higher. Then board up the bed some 2½ feet high at one side and 2 feet at the other, and cover top with boards or tar paper, the object being to keep the leaves dry. Hybrid Perpetuals, or in fact any semi-hardy rose of low growth, may be protected as above. In most winters the Hybrid Teas can be safely carried over in their boxes. In those winters when late frosts come lift up the table carefully, so as not to spill the, drain-tile. Place these tiles in the frames or among the roses, using ten grains of wheat to a tile. When spring comes lift up the tile carefully, so as not to spill the wheat and count the grains; by the use of the tiles one keeps track of the wheat and does not endanger the birds.

Tree peonies and yuccas should have an empty box placed over them, large enough to prevent the plant from touching the wood. Hibiscus syriacus, diervillas, except D. Lemoini and D. parviflora which are hardy—Iltea virginica, Cornus mar, and the like, are wrapped in straw, and when the wrappings exceed 4 feet in height they should be stacked to prevent high winds from toppling them over. Rodgersdrones when planted out are taken up, the roots given a good soaking in a tub, and replanted in cold pits, or in boxes placed in a coldhouse or pits. In the spring, another bath is

3036. Plants protected in a barrel covered with burlaps.

3037. Deep pit built like a coldframe, for carrying half-hardy woody plants over winter.
given them and the soil firmly pounded around them before replanting. This is essential for continued vigor. Cut all vines of the Clematis to within 1 or 2 feet of the ground and lay them down, first mounding the soil a few inches if surface drainage is not good and cover with ashes, boxed leaves, or soil, or mulch well and wrap the canes with straw. If close to a porch or steps, do not let the swept snow stay over them, unless well protected, as this snow solidifies and excludes air. If, as some now think, the broken outer skin of the hybrid forms subjects them to disease, then these varieties should not be bent over, but staked and wrapped. It is best not to cut the foliage of the eulalias or the Japan iris, as it, of itself, is a good protection, but manure at the base is essential. Cut down Arundo Donax, cover heavily with any material, and cover all with tar paper or water-tight shutters. Place half-rotted leaf-mold over fern-beds, narcissi, English and Spanish iris or any early-blooming bulbous plant, or a light strawy covering that is easily removed. Fine old manure a few inches thick is good and can remain. Place a good coating of stable manure around the trees on the lawn, and bear in mind that the feeding-roots extend out as far as the branches do. The soil under them has a double duty to perform—to sustain both the tree and the grass. Place short stakes around groups of phytodons, Asclepias tuberosa, or any other plants that are late to appear in the spring. Otherwise they may be overlooked in the spring and injured by digging. Examine all labels and see that none is cutting into the limbs of trees. Replace all rotten or defaced ones in the borders, using heavy labels, as thin ones often break off and are carried away when the surplus manure is removed. Cypress is a good material for labels. A good label for young trees and shrubs is made of a thin sheet of copper. The name is written with a stylus and a thin white paint rubbed on so as to fill in the depression. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the trunk and allowed to lie on the ground. Such a label is durable, unobtrusive and requires no attention for fear of cutting the wood, nor can it be lost.

W. C. EGAN.

Structures for the winter protection of plants.

Pits, cold pits, storage-pits and plant-cellar (Figs. 3038-3047) are structures, with the greater part sunk beneath the surface of the ground, built for the purpose of protecting plants in winter without continued fire-heat. They are employed almost exclusively for storing dormant plants. They are not suitable for storing growing plants any length of time, neither are they suitable for storing heat. They are employed almost exclusively for storing Structures for the winter protection of plants.

3038. An outside cellar, in which to store roots and tubers, and pots of resting plants.

3039. Nurseryman's cold pit. A cheap device for wintering plants that require comparatively little light.

south and be sheltered against north winds by buildings or other windbreaks. Owing to their positions they should be put in well-drained ground only and well protected against surface water. A well-designed frame-yard is the best possible place for small pits.

The coldframe is used by market-gardeners for wintering cabbage and lettuce for spring planting, or by florists for pansies, primroses, forget-me-nots, and the like, is really a simple pit. Such shallow pits, with proper protection, are useful for many other small plants which would be injured by severe weather. A deep pit, like a coldframe, is shown in Fig. 3037. A pit built on the plan of the old-fashioned "outside cellar" (Fig. 3038) is useful for storing tubers and roots. See that it is well ventilated. A section of another pit is shown in Fig. 3039. More elaborate pits, for accommodating large plants, are illustrated in Figs. 3040-3047.

Double glazed hotbed sashes are now used and can be employed for the pits shown in Figs. 3043-3046, or wherever winter protection is required, as it takes too much time to cover the ordinary sash with mats and shutters. These sashes cost a little more and they are heavier; it may be well to employ, therefore, a method for ventilation which obviates the necessity of lifting. As the glass is made of two panes of glass, the space between the panes or the air layer is the thickness of the sash bar; it keeps in heat and so keeps out frost. It is possible that some dust and perhaps fungous growth may accumulate or form within the layers. The glazing can be done at home, the lower glass being put in without putty and held in grooves on sides and ends and on the sash-bars by thin strips of wood.

For forms of pits, consult Figs. 3043-3046. Figs. 3043-3045 show inexpensive and convenient pits for small and medium-sized plants. They may be built 4 feet or less below the level of the ground, the height and width as shown in the diagrams; the length should be some multiple of 3, any thing between 9 and 30 feet, so that the glass roof may be made of hotbed sash, and also protected by the straw mats and wooden shutters in common use. See Hotbeds. These pits are useful for storage in winter and also for carrying some of the harder greenhouse plants in autumn until the houses are relieved of the chrysanthemum crop. Figs. 3046, 3044 make light hotbeds in spring, if filled with the leaves which formed their winter protection, and are also available for growing such plants as euphorbia during the summer. They are generally too deep for dund hotbeds. These pits are planned to run east and west. If Fig. 3045 is thus placed, the roof on the north side may be made of plank instead of glass, but if it runs north and south it should have a glass roof on both sides. Easy access to all is obtained through the roof by removing a sash. Sometimes a door can be built at one end. Fig. 3043 does not cost much more than Fig. 3044, and furnishes more room. By putting a few doors in the board roof, excellent ventilation and access is provided. Fig. 3045 gives the best head-room, but is rather dark for evergreens with soft foliage, e.g., Cytisus canariensis, unless the whole roof is glass. A
pit like this has always been used in the Arnold Arboretum for wintering seedlings rooted cuttings and grafts—young stock grown in flats but too delicate for the open ground. The arrangement of shelves shown in the diagram gives storage to large numbers of these small plants.

PLANTING

3040. A durably storing pit or cellar for very large plants.

In Fig. 3046 is shown a small plant-cellar, more expensive but with better capacity for large plants. It should run north and south, and, excepting the glass roof, is wholly below ground, and consequently extremely well protected against frost. The door is at either end or side. By taking advantage of sloping ground it is possible to enter on the ground-floor level, which is important when large plants in tubs must be handled. In such cases a concrete floor may be built. The monitor roof provides plenty of light and ventilation; wooden shutters cover the glass in cold weather. This form of pit is not only well adapted to plants, but also is excellent for storing fruits and also brassica sprouts, celery, and cauliflower until Christmas. The forms of buildings larger than those above described vary much with different circumstances. Sometimes the cellar of a stable, tool-house, or other outbuilding can be utilized.

The chief consideration is protection against frost, but provision must be made for thorough ventilation, and against a too high temperature in the autumn and early spring. It is because it is hardly possible to provide for these matters that dwelling-house cellars do not make good pits; they cannot be sufficiently ventilated to keep the temperature low enough except in the middle of winter. Growth is incited and cannot be maintained owing to lack of light.

Owing to their position, pits cannot well be made of wood, plank and cedar posts lasting from 4 to 6 years only. For large pits, stone and brick are most economical for walls and ceilings; for small ones concrete probably makes the cheapest and best wall; hollow tile probably makes the cheapest and best wall; hollow tile, or the roof may be double. The construction of a brick roof is shown in Fig. 3046. Concrete could also be used. A good grade hotbed ash makes the best glass roof. All sills, cross-bars, and the like, should be made of cypress and painted. The wood-work must be made strong to endure the continual exposures. It is false economy to stint in quantity or quality. In cellars for nursery stock, a comparatively small amount of light is required, and the low roof is boarded in and shingled, building-paper being used. Tanks may be substituted for boards, or the roof may be double.

Sand or gravel, 1 foot deep, makes the best floor, or half sand and half loam where plants are to be heeled-in. A concrete floor should be used only where the drainage is absolutely perfect.

The sides and ends should be banked with leaves or other material. (See Fig. 3039). In the vicinity of Boston this should be done about November 15. The same covering can also be given to low roofs. The glass is protected by mats and shutters, much as in ordinary hotbeds. It is a good plan to have on hand an extra supply of dry meadow hay to give additional shelter in zero weather.

PLANTING

3041. A doorway in Fig. 3040.
Pits like those shown in Figs. 3043 and 3045, like greenhouses, should carry more than one “crop.” In early autumn they hold chrysanthemums, carnations, stevias, and the like; next Rhododendron (Azalea) indica, Cytisus canariensis, heaths, and the like, some of which remain for the winter, while others are replaced by hardy shrubs, bulbs, and other plants for forcing. For spring and summer use, see above. In eastern Massachusetts gardeners begin to use them in September, but the final storage sometimes is not finished until Christmas. The longer the plants can be kept in the open air the better fitted they are for their winter quarters. In the care of pits, watering and ventilation are of prime importance. When first housed the plants should be well watered, and, if this is carefully done, it will often be found that no further water is required for plants in tubs and large pots (10 inches or more). This also is true of heeled-in stock. Ever:yi,ohing, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the plants in tubs and large pots also is true of heeled-in stock. Ever:yi,ohing, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the plants in tubs and large pots also is true of heeled-in stock.

3042. Winter protection. Plants carried over winter in a living condition in an unheated glasshouse.

The great difficulty in keeping plants in good condition is owing to the condensation of moisture within the pits at times when it is impossible to open them on account of severe weather; therefore no more water should be given than is absolutely needed. As long as the weather permits, keep the sashes off or the windows open night and day, and afterward open up whenever possible. On sunny days ventilate whenever the thermometer registers over 20° F., but do not begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the mercury above freezing, remove the sashes entirely. This is the best way to get rid of the moisture-laden air, and is essential for keeping evergreen plants with soft foliage in good condition. To change the air in large cellars is more troublesome; here it is advisable to build an open fireplace in which a brisk fire may be kindled on mild days when all windows can be unclosed, thus obtaining a better circulation than is otherwise possible. Sometimes these large cellars have a line of hot-water pipes or other means of heating, by which not only is better ventilation secured but also additional protection in severe weather.

An unheated greenhouse (Fig. 3042) can sometimes be used advantageously, not only for protection but, if it is warm enough, for growing plants in spring and autumn, and to a certain extent in winter. It is really a pit 6 feet deep built below ground and enclosed thus on the south side to some building already on the place. It might not be satisfactory for the extreme North but in southern New England and the middle states it is a great help: in European gardens it is sometimes called an alpine house, or, if it is larger and better built, a winter-garden. Give a southern exposure and have it so arranged that the floor is on the same or nearly the same level as the cellar floor; if this cellar is heated, so much the better. The cellar will be convenient for various operations, also for storing soil and tools; water should be handy. A door between it and the cellar is a necessity, but there need be none on the outside. The form of roof can be either lean-to or one-third span; in the latter form boarding, double if possible, can cover the roof next the house. Use double glazed glass and provide plenty of ventilation by glass or board shutters. This last is most important. The dimensions should not be less than 10 feet in width and may be more; the length can be any multiple of three so that hotbed sash can be used for the roof. The interior layout should be a walk, not over 2 feet wide, so placed that convenient and economical access is given the plants. These may be grown on benches, either solid or of boards, or planted in the earth. The great advantage of such a structure is that the plants can be handled from the inside in all weathers. The hardier plants, like wallflowers and violets, bloom all winter; in autumn it can be used to prolong the chrysanthemum season, in spring it is a good place for starting seedlings, e. g., lettuce, cauliflower, and cabbage, and, if warm enough, an inside hotbed can be made to start tomatoes, peppers and eggplant also; in it most of the plants named below can be stored or grown. Many plants of doubtful hardiness or of small size can be wintered and tried out. It is much simpler to handle than pits or frames, largely on account of easy access and the storage capabilities of the cellar. It makes a good place to store plants for forcing and will even flower well tulips, hyacinths, and narcissi. A three-quarters span 12 by 15 feet with 8 feet of glass roof, in southern Massachusetts, well protected in all ways, has recorded on a self-registering thermometer only 24° F. in the last three years, outside temperature going as low as —10° F.

Following is a list of plants that may be wintered in pits and frames with satisfactory results. The list is made for the neighborhood of Boston.

3044. A well-ventilated cold pit, roomier than the preceding and not much more expensive.

3043. One of the simplest and least expensive forms of cold pit for small and medium-sized plants.
PLANTING

A. Hardy plants.
1. Nursery stock of every description.
2. Stocks, cions, and cuttings for winter work.
3. Young nursery stock, seedlings, cuttings, or grafted too delicate for planting in autumn.
4. Hardy plants for forcing or winter decoration.

The temperature of pit or cellar for the above plants should be 35° F. or even lower occasionally. The larger plants should be heeled in on the floor in sand or in tank-like shelves along the sides. Instead of loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock is stored in flats or pans in which it has been grown. For forcing stock, see Forcing, pages 1265–1267.

AA. Tender and half-hardy plants.

Those marked with a star (*) are more tender and should not be exposed to frost. They should also be kept in the driest part of the pit.

1. Alstroemeria, canna, dahlia, gladiolus, *Milla biflora, montbretia, oxalis for summer bedding, tuberosa, tigridia, Zephyranthes Atamasco, Z. candida. Keep above in dry house-cellar, where no frost penetrates, temperature 35° to 40° F. Dahlias and cannas can be covered with dry sand if prone to wilt. Tigridias should be hung up in bags to avoid mice.

2. Agave, aloe, Leppa cervidora, Datura suaveolens, some of the hardier cacti, e.g., Selenicereus grandiflorus and Opuntia Ficus-indica, Cordyline indivisa, Yucca gloriosa, *Psidium Guaiava, *Punica Granatum, *A. excelsia, Aucuba japonica, *A. coronaira, Bellis perennis, *Callistemon sorts, Calluna vulgaris, *Camellia (different species, including auricula, Persian ranunculus, Viole odorata (tender sorts), pansies, wall-flowers, lettuce, cabbage, cauliflowers and parsley. These plants are wintered in coldframes, which should vary in depth according to the size of the plants.


The above plants are commonly handled in pits for various reasons. In eastern Massachusetts, with the possible exception of those marked thus (*), they will bear a few degrees of frost, if not too long continued, without harm. The average temperatures of the pit should be just above freezing, say 35° F. The value of these plants depends upon not only carrying them through the winter in good condition, but also in giving them a good start in the spring. For this purpose a cool greenhouse must be provided; a cold grapeery or a house constructed from the sashes used on the pits is equally good, in which the plants can be properly grown until it is warm enough to put them out-of-doors.

4. Anemone japonica and A. coronaira, Bellis perennis, Diathus Caryophyllus (clove pinks and European carnations from seeds), Galax aphytla, myosotis, primula in variety, including auricula, Persian ranunculus, *Viole odorata (tender sorts), pansies, wall-flowers, lettuce, cabbage, cauliflowers and parsley. These plants are wintered in coldframes, which should vary in depth according to the size of the plant; sometimes the plants are grown and flowered in the frame, at others they are bedded out when the season permits.

5. Arisarum, arum, calochortus (different species), freesia in variety, iris (tender species), ixia, sparaxis. The above plants can be potted and carried in a pit or frame until wanted in the greenhouse.

B. M. WATSON.

3046. A small plant-cellar for wintering large plants. It is also excellent for storing vegetables and fruits. It combines perfect ventilation with extremely good protection against frost.
Plants, small trees, and woody vines hardy in the northeastern United States.

The use of shrubs in landscape planting is explained in the preceding articles of this symposium on Planting. The illustrations, Figs. 3048 to 3060 inclusive, indicate the habit of some of the species.

1. before name means plant is low, 6 inches to 2 feet.
2. means plant is small, 3 to 6 feet.
3. means plant is medium, 6 to 8 feet.
4. means plant is large, up to 15 feet.

A means plant is evergreen.
B means plant is a vine.
C means plant is good ground-cover (trailing or creeping).
D means plant is good for edging (low, neat, and compact).
E means plant is semi-evergreen (holding leaves till December or later).
F means plant is medium, 3 to 5 feet.
G means plant is good ground-cover (trailing or creeping).
H means plant is hedge material.
I means plant requires protection in climate of Boston.
J means semi-evergreen (holding leaves till December or later).
K means plant is a vine.
L means plant is good for edging (low, neat, and compact).
V means plant is a vine.

Shrubs, small trees, and woody vines hardy in the northeastern United States.

3048. A good shrub, taking its natural and characteristic form.

P2—Buddleia Davidii (B. variabilis) var. magnifica (if not pruned, may run 3 feet, is slow-growing and easily restrained by clipping).
P3—Buxus sempervirens (must be protected in the North, for it is hardy and tree-like in the South).
P6—Buxus sempervirens var. suffruticosa.
P11—Callicarpa japonica.
P17—Callicarpa purpurea. Both of these callicarpas are tender and require careful cutting back early in spring.

G—Ceanothus americanus.
H—Ceanothus hylidius.
I—Ceanothus thalictroides.
J—Celastrus scandens.
K—Cephalanthus occidentalis.
L—Cercidia pensylvanica.
M—Chamaecyparis obtusa. This is the finest of the Japanese cypresses (Chamaecyparis), all of which were originally introduced in the trade under the name Retinospora. This form will reach 6 to 8 feet, but is dwarf and very slow-growing and may be restrained easily. Its foliage is small and blunt, dark green above with white V-shaped lines below. The spray is in compact, cone-shaped masses arranged laterally, producing very interesting horizontal lines and shadows.
N—Chamaecyparis pisifera. Better than the native hornbeam, C. caroliniana.
O—Chamaecyparis pisifera var. plumosa.
P—Chamaecyparis pisifera var. austrina.
Q—Chamaecyparis pisifera var. calyculata.
R—Chamaecyparis pisifera var. reticulata.
S—Chamaecyparis pisifera var. squarrosa.
T—Chamaecyparis pisifera var. plumosa.
U—Chamaecyparis pisifera var. australis.
V—Chamaecyparis pisifera var. calyculata.
W—Chamaecyparis pisifera var. squarrosa.
X—Chamaecyparis pisifera var. reticulata.
Y—Chamaecyparis pisifera var. australis.
Z—Chamaecyparis pisifera var. calyculata.
DEE—Juniperus commum var. montana (1 foot high).

DE—Juniperus horizontalis (J. Sabina var. procumbens).

DEH—Ilex opaea.

EGPV—Hedera helix.

EG1—Leucothoe Carolina (occasionally 3 feet).

DE2—Juniperus Sabina.....

DE3—Juniperus communis.

HS4—Ligustrum vulgare. the common privet.

3049. A good shrub ruined by the shears.

4—Magnolia denudata (M. Yulan) (tree, 30 to 40 feet).

S—Magnolia grandiflora (M. Virginiana).

4—Magnolia Lirata.

4—Magnolia Soulagesiana.

4—Magnolia stellata.

EP1—Mahonia Aquifolium (2 feet).

EP2—Mahonia japonica (4 feet).

V—Menispernum canadense.

EG1—Mitchella repens (1 to 2 inches; very flat and creeping).

D4—Myrica carolinensis. Can be kept low, very easily by thinning out and renewing from the base. Is still known in commerce as M. cerifera. Ranges north to Nova Scotia near the coast. Is more shrubby, with blunt leaves which are broader and more oblong than those of M. cerifera. This plant is a southern plant, closely related but probably tender in New England. It is more tree-like, with pointed leaves which are narrower and more lanceolate than those of M. carolinensis.

1—Myrica Gale.

2—Nertera alabamensis.

2—Oxeldendrum arboreum.

EP1—Pachistima Canby (4 to 5 inches).

EP1—Pachistima myrsinites (2 to 3 feet).

EP2—Pachistima suspensa (4 to 5 inches).

EP1—Pachysandra terminalis (6 inches to 1 foot).

EP1—Pachysandra myrtifolia.

EP1—Pachysandra japonica.

EP1—Pachysandra micropetala.

3—Philadelphus coronarius (often 10 feet).

3—Philadelphus glaucus (1 to 2 feet).

4—Philadelphus stellatulus (P. Grandiflorus or P. latifolius). Philadelphus (Lemoinei (6 varieties, especially var. V)—Philadelphus microphyllus (this and P. coronarius are the original parents of the Lemoine hybrids).

3—Phlox paniculata (tree, 30 to 40 feet).

4—Physostegia virginiana.

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3—Physostegia virginiana.
PLANTING

2—Prauna pomilla.
3—Prauna tomentosa.
5—Prauna triloba var. flore-pseudo.
5—Prauna tomentosa var. album.

EoHP—Pyracantha coccinea var. pauciflora (plant low, dense, and thorny).

4—Pyrus communis.
4—Pyrus uhalax.
4—Pyrus pyrifolia, Bechtel's variety.
4—Pyrus pubescens (small tree).

4—Quercus ilicifolia (Q. name).

H1—Hamnus catharticus.
H1—Hamnus frangula.

EoHP—Rhododendron arboreum.

EoHP—Rhododendron arborescens (R. Wilsonii).

Eo—Rhododendron, Boule de Neige (white, early).

E—Rhododendron calophylum.

E—Rhododendron catawbiense var. album (this has same habit and color as R. catawbiense, but flowers are white instead of magenta, early.).

E—Rhododendron catawbiense, Lady Armstrong (pink, early to medium).

E—Rhododendron Everest (lavender, early).

E—Rhododendron, H. W. Sargent (red, late).

E—Rhododendron, Mis. Armstrong (purple, bloom, late). 3050. One value of the shrub lies in its bloom—Clethra alnifolia.

E—Rhododendron viscosum.

V—Shepherdia arguta.

V—Shepherdia arguta var. alba.

V—Shepherdia arguta var. flore-pleno.

V—Shepherdia arguta var. thunbergia.

V—Shepherdia arbutifolia (R. Wilsonii).

V—Shepherdia arbutifolia (R. punctatum)

E—Rhododendron, Boule de Neige (white, early).

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E—Rhododendron, Mis. Armstrong (purple, bloom, late). 3050. One value of the shrub lies in its bloom—Clethra alnifolia.
PLANTING

which, though gray dogwood and juneberry and strongly by shrubs with horizontal branches, at least when old. The others have flat clusters of flowers.)

Shrubs for the Middle West.

The most popular shrubs in the Middle West, as in any new country, are usually of foreign origin. However, the native shrubs are becoming to play a part in restoring and intensifying the characteristic beauty of this region. The dominant feature of middle western shrubbery is not apparent to all. This is largely due to the fact that the Middle West contains no unique species that compel universal admiration. The middle western point of view may be indicated by brief notes on a few other species.

Medium-high shrubs, ordinarily 5 to 6 feet: Cornus Canadensis (or C. racemosa*), and C. stolonifera; Viburnum opulus, and its var. acutifolia; Viburnum cassiodides, V. dentatum, V. molle, and V. americanum. The last-named is considered by botanists to be the same as the European V. Opulus, but the American form is considered to be freer from plant-lice and is superior in other ways.

Tall shrubs, suitable for the back of a border, corner of a house, or high foundation: Aralia spinosa*; Cornus alnifolia* and C. rugosa*; Ceanothus americanus; and Physocarpus opulifolius; Viburnum Lentago and V. prunifolium.

Non-stratified shrubs.

Low shrubs: Amelanchier alnifolia and var. pumila; Diervilla trifida; Ecynnus obovata; Prunus pumila; Rhus canadensis (or R. aromatica); Ribes americum; Rosa Virginiana; R. Carolina; R. humilis, and R. setigera; Rubus hispidus; Symphoricarps occidentalis and S. orbiculata.

Medium-high shrubs: Corylus americana; Ecynnus americana; Ilex verticillata; Rhus copallina; R. glabra, and R. typhina; Ribes aureum and R. Cynosbati; Spiraea alba; Symphoricarpus albus.

Tall shrubs: Aronia arbustifolia and A. melanocarpa; Benzoin zavitale; Cephalanthus occidentalis; Staphylea trifolia; Zanthoxylum americanum.

The most significant plants in the above list, probably, are sumac and prairie rose. The sumac (Rhus glabra) was undoubtedly the most virile note on the wild prairie, where the summer foliage took on a wonderful gloss. It is still the most gorgeous color in the corn-belt, where brilliant reds are not commonly developed in autumn. The prairie rose, also known as the Michigan or Illinois rose (Rosa setigera), is now much planted beside front doors. The common wild rose of the open prairie is Rosa humilis, which, however, is familiar in the East, while Rosa setigera is decidedly more western in its range.

The middle western point of view may be indicated by brief notes on a few other species. Ceanothus ovatus is thought to be more refined in cultivation than New Jersey tea and has more "western color; should combine well with Lilium canadense or L. superbum. Cornus racemosa has been called "sunset dogwood" because in autumn its countless red pedicles make a glow like the characteristic prairie sunset; this and erect when young, become intensely stratified when old. This is an important part of the prairie style of landscape gardening. The following lists are therefore classified according to this idea.
sumac are prominent in “sunset gardens.” Cornus
rugosa is a magnificent species, but must have shade.
Although hazel (Corylus) may be considered “coarse” in
the East, its rugged character pleases the Middle
West and its autumn color is unique. Hamamelis vir-
giniana is very popular because its yellow foliage lights
up the autumn woods and because its straggled branches
carry the prairie spirit into the woodland. Sambucus
pubens, the red elder, will not thrive on clay or in fall
sun; it wants shade and prefers sandy soil. Symphori-
A few species commonly classed as woody are more herbaceous than most shrubs and hence more tender; top should be cut to the ground each spring and treated more as hardy perennials. Among these are the following:

**Trailing and climbing vines.**
- *Actinidia arguta.
- *Akikusa japonica.
- *Amelanchier canadensis.
- *Amelanchier; var. aureo-recticulata.
- *Amelanchier; var. Heliana.
- *Amelanchier; var. horizontalis.
- *Amelanchier; var. Engelmanni.
- *Amelanchier; var. arguta.
- *Amelanchier; var. Gordoniana.
- *Amelanchier; var. spectabilis.
- *Amelanchier; var. nigra.
- *Amelanchier; var. alba.
- *Amelanchier; var. rubra.
- *Amelanchier; var. rubriflora.
- *Amelanchier; var. fragrans.
- *Amelanchier; var. speciosa.
- *Amelanchier; var. nivea.
- *Amelanchier; var. grandiflora.
- *Amelanchier; var. purpurea.
- *Amelanchier; var. opulus.
- *Amelanchier; var. sterile.
- *Amelanchier; var. obtusa.
- *Amelanchier; var. pubescens.
- *Amelanchier; var. americana.
- *Amelanchier; var. canadensis.
- *Amelanchier; var. rosea.
- *Amelanchier; var. rubra.
- *Amelanchier; var. arguta.
- *Amelanchier; var. canadensis.
- *Amelanchier; var. rubra.
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- *Amelanchier; var. rubra.
Shrubs and climbers for the South.

Owing to the great diversity of soil, elevation, and climatic conditions found in the Mountain, Piedmont, and Coastal zones of the South, it is impossible to make or to give an absolutely accurate list of deciduous and broad-leaved shrubs and climbers adapted to the three above-named zones. The planter must, therefore, make due allowances for local conditions.

1. Piedmont Zone extends from the Mountain Zone to the Fall Line, which follows approximately the following cities: Weldon and Raleigh, North Carolina, Camden, and Columbus, South Carolina; Augusta, Milledgeville, Macon, and Columbus, Georgia; Montgomery, Alabama; Columbus and Holly Springs, Mississippi.

Deciduous shrubs for the Piedmont Zone.

Amelanchier rotundifolia.
Amelanchier alnifolia.
Amelanchier alnifolia var. alnifolia.
Amelanchier alnifolia var. virginalis.
Amelanchier canadensis.
Amelanchier canadensis var. gaultherioides.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. gaultherioides.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Amelanchier canadensis var. rosea.
Amelanchier canadensis var. pubescens.
Evonymus radicaDB var. vegeta.
Evonymus radicans var. variabilis.

Broad-leaved evergreens for the Piedmont Zone.

Syrmagia persica.
Gelsemium sempervirens flore-pleno.
Clematis virginiana.
Clematis texensis.
Celastrus orbiculatus.
Campsis hybrida.
Ficus pumila.
Elagagnus reflexa.

Hedera helix.

Actinidia arguta.
Actinidia chinensis.
Actinidia delicosa.
Akebia lobata.
Akebia quinata.
Amelopsis arborea.
Antigonon leptopus.
Artemisia absinthium.
Bertacchis rubescens.
Campeis chrysanthus.
Campeis hybrida.
Camptis, Mele, Gallen.
Campeis radicans.
Celastus orbiculatus.
Clematis apiculata.
Clematis crispa.
Clematis Flammula.
Clematis hybridra.
Clematis texensis.
Clematis virginiana.
Decumaria barbara.
Diocorea Batatas.
Elisa reficiens.
Evonymus radicans.
Evonymus radicans var. variegata.

Leucothoe populifolia.
Hydrangea petiolaris.

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2. Coastal Zone extends from the Fall Line, as outlined under the Piedmont Zone, to the Atlantic Ocean and Gulf of Mexico, but exclusive of that part of Florida south of a line drawn across the state to St. Augustine and Cedar Keys.

Deciduous shrubs for the Coastal Zone.

Acacia xanthophloea.
Austroacacia xanthophloea.
Barberis aestivalis.
Barberis darwinii.
Barberis helenae.
Berberis japonica var. latifolia.
Barbara
Barbara
Barbara
Barbara

Thea serrulata.
Persea floribunda.
Persea japonica.
Persea jasminoides var. schipkowskiana.
Prunus lusitanica.
Prunus cerasus.
Prunus spinosa.
Prunus Laevigata.
Ribes aureum.
Hippophae rhamnoides.
Hydrangea arborescens.
Hedera canariensis.
Gelsemium sempervirens.
Evonymus radicans.
Clematis texensis.
Clematis paniculata.
Decumaria barbara.
Clematis Andrewsii.
Campsis chinensis.
Antigonon leptopus.
Rhus canadensis.
Prunus triloba.
Vines for the Coastal Zone.
Rhodotypos kerrioides.
Punica granatum var. alba.
Pnoca japonica.
Punica granatum var. angustifolia.
Trachelospermum jasminoides.
Vitis sylvestris.

Vitis cordifolia.
Vitis rotundifolia.
Wisteria chinensis var. alba.

Wisteria chinensis var. florpo-
plena.
Wisteria multiplena.
Wisteria speciosa.

Broad-leaved evergreens for the Coastal Zone.

Abelia floribunda.
Abelia grandiflora.
Arbutus Unedo.
Ardisia crenulata var. rubra.
Anania amena.
Anania indica.
Analia obtusa.

Hex integra.
Hex latifolia.
Hex vomitoria.
Hex blancanum.
Ixora chinensis.
Ixora latifolia.
Laurus nobilis.

3. Mountain or Upper Zone includes all that territory above Harper's Ferry, Maryland; Roanoke, Virginia; Winston-Salem, Morganton, and Rutherfordton, North Carolina; Spartanburg and Pendleton, South Carolina;
Deciduous shrubs for the Mountain or Upper Zone

Acanthopanax pretchysulus.
Acer japonica.
Aesculus pavia.
Amelanchier alnifolia.
Amelanchier canadensis.
Amelanchier canadensis.
Amelanchier ovalifoilli.
Amelanchier rubrum.
Amelanchier ovalifoilli.
Amelanchier rubrum.
Amelanchier ovalifoilli.
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Amelanchier rubrum.
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Amelanchier ovalifoilli.
Amelanchier rubrum.
Ornamental shrubs for California.

No restrictions have been made in compiling the following list to include every plant of desirable ornamental characteristics that will grow in California. Many exotics are being introduced, some of which have proved highly satisfactory, while others are little known. The effort has been rather to classify under various subheads those shrubs which are undoubtedly suited for the purpose indicated and which have proved well adapted to the various sections of the state.

Many of the deciduous ornamental plants commonly employed in the eastern United States for landscape planting have purposely been omitted, as they fail to produce the same wonderful spring-flower effects under the different climatic conditions of California. Only such deciduous shrubs as bloom freely and seem to have become or more adapted to the drier climate of this state are included.

Because of the great variety of climate and soil conditions throughout the state, it has become necessary to think of it as divided into three general regions—the interior valleys, the San Francisco Bay district, and that part of southern California in the vicinity of the coast.

Those kinds marked with a dagger (†) will thrive only in southern California; those with a star (*) will grow in the South and as far north on the coast as the San Francisco Bay region, while such kinds as have no abbreviation attached will probably grow in all the cultivated areas of the state, including the large interior valleys. With one exception the lists in the chapters are arranged in the order of their desirability for the purposes described by the subhead. By cross-reference the lists should prove helpful in selecting species of certain characteristics for given climatic and cultural conditions to produce the results desired.

Group I. Shrubs which are more or less resistant to conditions created by full shade.

While the larger number of these shrubs will produce the best results in half-shade, or even in full sun if given sufficient water, they are more or less tolerant to conditions existing under live oak trees, in courts, or on the north sides of buildings.

Erica crenata
Erica glabra
Erica vittatil
Vitex cordifolia
Vitex labruscana
Vitex rotundifolia
Wisteria chinensis
Wisteria simulans
Wisteria chinensis var. alba
Wisteria floribunda
Wisteria sieboldiana
Wisteria floribunda

Group II. Shrubs which thrive most successfully in half-shade in California.

Many plants will produce the best results in full sun if favorably moisture conditions can be maintained throughout the summer, but the amount of sun exposure that plants in this list will withstand depends largely...
on the section of the states in which they are located and on the amount of water they receive. Because of neglect aided by the long dry season, they often do better, however, in half-shade where the soil does not dry out so rapidly.

Evergreen:

- *Daphne odora* (3 feet).
- *Eucalyptus* in variety (2 to 5 feet).
- *Coprosma Buxus* (6 feet).
- *Philodendron mexicanus* (6 feet).
- *Abelia grandiflora* (6 feet).
- *Sollya heterophylla* (3 feet).
- *Fuchsia in variety* (6 feet).
- *Aster microphylla* (8 feet).
- *Hydrangea Hortensia* (3 feet).
- *Cotoneaster horizontalis* (2 to 3 feet).
- *Camellia* in variety (8 feet).
- *Hypericum calycinum* (1 foot).
- *Hypericum Mucronatum* (3 feet).
- *Mahonia in variety* (4 feet).
- *Fatshedera japonica* (6 feet).
- *Aucuba japonica* (4 feet).
- *Nandina domestica* (6 feet).
- *Elaeocarpus rubra* (6 feet).
- *Pittosporum Tobil* (12 feet).
- *Pittosporum heterophyllum* (3 feet).
- *Cuphea* in variety (2 feet).
- *Hardenbergia monophylla* (5 feet).
- *Eugenia uniflora* (6 to 8 feet).
- *Heptacodium in variety* (4 feet).
- *Fluophago capensis* (4 feet).
- *Styrax in variety* (2 feet).
- *Olearia ilicifolia* (5 feet).
- *Tetrastigma japonica* (8 feet).
- *Asarabacca bellis* (3 feet).
- *Tilicea sundensis* (3 feet).
- *Jacobina in variety* (3 feet).
- *Strobilanthes Dyeraeana* (3 feet).
- *Templetonia retusa* (3 feet).
- *Thrysera perfoliata* (6 feet).
- *Menthaus major* (4 feet).
- *Tree forms in variety* (6 to 10 feet).
- *Prunus Laurocerasus* (8 to 10 feet).

**Deciduous**:

- *Chimonanthus japonica* (6 feet).
- *Diervilla in variety* (3 feet).
- *Kerria japonica* (6 feet).
- *Diospyros in variety* (4 feet).
- *Berberis Thunbergii* (3 feet).
- *Paeonia suffruticosa* (3 feet).
- *Rhododendron* (3 feet).
- *Rhus in variety* (6 to 8 feet).
- *Philadelphus in variety* (6 feet).
- *Spiraea Van Houttii* (4 feet).
- *Sorbus intermedia* (3 feet).
- *Viburnum Opulus var. sterile* (8 feet).
- *Viburnum tinus in variety* (6 feet).
- *Syringa in variety* (6 to 10 feet).
- *Magnolia in variety* (6 to 10 feet).

**Group III. Shrubs which thrive most successfully in protected sunny locations.**

Many plants, native of countries warmer than California, require warm moist situations.

**Evergreen:**

- *Araucaria* in variety (5 to 20 feet).
- *Acanthopanax spectabilis* (8 feet).
- *Sambucus in variety* (6 to 10 feet).
- *Berberis Darwinii* (6 to 8 feet).
- *Bouvardia Hamboldtii* (5 feet).
- *Rhus australis var. Veitchiana* (6 to 8 feet).
- *Cantua buxifolia* (8 feet).
- *Carissa grandiflora* (4 feet).
- *Chama in variety* (4 to 10 feet).
- *Choisyia ternata* (6 feet).

3060. A bower or arbor of rustic work, with roses and delphiniums.—To show an English scene.

(Garden of S. Charrington, from "Gardening Illustrated").
Group IV. Shrubs resistant to soil and climatic conditions along the California seacoast.

The plants in this list are fairly resistant to the effects of strong prevailing winds and thrive in dry sandy soils containing more or less salt and are therefore valuable for windbreaks and shelter plantings. In general, the finer the foliage and the more willowy or wire-like the branches, the more easily do they withstand the trying conditions. A noticeable exception is some kinds for windbreaks and shelter plantings. In general, the

Evergreen.

Cupressus macrocarpa (10 to 20 feet).
Tanacetum in variety (5 to 8 feet).
Myrica californica (6 to 8 feet).
Anacampseros raimondii (10 to 15 feet).
Euphorbia characias (6 to 8 feet).
Rhus integrifolia (6 to 8 feet).
*Phyllanthus umbellatus (8 to 10 feet).
*Myoporum in variety (8 to 10 feet).

Group V. Shrubs resistant to heat, drought, and neglect.

In some semi-arid sections of California, it is necessary to use plants that will grow more or less success-

fully under conditions of severe heat, drought, and neglect. Plants in this list are especially useful in those situations where no attention can be given after the plant is once established.

Evergreen.

Cassia in variety (10 to 25 feet).
Anemone in variety (6 to 10 feet).

*Echium in variety (10 to 15 feet).
*Pittosporum floribundum (10 to 15 feet).
Olea europaea (10 to 15 feet).
*Pittosporum crassifolium (10 to 15 feet).
Tristania conferta (10 to 20 feet).
*Phlomis arbutifolia (6 to 10 feet).
*Spirea punishiensis (6 to 10 feet).
*Rhamnus californica (8 to 10 feet).
*Crassula in variety (6 to 10 feet).
*Ceanothus in variety (6 to 10 feet).
*Cyrus in variety (6 to 8 feet).
*Ligustrum in variety (8 to 10 feet).
*Callistemon in variety (4 to 8 feet).
*Malaleuca in variety (8 to 10 feet).
*Catia in variety (2 to 4 feet).
*Albizia lohiana (10 feet).
*Parkinsonia aculeata (8 to 10 feet).
*Nerium Oleander (8 to 10 feet).
*Myoporum latum (8 to 12 feet).
*Raphiolepis umbellata (4 to 6 feet).
*Carpenteria californica (6 to 8 feet).
*Conocarphos salicifolius (12 to 15 feet).
*Evonymus japonicus (6 to 8 feet).
*Arctotis Unioio (8 feet).
*Caesia torminosa (8 feet).
*Caescia arborescens (4 feet).
*Leptospermum in variety (6 to 8 feet).
*Eugenia in variety (6 to 8 feet).
*

*Callistemon in variety (6 to 8 feet).
*Malva alba in variety (8 to 10 feet).
*Prunus in variety (8 to 10 feet).

Group VI. Shrubs which are especially free-flowering.

Many species of ornamental shrubs are particularly free-flowering in California, while others possess several flowering periods throughout the year. Because of their tendency to bloom in the fall and winter months, they are especially useful in the more intensively developed gardens where all the-year-round effects are desired.

Evergreen.

Choisya ternata (6 feet).
*Crassula ovata (6 feet).
*Polygala Dalmaisiensis (6 to 8 feet).
*Grevillea Thelomnathiana (4 feet).
*Rhododendron floribundum (6 feet).
*Lantana in variety (4 to 6 feet).
*Fuchsia in variety (6 to 8 feet).
*Sollya heterophylla (6 feet).
*Boronia Darwinii (6 to 8 feet).
*Scaevola rubra (4 to 6 feet).
*Nepeta in variety (6 to 8 feet).
*Belamcanda chinensis (6 to 8 feet).
*Zephyranthes in variety (6 to 8 feet).
*Eucalyptus in variety (6 to 8 feet).
*Leptospermum in variety (6 to 8 feet).

Palms.

Chamaerops humilis (6 feet).
*Phanerococcus Ramonii (15 feet).
*Phoenix canariensis (20 feet).
*Trachycarpus fortunei (20 feet).
*Salix matsudana (12 feet).
*Erythrina chapmanii (15 feet).
*Washingtonia filifera (20 feet).
*Erythrina podalyria (15 feet).

Group V. Shrubs resistant to heat, drought, and neglect.

In some semi-arid sections of California, it is necessary to use plants that will grow more or less success-
Group VII. Shrubs bearing ornamental fruits and berries.

The berried and fruit-bearing ornamental trees and shrubs form one of the most interesting classes of decorative plants. Not only do they produce a flower display throughout the spring and summer months but also add flashes of color for long periods in the fall and winter by their clusters of bright berries or fruits. Only those kinds bearing persistent fruit and of a color contrasting well with green foliage are acceptable in California. Such deciduous berried shrubs as have proved themselves adaptable are included in the list.

Those producing berried effects.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>Pyracantha coccinea</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Pyracantha crenulata</td>
<td>6 feet</td>
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<tr>
<td>Pyracantha angustifolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>Cotoneaster francheti</td>
<td>4 to 6 feet</td>
</tr>
<tr>
<td>Cotoneaster douglasiana</td>
<td>4 to 6 feet</td>
</tr>
<tr>
<td>Cotoneaster horizontalis</td>
<td>2 to 3 feet</td>
</tr>
<tr>
<td>Cotoneaster pannosus</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Cotoneaster acuminata</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Cotoneaster buxifolia</td>
<td>2 to 3 feet</td>
</tr>
<tr>
<td>Cotoneaster microphylla</td>
<td>2 to 3 feet</td>
</tr>
<tr>
<td>Cotoneaster frugida</td>
<td>6 to 10 feet</td>
</tr>
<tr>
<td>Photinia arbutifolia</td>
<td>8 to 10 feet</td>
</tr>
<tr>
<td>Myrtus ugni</td>
<td>4 feet</td>
</tr>
<tr>
<td>Duranta Plumieri</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Berberis Darwinii</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Hex Aquifolium</td>
<td>6 to 10 feet</td>
</tr>
<tr>
<td>*Cebrera elegans</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Cebrera auristigina</td>
<td>8 to 8 feet</td>
</tr>
<tr>
<td>*Pittosporum thomsonianum</td>
<td>10 to 15 feet</td>
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<tr>
<td>*Pittosporum viridiflorum</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Pittosporum stenoptera</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Arbutus Menziesii</td>
<td>10 to 20 feet</td>
</tr>
<tr>
<td>*Lychnis chamaeefolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>Rhamnus californica</td>
<td>8 to 10 feet</td>
</tr>
<tr>
<td>Rhamnus croceus</td>
<td>4 feet</td>
</tr>
<tr>
<td>*Nandina domestica</td>
<td>6 feet</td>
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</tbody>
</table>

Deciduous.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elaeagnus umbelata</td>
<td>10 feet</td>
</tr>
<tr>
<td>Symphoricarpos albus</td>
<td>4 feet</td>
</tr>
<tr>
<td>Crataegus coeruleus</td>
<td>10 feet</td>
</tr>
<tr>
<td>Berberis Thunbergii</td>
<td>6 feet</td>
</tr>
<tr>
<td>Sorbus aucuparia</td>
<td>10 to 15 feet</td>
</tr>
<tr>
<td>Symphoricarpos vulgaris</td>
<td>3 feet</td>
</tr>
<tr>
<td>*Nandina domestica</td>
<td>6 feet</td>
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</tbody>
</table>

Those producing fruit effects.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>*Eugenia myrtifolia</td>
<td>10 to 15 feet</td>
</tr>
<tr>
<td>*Eugenia uniflora</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Cornus capitata</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Fusidium in variety</td>
<td>4 to 8 feet</td>
</tr>
<tr>
<td>*Astrupia japonica</td>
<td>4 feet</td>
</tr>
<tr>
<td>*Eriobotrya japonica</td>
<td>10 to 12 feet</td>
</tr>
<tr>
<td>*Fujis Sillouwana</td>
<td>8 feet</td>
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</table>

Deciduous.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>*Eugenia europaea</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>*Eugenia alata</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>Ribes spectabile</td>
<td>4 feet</td>
</tr>
<tr>
<td>*Pitcaea thomsoniana</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Halesia speciosa</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Cotoneaster'froucida</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Chamaecytis japonica</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Pyrus floribunda</td>
<td>10 to 12 feet</td>
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</tbody>
</table>

Group VIII. Shrubs for hedges (California).

Many shrubs of a compact habit may be used as hedge-plants. 'In those, however, a fairly well-estab-

lized group of desirable species that lend themselves more easily to training of this kind. Those listed below are used extensively for hedges and have been found to adapt themselves readily to the severe system of trimming and to produce the dense and compact form desired.

Low edgings or boxings (6 to 18 inches).

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>Berberis Darwinii</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>*Buxus sempervirens var. suffruticosa</td>
<td></td>
</tr>
<tr>
<td>*Eugenia myrtifolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>Lonicera nitida</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Myrtus communis var. microphylla</td>
<td></td>
</tr>
<tr>
<td>Myrtus Ugni</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Eucalyptus pubescens</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Lithocarpus Erythrocarpus</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Philadelphus fringillifolius</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Malvaviscus molhis</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Cotoneaster franchetii</td>
<td>4 to 6 feet</td>
</tr>
<tr>
<td>*Eugenia myrtifolia</td>
<td>10 to 15 feet</td>
</tr>
<tr>
<td>*Alyssum fruticosum</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Myrtus communis</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

Small hedges (6 to 8 feet).

<table>
<thead>
<tr>
<th>Plant Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Berberis Darwinii</td>
<td>6 to 8 feet</td>
</tr>
<tr>
<td>*Eugenia myrtifolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Eugenia uniflora</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Buxus sempervirens</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Taxus baccata</td>
<td>6 feet</td>
</tr>
<tr>
<td>Lonicera nitida</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Myrtus communis var. myrtifolia</td>
<td></td>
</tr>
<tr>
<td>Prunus ilicifolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Pittosporum tenuifolium</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Pittosporum eugenioides</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Myrtus communis</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Elaegna arborea</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Acromeria decora</td>
<td>6 feet</td>
</tr>
<tr>
<td>*Rhamnus californica</td>
<td>8 to 10 feet</td>
</tr>
<tr>
<td>*Nandina domestica</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

High hedges (8 to 12 feet).

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Pittosporum tenuifolium</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Pittosporum eugenioides</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Pittosporum undulatum</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Pittosporum viridiflorum</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Arbutus Menziesii</td>
<td>10 feet</td>
</tr>
<tr>
<td>*Lychnis chamaeefolia</td>
<td>6 feet</td>
</tr>
<tr>
<td>Rhamnus californica</td>
<td>8 to 10 feet</td>
</tr>
<tr>
<td>*Rhamnus croceus</td>
<td>4 feet</td>
</tr>
<tr>
<td>*Nandina domestica</td>
<td>6 feet</td>
</tr>
</tbody>
</table>

Group IX. Shrub for ground-covers (California).

There are often banks and slopes where a lawn would be too expensive to maintain and unless covered with green foliage would remain unsightly. Other situations, especially under and between trees and large shrubs, would be materially improved if the ground-surface were covered with woody vines and trailing shrubs. It will be necessary to prune out the leader or upright stem of many of these shrubs to encourage their spreading or horizontal growth.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juniperus chinensis var. procumbens</td>
<td>3 feet</td>
</tr>
<tr>
<td>Juniperus sabina var. tanacetifolia</td>
<td>3 feet</td>
</tr>
<tr>
<td>*Salvia triminimia</td>
<td>6 feet</td>
</tr>
</tbody>
</table>
Group X. Shrubs for quick effects (California).

Many shrubs are of rapid growth and if given heat and moisture will produce very quick effects. They are, therefore, especially suitable for screens, barriers, and nature effects in recently created gardens.

Myoporum laetum (8 to 12 feet).
Alfuzara lagophylla (10 feet).
Leptospermum levigatum (6 to 10 feet).
Arctostaphylos in variety (6 to 15 feet).
Spartium junceum (5 to 15 feet).
Ceanothus spinosus (6 feet).
Arbutus Menziesii (10 to 15 feet).
Prunus ilicifolia var. integrifolia (10 to 15 feet).
Photinia arbutifolia (8 to 10 feet).
Carpenteria californica (6 to 8 feet).
Lyonothamnus floribundus var. asplenifolius (15 to 20 feet).

Group XI. Especially choice and neat shrubs.

Those shrubs which are free-flowering, compact, and possess interesting and well-arranged foliage, are much in demand for the more intensively developed parts of a garden. They are particularly suitable for use on small house grounds, in formal gardens, and around the base-line of buildings.

Erica in variety (4 feet).
Dracaena crenellata (3 feet).
Eugenia myrtifolia (2 feet).
Philadelphus pachysanmus (5 feet).
Rhododendron floridum (4 feet).

Group XII. Ornamental native shrubs.

While the native shrubs of California are not, in many cases, so effective and attractive for landscape purposes as most of the exotic material used, there is a growing interest in their ornamental qualities. They may be employed extensively to give character to the extremely naturalistic home grounds and to the typically California garden. Only the more ornamental species in general cultivation are listed below.

Carpenteria californica (6 to 8 feet).
Ceanothus thyrsiflorus (8 feet).
Phlox subulata (8 to 10 feet).
Lysimachia nummularia var. bulbifera (15 to 20 ft).
Prunus ilicifolia var. integrifolia (10 to 15 feet).
Arbutus menziesii (10 to 20 feet).
Arbutus arborescens (8 to 10 feet).
Canthius spinosus (6 to 8 feet).
Ceanothus spinosus (8 to 10 feet).
Garrea fremontii (6 feet).
Romneya coulteri (6 feet).
Ribes 'amethystum' (4 feet).
Viburnum opulus (3 feet).
Mahonia aquifolium (4 feet).
Kalmia latifolia (8 to 10 feet).
Rhododendron floridum (6 feet).
"Rhus ovata (6 to 8 feet).
"Bignonia coccinea var. lilacina (4 feet).
"Umbellularia californica (15 to 30 feet).
"Ceanothum velutinum (8 feet).
"Gaultheria Shallon (2 feet).
PLANTING

2. Vines producing light open tracery.

Vines to be ornamental should decorate and not entirely cover. Their chief purpose is to soften and partially break hard architectural lines. It is the contrast between foliage and background which produces decorative effect. Vines of this section are especially good for columns, walls, and frames.

a—Aristolochia serpentaria.
b—Aristolochia durior.
c—Aristolochia tomentosa.
d—Aristolochia gigantea.
e—Aristolochia aurea.
f—Aristolochia saligna.
g—Aristolochia rotundifolia.
h—Aristolochia elegans.
i—Aristolochia roxburghii.

3. Vines as ground-covers on slopes, embankments, and under trees.

Vines require little care, hold the soil and make a permanent effect in those situations where the soil is too poor or too shady to maintain a satisfactory lawn.

a—Bignonia capreolata.
b—Bignonia australis.
c—Bignonia cordifolia.
d—Bignonia sarmentosa.
e—Bignonia bossellula.
f—Bignonia purpurea.
g—Bignonia californica.
h—Bignonia lontana.


Because of their various ways of clinging to rough surfaces, these vines need no support. They should not be grown on wood surfaces which are to be painted.

a—Bignonia capreolata.
b—Bignonia australis.
c—Bignonia cordifolia.
d—Bignonia sarmentosa.
e—Bignonia bossellula.
f—Bignonia purpurea.
g—Bignonia californica.
h—Bignonia lontana.

5. Vines for quick effects.

Useful to obtain mature effects in gardens. Rapid-growing deciduous vines are especially desirable for porches, pergolas, and arbors located in the large interior valleys.

a—Actinidia chinesis.
b—Actinidia macrophylla.
c—Actinidia deliciosa.
d—Actinidia arguta.

John Wm. Gregg.
K. T. Stevens.

Vines for California.

In countries where there is a maximum of sunlight, vines become a most important class of plant-material. The many vines used in California are roughly divided into classes according to the climatic divisions of the state.\textsuperscript{3} Tropical and semi-tropical evergreen vines find most favor in southern California, where gorgeous coloring and luxurious growth appear most in harmony with the landscape; while the half-hardy evergreens and the choicest deciduous vines are most suitable for use along the central California coast. On the other hand, the vine which loses its foliage in winter finds the greatest favor in the interior sections of the state, although such few evergreens as withstand several degrees of frost are often employed for decorative purposes. When very quick effects are wanted, the annual vine is often used.

All vines except those clinging to rough surfaces need substantial support, while most vines require a certain amount of thrining and training. The tendency is to neglect the plant after it is once established and allow it to form thick unsightly masses of stems near the top of the support, thereby destroying such decorative beauty as the vine may possess. Vines should not be "headed back" or heavily pruned unless the plant is to be renewed, as a coarse rank growth is encouraged. If possible, choose strong stems as leaders and train in a fan-like manner so as finally to cover the desired area. Spring-flowering vines should be pruned soon after blooming, while summer- and fall-flowering vines may be thinned in the spring. The foliage of evergreen vines may be best reduced by careful selective thinning immediately after a blooming period. Always begin to train a vine as soon as possible; do not wait for it to begin to climb.

No climbing roses have been included in the following lists, as it is felt that they should be considered as a separate class of plant-material. Such vines as are not marked with "D" or "A" are evergreen, while those with an "o" or "x" are hardy. D—deciduous; A—annual; o—not resistant to frost; x—resistant to 10\textdegree to 12\textdegree of frost.

1. Vines which cover objects and surfaces densely.

The vines in this list have a tendency to cover their supports entirely, making a dense screen and thereby destroying architectural lines.

D—Actinidia chinesis.
a—Actinidia arguta.
x—Bignonia capreolata.
D—Bignonia australis.
x—Bignonia cordifolia.
D—Bignonia sarmentosa.
D—Bignonia bossellula.
D—Bignonia purpurea.
D—Bignonia californica.
D—Bignonia lontana.

D—Actinidia chinesis.
a—Actinidia arguta.
x—Bignonia capreolata.
D—Bignonia australis.
x—Bignonia cordifolia.
D—Bignonia sarmentosa.
D—Bignonia bossellula.
D—Bignonia purpurea.
D—Bignonia californica.
D—Bignonia lontana.
PLANTING

5. Trees somewhat resistant to shade.
Good for courts, north sides of buildings, under trees and on shady slopes.

6. Trees somewhat resistant to drought.
Vines are largely adapted to cool moist forest floors where the soil is deep and loose, but the following will endure a certain amount of drought and hard clay soils.

7. Vines somewhat resistant to shade.
Good for courts, north sides of buildings, under trees and on shady slopes.

8. Vines somewhat resistant to drought.
Vines are largely adapted to cool moist forest floors where the soil is deep and loose, but the following will endure a certain amount of drought and hard clay soils.

PLANTING

For this purpose vines should not be allowed to make too heavy top growth and they should be so trained that a certain amount of their foliage is pendent.

10. Foliage vines for California.
Many vines are especially ornamental because of their foliage effects. Those with smooth bright green closely arranged leaves are most desirable.

Many vines are especially ornamental because of their foliage effects. Those with smooth bright green closely arranged leaves are most desirable.
palmately lobed leaves and small greenish flowers in dropping heads, followed by similar heads of fruits remaining on the branches during the winter. The smooth light-colored often almost creamy white bark of the branches and limbs, usually mottled by darker blotches of the older bark, which peels off in large thin plates, gives the tree a very characteristic appearance in winter, while in summer the plane-tree, with its large head of dense bright green foliage and with its massive trunk is a beautiful and majestic shade tree. The native P. occidentalis is hardy North and P. acerifolia and P. orientalis hardly as far north as Massachusetts, while the southwestern and Mexican species cannot be cultivated in the North. From time immemorial, the oriental plane, which was well known to the ancient Greek writers, has been famous for the large size it attains—trunks of 30 feet in diameter and more are reported to exist—and has been planted as a shade tree in western Asia and southern Europe, and today it is still one of the favorite street trees throughout the temperate regions of Europe. It has also been recognised in this country as one of the best street trees, even to be preferred to the native plane, which, unfortunately, suffers from the attacks of a fungus, Gloeosporium nervisecatum, while the oriental is not injured by it. The plane-trees stand pruning—even severe pruning—well. To what extent they are sometimes pruned in European cities without losing their vitality is shown in an interesting illustration in "Furset Leaves," Vol. III, p. 97. They are also easily transplanted even as larger trees. They grow best in a deep and rich moist soil. 

Propagation is by seeds sown in spring and only slightly covered with soil and kept moist and shaded; also by cuttings of ripened wood and by greenwood cuttings under glass in June taken with a heel, and sometimes by layers. Varieties are also sometimes grafted in spring on seedlings of one of the species. The stellate hairs of the young leaves when detached by the wind, sometimes float in great quantities in the air and are liable to cause irritation and sometimes inflammation of the mucous membranes of the eye, nose, and mouth. But as this is likely to occur only during a very limited period late in spring it can hardly be considered as a serious objection to the use of Platanus as a street tree.

3061. Platanus racemosa.

3062. Platanus acerifolia. (X about 1/4)
pyramidalis, Jaen. (P. pyramidalis, Bolle). Of pyramidal habit; lvs. usually 3-lobed, often longer than broad, with usually rounded base. Var. tubifera, Jaen. (P. superba, Hort.). With very conspicuous elongated, tubular stipules. There are also some forms with variegated lvs. Var. Süssneri, Hort., with the lvs. spotted and marked white, and var. Kelloggiana, Schmidt. (var. aureo-variegata, Hort.), with yellow-variegated lvs.—The London plane is more generally planted under the name of the oriental plane than the true P. orientalis. It resembles in foliage more the American plane and is of more pyramidal habit than the oriental plane, which in its typical form has a broad head, with wide-spreading branches, deeply divided, 5-7-lobed lvs., and the fr.-heads usually in 3’s and 4’s. It is somewhat harder than the oriental plane.

occidentalis, Linn. BUTTONWOOD. BUTTONBALL. AMERICAN PLANE-TREE. Also wrongly called SYCAMORE. Fig. 3063. Large tree, attaining 180 or occasionally 170 ft., with a round-topped oblong or broad head and with a trunk 10 ft. or exceptionally more in diam., often of considerable height: bark of limb and branches of very light often almost creamy white color, at the base of the trunks dark brown, fissured: stipules large, with toothed margin: lvs. as broad or broader than long, truncate or cordate, rarely cuneate at the base, usually 3-, sometimes 5-lobed, with shallow sinuses; lobes shorter than broad, coarsely toothed or cleft; floccose-tomentose when young, at maturity only pubescent on the veins beneath, 4-9 in. broad: fr.-heads solitary, rarely in 2’s, on 3-6-in.-long peduncles, about 1 in. across or more, comparatively smooth at length; nutlets with obtuse apex, with the 327. G.F.2:354, 355; 9:55. Em. 1:261, 263. Gng. Onto and Minn., south to Fla; and Texas. S.S. 7: 326, 4:343. Mn. 3, p. 69; 5, pp. 205, 209.—The most massive and perhaps the tallest of all deciduous trees of Amer. and an excellent street and park tree where it is planted as a street tree in Mex., P. Lindeniana, Mart. & Gal., and P. glabra, Donn., all natives of Mex., are not yet intro.

ALFRED REHDER.

PLATÖNIA (from a personal name). Gutiferae. Trees, little known as yet in cult.: lvs. leathery, closely and finely feather-veined: fr. large, rose, solitary, terminal, perfect; sepal 5, imbricate; petals 5, much larger than the calyx, scarcely convolute into an ovoid corolla; stamens 5; ovary 5-lobed: fr. a fleshy indehiscent 5-lobed edible berry. Two species from Brazil. P. insignis, Mart. Large tree: lvs. coriaceous, oblong-acute: fr. solitary, terminal, showy; sepal suborbiculate, 2 outer smaller; petals broad-ovate, rose outside, white inside; ovary ovoid: berry subglobose or oval. Brazil. Intro. and distributed by the U. S. Dept. of Agric.

PLATYCARYA (Greek for broad, and nut; alluding to the shape of the fruit). Syn., Fortunella. Juglandaceae. A monotypic genus distinguished from all other Juglandaceae by its fertile fr. forming an upright conic spike. Small deciduous tree: the branches with solid pith: winter buds with imbricate scales; lvs. odd-pinnate, similar to those of Carya Pecan, but smaller: staminate catkins axillary; pistillate terminal, solitary: fr. a small, winged nut in the axis of densely imbricated, rigid and sharply pointed lanceolate bracts forming a terminal upright cone. Rarely cult. and not hardly north of the Miss. states. It has graceful foliage, but its ornamental value is not great. Prop. by seeds and by layers, probably also by grafting on Carya.

strobilacea, Sieb. & Zucc. (Fortunella sinensis, Lindl.). Small tree. lvs. oblong-obovate, serrate, pubescent only on the midrib beneath, 3-4 in. long: fr. heads solitary, rarely in 2’s, on 3-6-in.-long peduncle, about 1 in. across or more, comparatively smooth at length; nutlets with acute apex, with the rest of the style 5-in. long or shorter. May, Maine to Ont. and Minn., south to Fla. and Texas. S.S. 7:326, 327. G.F.2:354, 355; 9:55. Em. 1:291, 293. Gng. 4:343. Mn. 3, p. 69; 5, pp. 205, 209.—The most massive and perhaps the tallest of all deciduous trees of N. Amer. and an excellent street and park tree where it is not injured by fungous diseases. A doubtful variety is var. hispánica, Wessmuel (P. hispanica, Lodder.). Lvs. large, 3-5-lobed, with very shallow sinuses, coarsely toothed, usually cordate at the base. Gn.1, p. 688; 20, p. 370.—The P. densicoma, Dodge (B.S.D. 1908:68), described as having usually truncate or broadly cuneate lvs. and 1-3 heads with acutish nutlets is probably not different from P. occidentalis or may belong to P. acerifolia.

P. suárezii, Spach, comprises all species of the genus.—P. Wrightii, Watts. Tree, to 80 ft., often divided into several trunks: lvs. usually cordate or truncate, deeply 3-5-lobed, with lanceolate, acuminate, entire or dentate lobes; tomentose beneath or nearly glabrous at length, 5-8 in. long; fr.-heads raceme, rather smooth, each on a short stalk. New Mex. and Ariz. to Calif. S.S. 7:329.

The other species, as P. mexicana, Motte, which is sometimes
is the only species that does not produce suckers at the roots, by which all the others are easily propagated. It alone must be raised from spores, a long and anxious process. The only kind that has an erect and rigid habit is \textit{P. Hillii}, which therefore is grown in pots while all the others may be grown on a block of wood, and some in baskets. \textit{P. biforme} differs from all others in having a separate and specialized structure on which the sori are borne, the other kinds bearing their spore-masses on the surface of the fertile fronds at or near the last forks. \textit{P. biforme}, though it has been advertised, is probably nowhere in cultivation in the world. There is an improved form of the common type known as \textit{P. alcericorn} var. \textit{majus}, which is stronger-growing and has thicker fronds, enabling it to endure a drier atmosphere. It is therefore one of the best, if not the best, for exhibition purposes. At the other extreme from the slender grace of \textit{P. alcericorn} and the rest is the bold and broad style of \textit{P. zanthoicum}. The only one which bears no resemblance to antlers is \textit{P. angolense}. All the species require a moist atmosphere, though the humidity should be reduced during the winter. With the exception of \textit{P. alcericorn} they all demand a high temperature. All need perfect drainage, and in winter they should not have too much direct syringing, for they need a slight rest and are likely to spot or damp-off if water remains on the foliage too long. \textit{P. zanthoicum} is said to be particularly sensitive. Stag-horn ferns are often grown on pieces of tree-fern stem. They are fastened to such support or to a board by means of wire, having first furnished the roots with a slat piece of peat for roothold and some sphagnum moss, to which may be added a little bone-meal for food and some charcoal for drainage. A little moss may be added every year or two. Eventually the barren fronds will entirely cover this material and the plants should then be left undisturbed for years. A stag-horn fern, with antlers spreading 6 or 8 feet, is a sight never to be forgotten. (W. H. Taplin and F. L. Atkins.)

\textbf{a. Plants not forked like a stag-horn.}


\textbf{bb. Plants resembling a stag-horn.}

\textit{biforme}, Blume. According to Blume's plate and description, this differs from all other kinds in having the spores borne on a special appendage, which is kidney-shaped and attached below the first fork. Blume says there are 2 such appendages; that the barren lvs. are roundish, entire below, lobed above: fertile lvs. 3-5 ft. long, many times forked, pale green. Moore says: "Fertile fronds in 3's, elongate, pendent, with scarcely any disk, bipartite for about two-thirds of their length, one of the margins of each primary branch entire, the other bearing numerous lobes in about three series on a dichotomous plan." Strong features of this plant are the length, narrowness and acuteness of the forks, and also the narrowness of the "disk" or unbranched portion just below the primary forks. Java. G.C. II. 3:303 (repeated in III. 10:701 and 28:431). A.G. 15:111. Gn. 10, p. 385 (repeated in Gn. 30, p. 300).

\textbf{cc. Barren lvs. not stag-horn-like, entire or merely lobed.}

PLATYCLINIS (Greek, broad bed; in allusion to the elon- 
guim as the thread-like racemes arching from 
the densely tufted green foliage give the 
plants a pleasing appearance; sepal and petals 
spreading; labellum 3-lobed; column short, with an 
equal-toothed elon- 
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dropping racemes 6-10 in. long, small and not 
showy, but the thread-like racemes arching from 
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conical, loculicidal within the lobes of the calyx, 5-6 valved.—One species, E. Asia and Japan. This plant was first placed in Campanula by Jacquin, and later, by Schrad, in Wahlenbergia; and it is still sometimes cult. under these names. In 1860 it was made a separate genus (Platydon) by A. De Candolle. It is distinguished from Campanula by its broadly cup-shaped fls., the stamens dilated at the base, and the caps. opening at the top and not at the sides.

From Wahlenbergia it differs in the form of the caps. being opposite to the calyx-lobes instead of alternate with the sepal. Several supposed species have been described at different times, but there seems to be no doubt that the genus is distinctly monotypic and that all forms can be referred, as forms of the type P. grandiflorum, which has been widely distributed and thereby greatly modified. It has been found in a wild state from Dahuria to Manchuria, in China, in Siberia, Korea, and Japan.

Platydon requires a medium sandy loam, and does not succeed in either extremely stiff or sandy soils. It is particularly sensitive to ill-drained soils. Under suitable soil conditions it is perfectly hardy and will even stand considerable neglect. It is desirable to keep the stems tied during the season, for if once allowed to fall they can never be raised without breaking. In autumn the old stems should not be cut away, but the plant allowed to die off naturally; otherwise the crown may be injured. It can be propagated either by division or by seedling; the latter being more surely successful and therefore preferable; besides, a greater variety of flowers is obtained in this way. More care and skill are necessary in propagation by division, because of the fleshy rootstock. It is best accomplished in spring, when the plant is breaking into new growth.

One of the best single varieties of P. grandiflorum is "Die Fee," large and very free-flowering, sky-blue. Of the numerous semi-double and double sorts may be noted Coos & Koennemann's German introductions: Capri, deep blue, medium tall; Multiflora, with thickly set clear blue bells; Siedenball, lilac-purple, and the dark blue Vineta. Of French origin are Cloche bleue, navy blue, and Gloz azuré, sky-blue. (Richard Rothe.)

**PLATYLEPIS 2711**

Saxifragaceae. A monotypic genus allied to Hydrangea. The species is a woody plant, with opposite serratate lvs. and white, comparatively large fls. in long-peduncled, loose cymes, the marginal ones sterile and with enlarged calyx; petals 4; stamens numerous; fr. a 2-celled many-seeded dehiscent capsule. It is not hardy N. and of little decorative value. It thrives best in rather moist, porous soil and partly shaded position and is easily prop. by seeds, Greenwood cuttings under glass, or layers.

**arg Hydrangea.** The species is a woody plant, with opposite serratate lvs. and white, comparatively large fls. in long-peduncled, loose cymes, the marginal ones sterile and with enlarged calyx; petals 4; stamens numerous; fr. a 2-celled many-seeded dehiscent capsule. It is not hardy N. and of little decorative value. It thrives best in rather moist, porous soil and partly shaded position and is easily prop. by seeds, Greenwood cuttings under glass, or layers.

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lateral not reflected in the middle, narrower petals, and a lip not constructed in the middle. Maucauren Is. Both species have been intro. at Ken Gardens, but probably are not in general cult. Stovehouse plants.

F. TRACY HUBBARD.

PLATYLOMA is a name for ferns of the genus Pellaea, which have a narrow indusium and a broad sorus. For P. Bridgesiana and P. falces, see Pellaea.

PLATYSTELOMON (Greek, broad, thread; referring to the broadened filaments). Papaveraceae. Low annual herbs generally branched at the base, sometimes grown in flower-gardens.

Stems erect or decumbent, glaucous: leaves alternate or subopposite, linear or oblong-lanceolate: fls. usually erect and solitary; sepals 3, ovate, caducous; petals 6, sometimes more, yellowish white or yellow or white, caducous or rarely persistent; stamens numerous; ovaries 6-20, distinct: fr. at maturity many carpels totally distinct or slightly joined, carpels moniliform.—About 60 species natives of the Pacific Coast according to Fedde (Engler's Pflanzenreich, hft. 40. IV. 104). 1 species according to Gray and a large number of American authors. Platystemon grows wild throughout Calif., except in the mountains, and is said to prefer a loose soil.

PLATYPNOS (Greek, broad stigma). Papaveraceae. Low slender California annuals with pale yellow fls. less than 1 in. across. They are among the few plants of the poppy family with entire lvs. They are closely allied to Platystemon, but differ in having the filaments thread-like, the stamens numerous, free; stigmas not constricted in the middle. Mascarene PlatyPNOS (P. leiocarpus, Fisch. & Mey.).

PLATYSTIGMA (Greek, broad stigma). Papaveraceae. Low annual herbs generally branched at the base, sometimes grown in flower-gardens.


P. lineare, B.C. 44:290.—This plant deserves to be better known. It is frequently improperly called the California poppy, but the true California poppy is Eschscholzia californica, the "California poppy." F. TRACY HUBBARD.

PLATYTHECA (Greek, broad anther-cells). Tremandraeae. Small shrub, somewhat heat-like, suitable for greenhouse culture.

Leaves whorled: fls. 5-merous, numerous, borne toward the end of the branches, light purple, about 1 in. across, center marked with a red star; stamens numerous; free; stigmas not constricted in the middle. Four species from Calif. and Ora. P. lineare is the only one with thick stigmas and also differs in its fls. from the other two in having the anthers jointed with the filaments; in Platythea the anthers have 4 cells all in the same plane; in Tetraphala the anthers are 2-celled or 4-celled, with 2 or 4 front of the cells.

gaioides, Steetz (P. gaioides, L.). Lvs. linear, 3 in. long, about 1 in a whorl, hairy. Said to bloom in June. F.M. 13:171 (as Tetraphala gaioides). G.C. III. 44:290.—This plant deserves to be better known. Cuttings of half-ripened wood root freely under a bell-glass in a shaded house at 60°. Cuttings rooted in February or March will make good plants in 5-inch pots in one year. In summer keep them plunged outside, but covered with shaded sash. By trimming frequently they will make well-shaped plants, needing no supports. Kept in a coolhouse (45°) during winter, they will be covered with bloom in March and April. The fls. last but a short time, but the plant is so free that it is always covered with the blue bloom.

H. D. DARLINGTON and WILHELM MILLER.

PECTOCOMIA (Greek, plated hair; application obscure). Palmaeae. Six species of East Indian climbing pinnate palms which fruit once and then die.

One of the most interesting species is P. khosyana, which is figured in B.M. 5105 under the erroneous title of P. assamica. This species has a slender st. 60-80 ft. long, and about as thick as a man's arm, being slightly thicker above than at the base. The lvs. attain 30 ft. and are pinnate only in the lower half, the rest of the fr. being a long whin-like extension of the rachis of the fr. A singular feature of this palm is the device by which it climbs. This consists of a series of compound spines shaped like a downward-pointing human hand, the back of the hand being yellow and the 5 or 6 fingers composed of brown spines. These organs are scattered all along the lower side of the flattened rachis. They hook on the branches of trees and thus enable the palm to climb for light. Probably all the species possess these flagelliform lvs. and remarkable spines. The whip-like fr. tips may act as tendrils. The genus is little known to cultivators. It is allied to the rattans (Calamus), which also are climbers.

tongata, Mart. & Bl. Lvs. large; fls. 1-1½ ft. x 2 in., sparsely white powdery beneath, with 3 very slender parallel nerves or costae; fr. 1 in diameter, the rachis 30 ft. and are pinnate only in the lower half, the rest of the fr. being a long whin-like extension of the rachis of the fr. A singular feature of this palm is the device by which it climbs. This consists of a series of compound spines shaped like a downward-pointing human hand, the back of the hand being yellow and the 5 or 6 fingers composed of brown spines. These organs are scattered all along the lower side of the flattened rachis. They hook on the branches of trees and thus enable the palm to climb for light. Probably all the species possess these flagelliform lvs. and remarkable spines. The whip-like fr. tips may act as tendrils. The genus is little known to cultivators. It is allied to the rattans (Calamus), which also are climbers.

PLECTRANTHUS (Greek, spur flower; alluding to the swollen base of the corolla-tube). Labiatae. Herbs and subshrubs, bearing rather small flowers ranging from blue and purple to lilac; sometimes planted for ornament in warm countries.

Inflorescences various; calyx 5-toothed, the teeth equal or variously 2-lobed; corolla-tube exerted, swollen behind at the base; limb 2-lobed; stamens 4, filaments toothless, free; nutlets ovoid or oblong, smooth or minutely punctulate.—About 120 species from the tropical and subtropical regions of Afr. and Asia to Japan, Austral, and Polynesia. The genus is closely allied to Coleus, being distinguished by having the stamens free instead of united at the base into a tube, which is distinct from the corolla. In other respects the genus has wide limits of variation. Sometimes called cockspur-flower. Prop. by cuttings which root easily.

fruticosus, L'Hér. South African shrub, 3-4 ft. high; lvs. 4 in. or more long, petiolar, broadly ovate, doubly dentate; racemes laxly panicled; whorls about 3-6-fl.; fr. blue; pedicels 1½ in. long; fr. 6-8 in. long; fruit above the base; fruiting calyx declimate.—Said to be an elegant shrub; a specimen reported at Los Angeles is 4 ft. high and 6 ft. through.

P. sclerocladus, N. E. Br. A tall branched herb with broadly ovate lvs. 2-4 in. long; racemes crowded, spike-like; corolla white
and bluish. Trop. Afr.—P. centropogon, Baker. About 3 ft. high, with slender branches; lvs. petiolar, toothed not unlike those of the common nettle; fls. in terminal loose panicles 6 in. long, long-stalked and light blue. Fls. in winter. Trop. Afr.—P. ciliata, K. & N. V. St. covered with purple hairs; lvs. broad, bright green above, purple beneath with purple spots. S. Afr. A tree recently intro. into Italy.—Stud to be a showy autumn- and winter-flowering plant with a compact habit.—P. Cupanian, Neck. A quick-growing species with red-tuberous and also axilary ones produced in the axil of the branch-nodes. Trop. Afr. This species is cult. and the production made in the Soudan.—P. ocilla, N. E. Br. A stout subshrub, covered with velvety hairs; lvs. ovate, 3-6 in. long, short-petioled, crenate, upper surface rich velvety green, under surface whitish; stamens 5; ovary with 3-6-celled: frs. somewhat compressed, broad-ovoid, compressed, didymous, 2-stoned; stones indehiscent, 1-seeded.—About 150 species of shrubs or small trees, found in the Old World, mostly in the Tropics.

PLECTRONIA (Greek, much, fr. referre, to the spines). Rubiaceae. Woody plants sometimes cultivated in warm regions for the ornamental flowers. They are more or less spiny and have somewhat funnelform-shaped 5-parted fls. with reflexed segms. valvate in the bud, and a hairy or naked throat; calyx obovate or oblong, compressed, didymous, 2-stoned; stones indehiscent, 1-seeded.—About 150 species of shrubs or small trees, found in the Old World, mostly in the tropics.

PLECTRANTHUS

3067. Pleione praecox. (X1/2)


Pseudobulbs soon dying; lvs. thin, deciduous, falling usually after the pseudobulbs are matured: fls. large, brightly colored, one or two borne on short scapes produced from base of pseudobulbs. About 13 species (Pfitzer & Kranzlin, Engler’s Pflanzenreich, hft. 1907), of the mountains of India, extending to elevations where snow and frost are not uncommon. Few are cult. in Amer.

maculata, Lindl. Pseudobulbs round, flattened, depressed at the top, forming a fleshy ridge around the summit: lvs. lanceolate, from flattened sheaths: fls. preceding the lvs., on short peduncles; sepals and petals lanceolate, spreading, white; labellum funnel-shaped, with 5-7 fringed lamellae extending the entire length of the labellum side lobes streaked with purple, middle lobe ovate, wavy, white, spotted with purple and yellow. The lvs. fall in Sept.; fls. in Nov. B.M. 4991. F. S. 14:170. F. 1851:97 (all as Cologynum maculata).


lagnaria, Lindl. & Paxt. Pseudobulbs clustered and depressed, as in the other species, depresses long with brown: fls. about 4 in. across, rose-lilac; sepals and petals narrowly lanceolate; labellum convolute, crisp on the margin, pale lilac, blotched with yellow and deep crimson in the throat and having several yellow crests. Aug.—Nov. Himalaya Mts. B.M. 3579. F. S. 23:2386. L. H. 14:510 (all as Cologynum lagnaria).

Grelogyne lagenaria). Fls. terminal, showy, rose red with a yellow disk: labellum somewhat concave, oblong-lanceolate, about 1½ in. long; lip large, convolute around the column, rather narrow, darker red with purple-brown markings. China. B.M. 869:2718. Schilleriana, Pitz. & Kranz. Pseudobulbs 2-lvd.: fls. yellow, with
Pleonema

Pleione

pleione

Plukenetia

Pleuróperomá

Pleiôspérmum

Pleurostrothalis

Plukenetia

Pleiôspérmum (from the Greek for many and seed). Rubáceae, tribe Citræae. Small trees distinctly related to Citrus, but having fruits filled with mucilaginous pulp. Linnaeus \( P. \) Pleurospérmum, Endler, 1890.

Small, pinnate, bifoliate, or unifoliate; spines straight, singly or in pairs in the axils of the lvs.: \( f \) in terminal panicles or axillary clusters; ovary 5-celled with 2 ovules in each cell. —Two species are known, ranging from India and Ceylon to Java. Both species of Pleurospérmum are small trees, and both should be tested as stocks upon which to graft the common citrus frs.

So far, attempts to intro. living seeds of \( P. \) alatum from India to this country have failed, possibly because of the large size and soft texture of the seeds.

\( s. \) alatum, Swine. (Linómiæ aludia, Wight & Am.).

\( s. \) Tembar-Embundo. Small tree, common in S. India and Ceylon, especially in the dry regions; small branches, spineless or with spines 1 in. long; lvs. trifoliate; \( f l \) obviate, petals winged: \( f l \) buds downy: \( f l \) 4–5 in. long, short-pedicelled in terminal or axillary panicles: \( f l \) : fr.; 5- or 6-celled, 2 to 4 in. long; sepals lanceolate, acuminate; petals obtuse, 

Pleurospérmum family, obovate or cuneate: fr: oblong, ovoid, or subglobose.—About 45 species, a few in Eu., mostly in the tropics of both hemispheres. Related to Pácospermium are small trees, and both should be easily distinguished by the sepals, which are fringed with silvery pendulous hairs.

\( P. \) apiculata, Linn. Lvs. 1-2 in. long, linear-lanceolate: racemes 3-5-ft., about as long as lvs.: \( f l \) pale yellow, at times greenish. Venezuela — \( P. \) attenuata, Rolfe. \( f l \) : lvs. elliptic, 14–11 in. long: scapes slender, 2–4-ft.; \( f l \) about 5 in. long; sepals and petals light green marked with purpl, lip greenish white.—P. barbatum, De Wild. Lvs. small, oblong-lanceolate: \( f l \) small, yellow, rather nodding. Brazil—\( P. \) Bornhardtii, Rolfe. —\( P. \) Borcherdistii, Rolfe. —3-7 in. a raceme; sepal red, dulled purple, the dorsal green-margined at base, lanceolate, long-acuminate, nearly 2 in. long; petals long-acuminate about 14 in. long, light green striped brown, lip 3-celled, less than 5 in. long, the erect side lobes greenish white, the front lobe dull reddish purple, the rear lobe greenish white, the front lobe dull reddish purple. Colombia—\( P. \) Cogmauxana, Schlcht. Lvs. densely hairy on outside, pale, densely covered with purpl markings. Costa Rica—\( P. \) cranjera, Hart. Very small; lvs. orthotylate, ovate, about 5 in. long, covered outside with long whitish hairs; dorsal sepall light green, with pale brown dots; lateral sepals united, red-purple. Brazil—\( P. \) curnifera, Cogn. Lvs. very flaky, lanceolate; \( f l \) : 14 in. long; lower half of sepals char. pale yellow with red spots, upper half very flaky, pale reddish brown. Brazil—\( P. \) dulda, A. Rich. Small, creeping; \( f l \) yellow, with shining orange-yellow lip. Mex.—\( P. \) patracta, Linn. Raceme classtichus, \( f l \) with a few deep purple spots on base of lip; sepal pubescent, elongated, the dorsal linear; petals lanceolate-lanceolate; lip clawed, obtuse, toothed at base, Brazil—\( P. \) virgata, Linn. Lvs. 1-13 in. long, elliptic-oblong; pedantes 1 fl.; \( f l \) : 3-5-in. long, red-labeled. Sp.; Brazil—\( P. \) rahina, Linn. Raceme very long; sepal lanceolate, acuminate; petals obtuse, lip obvate, repand, obtuse. Brazil—\( P. \) subfloribas, Kränz. Lvs. nearly 2 in. long, subulate; racemes slightly longer than lvs., 5– or more-fl.; \( f l \) about 6 in. long, yellow, with purple lines. Brazil—\( P. \) smithii, Rolfe. Lvs. 2-3 in. long, lanceolate-oblong; racemes many-fl., 4-5 in. long; \( f l \) very small, greenish. Trop. Amer.

George V. Nash.

Pleoçama (Greek, bent hairs, alluding to the pendulous branches). Rubáceae. Erect branched shrubs, usually fett, to be grown under glass for the bloom or planted out far S.: branches very slender, pendulous.

\( f l \) opposite or verticillate in 4’s, linear-elongate, filiform, acute, falcoid; stipules connate into a short scarios sheath, persistent: \( f l \) : petiole very short, axillary, calyx-tube globose, 5-celled, persistent; corolla funnel-form-campanulate, short-tubed, pilose-throated, limb 5-7-flowered, lobes oblong-lanceolate with the tip bent and callous, valvate; stamens 5–7; ovary 2-3-celled: fr. a small globose, white, succulent berry. One species, Canary Isls. \( P. \) pendula, Ait., the only species, grows about 2 ft. high, has white \( f l \) and linear-oblong filiform lvs. Intro. in S. Calif. and also cult. in greenhouses abroad.

Plukenetia (from Leonh. Plukenet, an English botanist of the 17th century). Euphorbiaceae. Woody climbers, sometimes cult. in the tropics for the \( f l \): lvs. alternate, simple, often cordate, 3-5-veined: \( f l \) small, in lateral clusters, apetalous; calyx valvate; stamens 8–30; styles united to the apex into a swollen column; ovules 1 in each cell of the ovary. About 12 species in the tropics of both hemispheres. Related to Pluchochloria and Trugia. The following species is edible and has been utilized for hog feed, for which they are frequently planted in their native kõld. \( P. \) volubilis, Linn. Style–column long and slender: \( f l \) : petiolate, somewhat pointed, repand or ser. on margin. W. Indies. —\( P. \) corneiflora, Sm. Style–column obviod or hemispherical. Java; \( f l \) said to be aromatic and used as a pot-herb.

J. B. S. Norton.
PLUM. The tree and fruit of many species of Prunus. A few kinds are grown for the ornamental flowers and others for colored or variegated foliage. Prunes are cured dried plums.

It is probably more difficult to give specific practical advice for the management of the plum than for any other common fruit, for the reason that it represents several distinct species which are not equally adapted to all parts of the country, and the same remarks will not apply to them all. There is no country in which the domesticated plum flora is so complex as in North America, for not only are the specific types of Europe and of Japan grown, but also species that are peculiar to this continent. In the northeastern states and on the Pacific slope the European or domestic types are the leading plums. In these same areas and also in the South and in parts of the mid-continental region, the Japanese plums also are now popular. In the cold North, in the great interior basin, and also in many parts of the South, various native types now constitute the leading cultivated plums. These native plums are developed from wild species of the country, and they are unknown in cultivation (except in botanical or amateur collections) in any other part of the world. These have been developed chiefly within fifty and sixty years, although a few varieties are older than this. For a history of this evolution, see Bailey, "Sketch of the Evolution of our Native Fruits;" also, as well as for culture and varieties of plums in general, Waugh, "Plums and Plum-Culture," and Hedrick, "The Plums of New York." See Prunus.

The plums cultivated in North America may be arranged in the following groups:

1. Domestic or European types, Prunus domestica. Native to western Asia, comprising the common or old-time plums, such as Green Gage, Lombard, Bradford, Yellow Egg, and the like. They are the leading plums from Lake Michigan eastward and north of the Ohio, and on the Pacific slope. Figs. 3068, 3069 are of this species. The Damsons (Fig. 3070) are small-fruited forms of this general species-type. Of late years, hardy races of Prunus domestica have been introduced from Russia. These have value for the colder parts of the plum-growing regions. Figs. 3071, 3072, show representative forms of the Russian type.

2. The Myrobalan or cherry-plum type, Prunus cerasifera. Native to southeastern Europe or southwestern Asia. The seedlings are much used for stocks upon which to bud plums; the species is also the parent of a few named varieties, as Golden Cherry; and DeCaradeuc and Marianna are either offshoots of it or hybrids between it and one of the native plums, probably hybrid.

3. Japanese types, Prunus salicina (P. triflora). Evidently native to China. The type seems to be generally adapted to the United States, and is of great value to both the South and North. This species first appeared in this country in 1870, having been introduced into California from Japan. For historical sketch, see Bulletin No. 62, Cornell Experiment Station (1894); also Bulletin No. 106 (1896); Hedrick, "The Plums of New York." Fig. 3073 shows one of these plums; also Fig. 3074, as to tree forms, which are very variable in the different pomological varieties.

4. The apricot or Simon plum, Prunus Simonii. Native to China. Widely disseminated in this country, but little grown except in parts of California. Introduced about 1881.

5. The americana types, Prunus americana, P. nigra (Figs. 3075, 3076), and P. mexicana. The common wild plum of the North, and extending westward to the Rocky Mountains and southward to the Gulf and Texas. Admirably adapted to climates too severe for the domestic plums, as the Plains and the upper Mississippi Valley.

6. The Wild Goose and Chickasaw types, Prunus hortulana, P. angustifolia, P. Munsoniana (Figs. 3076, 3077). A variable type of plums, comprising such kinds as Wild Goose, Wayland, Moreman, Miner, Golden Beauty, Newman, Caddo Chief, Lone Star, and many others. The species involved in this group are not yet clearly defined botanically, and what part the hybrid and intergradient forms play in the evolution of cultivated varieties is yet largely to be determined. In adaptability they range from Michigan to Texas, eastward and westward, but are essentially fruits of the great interior basin.

7. The Beach plum, Prunus maritima. Native to the coast from New Brunswick to Virginia. In cultivation, represented by the unimportant Bassett's American; also as an ornamental plant.

8. The Pacific Coast native plum, Prunus subcordata, wild in California and Oregon. Sparingly brought into cultivation, chiefly in the form known as the Sisson plum.

The welding of these many stocks will undoubtedly produce a wide range of fruits in the future, of which we yet see only the first promise. The experiments of Hansen in South Dakota in hybridizing P. Simonii and

P. americana, P. salicina and P. americana, P. Besseyi with plums, and others for a marginal climate, as well as the experiences of other workers in combining many of the species, all point to a wealth of plums for both the South and North. This species first appeared in this country in 1870, having been introduced into California from Japan. For historical sketch, see Bulletin No. 62, Cornell Experiment Station (1894); also Bulletin No. 106 (1896); Hedrick, "The Plums of New York." Fig. 3073 shows one of these plums; also Fig. 3074, as to tree forms, which are very variable in the different pomological varieties.

The plum of history is Prunus domestica. It is to this species that general pomological literature applies. It gives us the prunes (see Prune). These plums
be thrown into five general groups, although any classification is arbitrary at certain points:

1. Prunes, characterized by sweet firm flesh, and capable of making a commercial dried product. They may be of any color, although blue-purple prunes are best known. Some of the prunes are grown in the East as ordinary market prunes, being sold in the fresh state. Almost any prune can be made into dried prunes, but the varieties used commercially for this purpose constitute a more or less distinct class of sweet and thick-fleshed kinds (see definition, page 2719). In the East, prune is nothing more than a varietal name.

2. Damsons, comprising very small firm plums of various colors, usually borne in clusters, the leaves mostly small. The run-wild plums of old roadsides and farmyards are mostly of the general damson type (Fig. 3070).

3. The green gages, comprising various small green or yellow-green plums, of spherical form and mostly of high quality. Reine Claude is the commonest representative of this group in the East. The name green gage often stands for a group rather than for a variety.

4. Large yellow plums, such as Coe Golden Drop, Washington, and the like.

5. Large colored plums, including the various red, blue, and purple varieties, like the blue prunes, Lombard, Braebush, Quackenboss, and the like.

The Japanese plums (Prunus salicina) differ from the domestica in having longer thinner smooth and mostly shining leaves, smooth twigs, a greater tendency to the production of lateral fruit-buds on the annual growth, and mostly round or shorter fruits with colors running more to cherry-reds and light yellows. Most of the varieties are as hardy as the domestica series. The Japanese varieties are important because they add variety to the list, and especially because they are rich in very early kinds, and the fruit is usually so firm that it carries well; aside from this, the trees are vigorous and very productive, and the species is less liable to injuries from black-knot and curculio than the domestica.

The native plums, chiefly offspring of Prunus americana, P. nigra, P. angustifolia, P. Munsoniana, and P. hortulana represent a wide range of varieties. Those from Prunus americana and P. nigra parentage are very hardy and are adapted to regions in which the domestica and Japanese types are tender, as in northern New England, parts of Canada, and the northern plains states. Those partaking strongly of P. angustifolia parentage, and the greater part of the hortulanas, thrive well in the South, where the climate is too con- tinuously hot for other plums or where the fruit-rot fungus is too prevalent.

The domestica varieties are mostly fertile with themselves, but the natives usually bear best in mixed planting so that pollination is assured. See Pollination. The Japanese varieties also usually profit by mixed planting. How far failure to set fruit is due in general to lack of pollination and how far to other causes, is yet largely to be worked out.

Plum-growing.

The plum thrives on a variety of soils. The domestica commonly do best when planted in clay loam. They usually thrive well on lands which are suited to pears, or on the heavier lands to which apples are adapted. Yet many varieties grow well on lands that are comparatively light or even almost sandy, with good care. The americana thrive best in a rather moist soil, and mulching is often very favorable to the size and quality of the fruit.

The stocks upon which plums are grown are various. By far the greater number of the trees in the North are now grown on Myrobalan, which is a species of rather slow-growing plum (Prunus cerasifera), native to southeastern Europe and southwestern Asia. This is the stock sometimes recommended in the older fruit-books for the making of dwarf trees; but unless the top is kept well headed in, the trees generally make normal growth upon it. Trees grown on this root are usually larger and finer at one or two years of age than those grown on other plum stocks, and the probability is that they are nearly as useful from the grower's standpoint as any other. However, there are some varieties that overgrow the Myrobalan, and the stock is likely to sprout from the ground and thereby cause trouble. The Myrobalan is variable from seed, and this fact may account for some of the unsatisfactory results now and then reported. St. Julien is perhaps a better stock, but is more expensive to import and less readily budded. The Myrobalan and St. Julien stocks are imported.

Probably the best stock for domestica, from the standpoint of the grower, is the domestica itself, but seeds of it are more difficult to secure, the stock is more variable and it is more likely to be injured in the nursery row by leaf-fungi; therefore, as a matter of practice, the Myrobalan has very generally supplanted it. In the middle and southern states the peach is largely used as a stock upon which to grow plums, and it seems to be gaining favor in the North. It is undoubtedly a very excellent stock for sandy lands, and, in fact, is probably better for such lands than the Myrobalan itself. Some varieties—of which Lombard and French Damson are examples—do not take well on the peach. The Japanese plums are commonly worked on the peach. The Marianna stock, which is much recommended in the South, has not found favor in the North. Some varieties of plums are such slow and crooked growers in the nursery that it is advisable to top-graft or bud them on some strong and straight stock. The Lombard is no doubt the most adaptable stock for this purpose now grown by nurserymen. The old Union Purple is one of the best stocks, but is not much grown at present. Reine Claude, German Prune, and Copper are probably best when top-worked on some strong stock. For many native varieties, seedlings of vigorous natives, as of Golden Beauty and Wrayland, make excellent stocks. Americans should be worked on their own seedlings, at least in the North. In the South they are often budded on Marianna. The whole subject of plum stocks needs experimental study.
XC. Bavay or Reine Claude (Reine Claude de Bavay), one of the Green Gage plums of American orchards.
Plum trees are usually planted when two years old from the bud, although some of the strong-growing kinds may be planted at a year old with the very best results. As a rule, all plum trees are planted about as far apart as are peaches, that is, from 15 to 20 feet each way. Many growers prefer to plant them closer one way than the other and eventually to stop cultivation in one direction. If this system is used, they may be placed 18 or 20 feet apart one way, and 8 to 12 feet the other way. When planted, the trees are pruned in essentially the same way as apple trees. It is usually advisable to start tops as low as possible and yet allow of the working of the curculio-catcher or other tools below them. This means that the limbs should start from 3 to 4 feet above the ground. With the modern implements and methods of tillage, there is little inconvenience in working the land if tops are started as low as this. The subsequent pruning of the plum tree has no special difficulties. About four or five main limbs are allowed to form the framework of the top, and in most varieties, especially those which are not very tall growers, the central trunk or leader may be allowed to remain. The fruit of the domestica is borne mostly on spurs, as shown in Fig. 3078. These spurs, therefore, should not be removed unless it is desired to thin the fruit. In the americana and the Japanese varieties, the fruit is borne both on spurs and on the annual axial growth.

Insects and diseases.—The black-knot is one of the most serious plum diseases. It is best kept in check by systematically cutting it out (several inches below the swelling) and burning it. The grower should go over his orchard for it in the summer and again as soon as the leaves fall. If trees are thoroughly sprayed every year with self-boiled lime-sulfur or bordeaux mixture two or three times during the summer. The mixture for spraying plums should be weaker than for apples, particularly for the Japanese varieties.

The blight, which causes the leaves to fall in August or September, is a damaging disease; but it can readily be kept in check by thorough spraying with self-boiled lime-sulfur or bordeaux mixture two or three times the summer. The mixture for spraying plums should be weaker than for apples, particularly for the Japanese varieties.

The fruit-rot is the work of a fungus. Many times the dead and dried fruit may be seen hanging on the tree all winter, as shown in Fig. 3079; and in such cases it is very likely that the fruit-spur may be killed, as the upper one in the picture has been. In handling this disease, the first consideration is the fact that some varieties are much more susceptible to it than others. The Lombard is one of the worst. Again, if the fruit grows in dense clusters, the disease is more likely to be severe. The thinning of the fruit, therefore, is one of the best preventives of the spread of the disease, and at the same time, also, one of the most efficient means of increasing the size, quality, and salableness of the product. Thorough spraying with self-boiled lime-sulfur is a specific for the trouble and helpful in related troubles or diseases.

The curculio, which causes wormy fruit, can be held in check by the process described under Peach. Formerly, jarring the beetles on sheets or curculio-catchers (a wheelbarrow-like device with a large cloth hopper) was the prevailing practice with those who gave extra care to their fruit, and this method is still recommendable to amateurs and small plantations; but with the modern good tillage and the practice of keeping all parts of the plantation and the hedge-rows clean, and with the introduction of more effective spraying, the curculio is found to do much less damage and usually to be held sufficiently in check. Practising open pruning to let in the sun, and raking the dropped fruit out into the sun will also check the breeding. How far spraying with arsenicals will control the curculio on plums is not yet well understood, but growers usually feel that it is a distinct aid. To the bordeaux mixture or to self-boiled lime-sulfur, two and one-half pounds of arsenate of lead may be used to the fifty gallons, in one spraying soon after the petals drop, and another a week or ten days later.

L. H. B.

Native American plums.

Approximately 300 varieties of plums, derived chiefly from six native types, have been named, described, and introduced by American nurserymen and have found their way into American orchards and American pomological literature. The major part of this interesting development came in response to the urgent demand, most manifest in the years from 1870 to 1900, for the discovery of new types of garden fruits suited to the peculiar conditions of the middle western prairie states. Outside this area, the native American plums made much less impression, and while they have been widely tried, they have been generally discarded. Even in the area to which they are native and in which the need for them is greatest, they do not now play an exclusive rôle. A large part of the named varieties introduced by the nurserymen have already been lost to American horticulture. A creditable minority of these varieties, however, have qualities of absolute and considerable merit, and may be looked on as permanent additions to our pomological wealth. The native varieties are still propagated and planted by thousands annually, both for home use and for market. For certain culinary purposes, many of the natives are superior; and in many places, particularly in states of middle latitude, they are the most profitable market plums grown.

The americana plums are especially qualified to withstand the severity of northern winters. They are superlatively hardy. They are practically the only plums...
The plums grown in the cold northwestern states (except the comparatively unimportant nigras and the Miners) and their usefulness in northern New England and middle Canada is limited only by the extent to which they are known. Their cultivation has been developed to a special degree in Iowa, Wisconsin, Minnesota, and adjacent states. For this region they must be propagated always on americana stock. This stock has other advantages besides its hardiness, and it is coming into extensive use for all sorts of plums in the Northwest. This stock is sometimes used as a stock, but has not yet passed the experimental stage. It dwarfs americana plums on it. It is perfectly hardy.

The americana plums are wayward and awkward growers. With many varieties it is impossible to make a comely orchard tree. They do not appear to take kindly to pruning; and the usual method has been to let them very much alone. Careful pruning during the first few years, directed with a view to forming an open top on comparatively few supporting main branches, will do something toward shaping the trees; but with our present knowledge, no extensive pruning can be recommended for mature trees. The method of heading-in, as usually practised with the domestica plums, is especially unadapted to the americana plums. The pruning-knife, closely resembling Wild Goose, Wooton, and Whitaker makes an open-headed tree without much trouble. So does Sophie. Wild Goose is more inclined to be thick and thorny in the top, but may be thinned carefully to make an accessible head. Milton is much liked Whitle ; wild plums. Milton makes a fine specim.; which, with a little timely pruning, is almost ideal.

The Chickasaw varieties (P. angustifolia) are effective pollinizers for the Wild Goose and Japanese varieties blooming at the same time; but very few of them have sufficient value in themselves to make them profitable orchard trees. A few varieties, like Munson and McCartney, are still planted for their own fruit; but in general they have been displaced by other types of plums. The trees are mostly bushy, thorny and thick-topped, sometimes so thick and thorny that the birds can hardly get in to steal the fruit. It is difficult to prune them enough to make really satisfactory trees. The Chickasaw plums are adapted to the southern states, though Pottawatamie (probably a form of P. americana) succeeds as far north as southern Iowa and central Vermont. They propagate readily on any kind of stocks, but are very much given to suckering wherever they make roots of their own.

Other types of native plums, such as the Sand plum, the Beach plum, the Pacific plum, and the like, are not sufficiently numerous in cultivation for their treatment to have been determined.

Hybrid plums of various strains have been introduced in considerable numbers. Most of these hybrid varieties resemble rather strongly one or the other of their parent species; and the best that can be said regarding their culture at this early day is that they may be safely treated like the varieties which they most closely resemble. Wickers, President, and perhaps Climax, with some others, resemble the Simon plum, and ought to have much the same treatment, although practically the same treatment as the Japanese varieties. Gonzales, Excelsior, Golden, and Juicy, on the other hand, resemble the Wild Goose type, and may have the same general treatment that they have done. Some of these hybrid varieties, especially crosses of Wild Goose and Chickasaw types with the Japanese plums, are making some stand commercially, especially in the South, West, and in the Rocky Mountain States.

The Wild Goose group (P. Munsoniana) includes varieties like Wild Goose, Milton, Wooton, and Whitaker, adapted to the latitude of Maryland, Kentucky, and Kansas. They succeed only less well southward; but are not generally valuable to the north, of this line. For the section named, the varieties of this class have unquestionably been the most profitable.
All the native plums, with wholly negligible exceptions, require cross-pollination. For the most part, however, they are fully inter-fertile, so that one given variety will pollinate any other variety, providing the two bloom at the same time. Simultaneous blooming is of chief importance in adjusting varieties to one another for cross-pollination. To determine which varieties bloom together, careful observations should be made in the orchard and recorded, or recourse must be had to the published tables. Pollination is effected chiefly, if not exclusively, by the bees, so that their presence should be encouraged.

Most of the native plums make comparatively small trees, so that they may be set somewhat close together in orchard planting, say 12 to 20 feet apart, usually about 15 feet. Some varieties, particularly in the South, need 20 to 30 feet space. Putting a plum orchard down to grass is not admissible under any circumstances; but cultivation should cease with the first of July, or certainly by the middle of July; for the native plums are especially liable to make too much late summer growth. High manuring of the soil is not usually necessary, or even desirable; yet something considerably short of starvation will be found the best treatment for native plums.

F. A. WAUGH.

The plum in California.

The cultivation of the plum in California differs widely from that in the other plum-producing sections of the United States. Here the dreaded curculio is unknown, and while the equally dangerous black-knot has been found infesting a native wild cherry (P. demissa) it has never been observed in cultivated orchards. The most delicate varieties of the Old World find a very congenial home and form the basis of practically all orchard planting. In early mining days the California native plum (Praena subcordata) was frequently cultivated, and before the introduction of European standard varieties attempts were made to improve the fruit by the usual methods of selection. Some very promising results were obtained; but since the demonstration of the great success of the more delicate and higher-flavored varieties, there has been little incentive to the use of the native species.

It seems hardly fair to make a distinction between "plums" and "prunes" in discussing this subject from the California standpoint. With the exception of the differences in the preparation for market, what may be said of the plum applies as well to the prune; for a prune is simply a plum which dries sweet without removing the pit. In most of the varieties of plums there occurs a fermentation around the pit in the process of drying, which prevents their being successfully dried without its removal; these are known as "plums." The prune varieties are, however, much richer in sugar which determines their adaptability to drying whole. As California has to find distant markets for most of its immense fruit crops, by far the greater portion of the plum areas are devoted to the production of prunes. The total amounts of plums produced in 1914 are as follows: Dried prunes, 51,000 tons; canned plums, 90,000 cases or 2,160,000 quarts; overland shipments, 7,905 carloads of fresh fruit.

The plum has an exceedingly wide range in California. It is thrifty and healthy on the immediate coast, in the interior and coast valleys, and well up into the foothills. This is perhaps most strikingly shown by the fact that every county in the state, except two perhaps (one being the city of San Francisco), contains plum or prune orchards, or both. When it is considered that this covers an area of nearly 100,000 square miles, extending through 9 1/2 degrees of latitude, a fair estimate of the adaptability of this fruit to varying conditions of soil and climate will be obtained. By choosing varieties ripening in succession, the California plum season may be extended from May to December. It is not surprising, then, that the acreage devoted to plums and prunes is one of the largest in the state, reaching a total of nearly 142,000 acres, an aggregate of nearly 11,000,000 trees, of which about four-fifths are prunes. Placer County leads in the acreage of plums with 5,500 acres, and Santa Clara in prunes with 58,400 acres. This great industry has developed since the discovery of gold. The early Mission plantings (1769-1823) included varieties of European plums, a few of which were able to survive after the abandonment of the Missions in 1834, by reproducing themselves by suckers. One variety found at the Mission Santa Clara was grown and marketed as the "Mission plum" as late as 1870. The
introduction of improved plum varieties, however, dates back to 1851, when the first grafted fruit-trees were brought to the state by Seth Lewelling from Oregon, where he and his brother had established nurseries in 1847. Prior to this introduction, however, the miners were supplied with fruit of the native plums. The first importation of prune cions from France by the United States Patent Office in 1854 did not reach California. It was not until two years later that Pierre Pellier brought with him to San Francisco a small package of cions from the famous prune district of Agen, in France, which arrived in fairly good condition and were at once sent to Pellier's brother, Louis, who had already established a nursery and fruit-garden in the Santa Clara Valley, upon a portion of the site of the present city of San Jose. From these cuttings, a number of trees were procured which succeeded admirably, and eventually were distributed through different sections of the state, but principally in the Santa Clara Valley, which to this day remains the center of the California prune industry. In 1858 the first California grown and cured prunes were exhibited at the State Fair in Sacramento; but it was not until 1870 that it became a commercial industry. Peach, apricot, and almond roots were used, to some extent, for the native plums. The Myrobalan seedlings, then, to the peach, that root is still preferred for plum stock; and prunes have greatly simplified matters. Peach, apricot, and almond roots were used, proving best. The introduction of improved plum varieties, however, has been practically abandoned, and seedlings are now the rule. This is all-important in California, for there the roots of all plants must necessarily go deep for their moisture and nourishment. In fact, deep-rooting is the rule beyond all common expectation; thus almond roots the thickness of one's thumb have been found at a depth of 22 feet—one of the many instances of the characteristic conditions of California agricultural practice.

Propagation is by both buds and grafts. The usual practice is to bud the young stock in July and August, and then, in January and February following, all those which have not taken can be grafted, thus securing two chances. When peach or almond is used as stock, budding alone is done, as these stocks have been found to take the graft poorly. The trees are not allowed to remain in nursery longer than one year after budding, and in many cases are set out the spring following, as "dormant buds." In early days the tendency was to rather close planting, in some cases as close as 16 feet; but later plantings were made with wider distances. The layout out of orchards has caused much discussion, some asserting that the quincunx, hexagonal, and triangular systems secure better use of the land and allow better access to plow and cultivator than do the plantings in squares. The square, however, is the most generally used. The style of tree is the low-headed vase-form. The rule is to cut back the young trees at planting to 18 to 24 inches. Until the top is formed the stems are protected, by whitewashing or wrapping with burlap, from the hot afternoon sun. The first year from three to five branches are allowed to grow from the stem, and these used to form the main limbs of the tree. From this time the pruning is done according to the usual methods for the vase-form tree. Many plums, owing to the brittleness of the wood, are yearly pruned rather short but the French prune is able to carry fruit on much longer branches. After the second or fourth season, the growth of wood is much less and usually the pruning operations are confined to pruning the tree in shape, removal of dead or damaged branches, and shortening-in the current season's growth to keep the young twigs in a vigorous growing condition and to prevent overbearing. The long slender branches are not cut back. The long arching "canes" are allowed to remain until they have produced a crop (which they do in the second season with the greatest profusion), the ends resting upon the ground as the fruit gains weight. When these droop too low, they are cut back to the crown, when others will be produced to take their places.

Thorough and persistent tillage is one of the first principles of the California orchardist, for with him the absence of summer rains makes the conservation of the winter rainfall an absolute necessity. Even in the summer-irrigated districts the soil is tilled and kept loose as soon as it is in proper condition, and no weeds are allowed to rob the trees. Formerly all the prune and plum crop was produced without summer irrigation. Winter irrigation was often practised and the water conserved in the soil by the usual methods of tillage. But regular bearing of fruit of good size requires a moist soil. The installation of numnum plantz.

3076. Flowers of native plums. Prunus americana on the left; P. Munsoniana on the right.

3077. Wild Goose plum tree.
and irrigation systems, therefore, has received a great
impetus, and the use of summer irrigation when required
is an established practice.

In some of the older orchards, the need of fertilizing
is beginning to be felt. In general, the main
deficiency has been found to be vegetable matter, and,
consequently, nitrogen. The extremely fine tilth which
has been maintained has resulted in the destruction of
all natural green growth and the "burning out" of the
humus, and has necessitated the call for a green-
manure crop. This problem is rendered more difficult
in California by the fact that any such crop must be
produced during the winter months and be ready to
plow-in with the beginning of tillage in March; for no
summer-growing crop can be allowed in the orchard,
unless the land is regularly irrigated and then alfalfa
may be grown. On non-irrigated orchards, winter-
growth of hardy legumes, as vetches, is undertaken.

As mentioned above, the plum has few serious ene-
 mies in California, and none which cannot be held in
check by spraying and other treatment. Upon the
leaves the plum aphis and the canker-worm have
given some trouble. The "peach-moth" has been found
at work on the prune trees, but not to any serious
degree. Relief has been secured by cutting
leaves the plum aphis and the canker-worm have
produced during the winter months' and be ready to
check by spraying and other treatment. Upon the
plow-in with the beginning of tillage in March; for no
summer-growing crop can be allowed in the orchard,
unless the land is regularly irrigated and then alfalfa
may be grown. On non-irrigated orchards, winter-
growth of hardy legumes, as vetches, is undertaken.

In California some fruit is usually borne the third
year; in the fourth a fairly
profitable crop is expected:
the fifth, from 50 to 60
pounds to a tree should be
produced, which ought to
double in the sixth, and
after that from 150 to 300
pounds is the rule. These
figures apply mostly to the
prunes. From 200 to
300 pounds are considered
the average at full bear-
ing in the Santa Clara
Valley. In some instances
600 and even 800 pounds
have been obtained, and a
six-year-old tree at Visalia
(San Joaquin Valley) is
credited with 1,102 pounds
of fruit in one season.

It would be impossible to enumerate a full list of the
varieties actually in successful cultivation
within the state. Such a list would probably in-
clude every noteworthy
variety of domestica plum.
Many, however, despite
excellence of quality and
flavor, are suited only for
home-growing, or at most
for local markets, on
account of poor shipping
costs. For this reason
the number of varieties
planted on a large scale is
being constantly reduced.
At the head of the list
stands the Prune d'Agen,
the originally introduced French prune, which has
proved itself adapted to more varying conditions than
any other variety, and is therefore perhaps the most
generally planted variety of fruit in the state. It is,
consequently, used chiefly for canning. In the same category
belong the Robe de Sergeant, Imperial Epineuse, Silver
and Sugar—all drying varieties.

The Robe de Sergeant (supposed
to be a synonym of the Prune d'Agen in France) is also a
defective bearer in some districts, and is used mostly in the prepa-
ration of "bleached prunes," for which it has proved
profitable in some instances. It is sometimes marketed in the fresh
state also. The Imperial Epineuse, a recently introduced French
variety was largely planted but though large, it has
proved rather irregular in bearing, difficult to cure and
very subject to thrip injury. Luther Burbank's Sugar
prune bases its claims upon superior earliness, sweetness
and flavor, together with fair medium size. It dries easily
but is of coarse texture. The German prune, Italian
(Pellenberg), Golden prune, Hungarian (Pond Seedling)
and Tragedy are varieties sometimes used for canning,
but are frequently shipped green as "plums." Of
these the German is perhaps the most extensively used.
The Italian succeeds well along the coast in places
liable to fogs or sea winds, where the French is not at
its best. It is valuable as a late variety, and is said to
dry excellently, as does also the Golden, an Oregon
seedling. The fruit of the Hungarian (Pond) is very
handsome and showy, and is rated, on its style, a good
seller as fresh fruit in both the local and distant mar-
ket; not suitable for drying. The Tragedy and
the Imperial (California seedlings), Giant (Burbank's),
Royal Native, Simo and Peacn, are popular for early
market—especially for eastern shipment. For canning,
Coe Golden Drop and the Imperial Gage are the most
popular. The Jefferson, Washington, and Yellow Egg
are all highly regarded, and planted more or less widely,
as they suit the different climatic regions. Many of
the Japanese plums are grown: Red June, Satsuma,
Burbank, Wickson, Climax, Santa Rosa, and Formosa
(all Burbank varieties) are prominent for eastern
shipment, local market and domestic use.

See Wickson's "California Fruits and How to Grow Them," the Reports of the California State Board of
Horticulture, and the Reports and Bulletins of the
California Experiment Station.

ARNOLD V. STUBENRAUCH.
E. J. WICKSON.

PLUM

PLUMBAGO 2721

PLUMBAGO (from Latin tor lead, from the lead-
colored flowers of some species, or because of some old
tradition). PLUMBAGO. Subshrubs or herbs, often cultivated, particularly under glass,
for the handsome phlox-like flowers.

Mostly perennial, sometimes climbing, often more or
less woody; lvs. usually alternate and entire, clasping
(or auricled) by the blade or by base of petiole: fls.

PLUMBAGO 2721

3079. Fruit-spurs of a domes-
tica plum. The letters indicate the
termination of annual growths.

3079. Plum-cot. The
mummy plums hang on
the tree all winter.
Plumbago capensis. (X3)

spicate or racemose on the ends of the branches, blue, violet, red, or white, gamopetalous, salverform, the tube usually slender; calyx tubular, 5-toothed, and somewhat angled, glandular; stigma usually 3, free from the corolla-tube, the filaments mostly with a dilated base; ovary attenuated at the top, the single style with 5 stigmas: fr. a membranaceous 5-valved caps. — About 10 or a dozen species inhabiting warm countries, chiefly of Eu., Asia, and Afr. For P. Larpentiae, consult Ceratostigma.

Two species of shrubby plumbagos, P. capensis and P. rosea, are deservedly well known. In the middle and northern states they are treated as greenhouse pot-plants and are usually turned out to flower in summer. They are readily procured by cuttings taken either in autumn from plants growing in the open or in the spring from stock plants. They require an intermediate temperature.

_a. Fls. red._

rosea, Linn. (P. sanguinea, Hort.). St. zigzag, more or less climbing, glabrous even in the infl.: lvs. large, ovate-elliptic, the short petiole somewhat clasping: fls. purplish red, in long racemes, the corolla-lobes little if any exceeding the exerted part of the tube, the calyx glandular-hairy; base of style hairy. S. Asia. B.M. 230. Var. coerulea, Hook. (P. coerulea, Salisb.), is a form with larger scarlet fls. B.M. 5363. Gnn. 1:183. H.T. II. 6:292. This is the form chiefly cult. — Like P. capensis, this species is useful for summer bedding. It is also an excellent subject for winter blooming in pots.

_b. Perennials, with more or less scandent sts._

_P. capensis._ Thumb. Fig. 3080. Semi-climbing shrub but a straggling upright plant as grown under glass, somewhat glaucous, glabrous except in the infl.: lvs. scabrous, heliopetalous to oblong-spulate, nearly or quite obtuse and short-mucronate, narrowed into a very short petiole: racemes relatively short, the fls. sometimes appearing as if un accelbed; fls. azure-blue, with a very slender tube 1½ in. long and several times longer than the glandular-hairy cylindrical calyx-tube, the corolla-lobes ovate-obovate and phlox-like: caps. oblong-ovate, tapering and angled below. S. Afr. B.M. 2110. B.R. 417. Gn. 44, p. 380; 46, p. 245; 48, p. 344; 58, p. 20. G. 15:518; 27:41. Gn.W. 24:121. G.W. 10, p. 361. R.H. 1908-60. Var. alba, Hort., has white fls. — A well-known greenhouse plant. Old plants turned into the soil in late spring in a sunny exposure bloom profusely until frost. Plants struck from fall cuttings also give good bloom the following summer, but younger plants usually do not bloom so well. Plants can be kept in a cellar during winter, or they may be grown under glass for spring and summer bloom. It is an excellent raffle plant. In S. Calif., it climbs trees 15-20 ft. high if undisturbed. P. capensis and the white-flowered varieties are the commonest kinds.

PLUMÉRIA (Charles Plumier, 1646-1706, distinguished French botanist). Also spelled Plumeria and Plumiera. Apocynaceae. Tropical trees grown for their showy and very fragrant flowers.

Leaves alternate, penninerved, the primary veins joined to a nerve running parallel with the margin: fls. in terminal or 3-5-merous cymes; bracts usually large and covering the young buds but deciduous long before anthesis; corolla-tube cylindrical throughout; stamens included, near the base of the tube; disks wanting or fleshy and covering the tube of the calyx; ovules in many series; follicles 2.—About 50 species, all trop. American, of which 2 kinds at present are offered in S. Calif., and 2 in S. Fla. The species are much confused and imperfectly understood.

Plumerias are amongst the most fragrant of tropical flowers, vying in this respect with the jessamine, Cape jasmine, and tuberose. They have large wax funnel-shaped flowers with 5 spreading lobes of white, yellow, rose-purple, or combinations of the three colors. Choice specimens have been known to have clusters 9 inches across, composed of more than twenty flowers each 3½ inches across. They are considerably cultivated in all tropical lands. In the Pacific islands, P. acutifolia is frequent in graveyards. The word frangipani is supposed to be from the French, frangipanier, conglutated milk, referring to the tenacious white juice which exudes plentifully from the wounded plant. Other accounts suppose it to have come from an Italian nobleman of that name who in the Middle Ages compounded a perfume of many ingredients and which the odor of these flowers resembled. All species are likely to be called frangipani. Plumerias are essentially summer-growing plants. Keep rather dry in
PLUMERIA
winter. Propagation is by cuttings in February or March.

rubra, Linn. FRANGIPANI. Low tree or shrub: lvs. 5-8 in. long: cymes spreading; corolla-lobes broadly oval, longer than the tube. Mex. to Guiana and Ecuador; naturalized in W. Indies. B. R. 780 (fls. chiefly golden, only the tips bright rose). B. M. 279.—In W. Indies sometimes called "West Indian red jasmine."

AA. Fls. chiefly white or yellow.

b. Lvs. narrow, oblone-linfa.

alba, Linn. Lvs. rounded or acuminate at top, revolute at margin, tomentose beneath; veins rectangular-transverse: fls. white. W. Indies.—P. hypoleuca, Gasp., is probably a color variety, with yellow fls.

nn. Lvs. wedge-shaped to lanceolate.

acutifolia, Poir. (P. acuminata, Ait.). FRANGIPANI. Figs. 3081, 3082. Lvs. acuminate, often 1 ft. or more long, 3 in. wide, broadly lanceolate, with a long tapering base: corolla-lobes oval. Mex. B. M. 3932 (fls. white, much flushed from the center with pale yellow). P. acuminata of B. R. 114. H. U. 4, p. 161, with its narrow oblong lobes and close well-defined golden center, may be a different species though commonly considered the same.— Cult. in all tropical countries for the fragrant whitish fls.; flowers all the year. Also known as the temple-flower and graveyard-flower.


Wilhelm Miller.

F. Tracy Hubbard.

PÓA (ancient Greek name for grass or fodder). Graminaceae. Mostly perennial grasses of low growth, several species of which are cultivated for forage and a few for ornament.

Spikes 2-6-fl., in open panicles; glumes shorter than the lemmas, awnless; lemmas keeled on back, membranaceous, scarious-margined, awnless, 5-nerved, often cobwebby at base.—About 100 species, natives of temperate and cold regions.

AA. Plants producing creeping rootstocks, thus forming a sod.

b. Fls. dioecious.

archigifera, Torr. TEXAS BLUE-GRASS. Culm 2-3 ft. high; panicle contracted, 3-8 in. long; spikelets 3-in. long; first glume 1-nerved, second 3-nerved; lemma copiously weby-hairy at base. A native of Texas, where it is a valuable forage grass.—It prop. by rhizomes and forms a dense sod. Recommended as a winter pasture-grass in the S. Eas. Easily distinguished from the other species by its contracted panicle and large spikelets. Dept. Agric., Div. Agrost., Bull. No. 17:246.

compréa, Linn. Known in the trade as CANADA BLUE-GRASS (though it is probably not native to Canada) and ENGLISH BLUE-GRASS, but the latter name is often applied to Festuca pratensis. Distinguished from P. pratensis, which it resembles, by its blue-green foliage, distinctly flattened culms, and its short and much contracted panicles. Spreads by rhizomes. Native of Eu. and extensively naturalized in this country, being found in open and rather sterile soil. Dept. Agric., Div. Agrost., Bull. No. 17:248.—It is of little value as a pasture grass except possibly on sterile soil.

pratensis, Linn. KENTUCKY BLUE-GRASS. JUNE-GRASS. Fig. 3083. Panicle pyramidal, open, usually 3-4 in. long; spikelets 3-fl.; fls. 3-nerved; first glume 1-nerved, second 3-nerved; lemma cobwebby at base; culm usually 1-2 ft. high, forming a sod with its copious rootstocks, its long soft basal lvs. producing an abundance of foliage. Native in the cooler regions of the northern hemisphere. Dept. Agric., Div. Agrost., Bull. No. 20:148.—A common pasture-grass through the middle part of the U. S. Its most important horticultural use is for lawns, for which purpose its habit and aggressiveness are eminently adapted.

A. S. Hitchcock.
PODACIENIUM (Greek, foot and achene, alluding to the base of the achenes). *Compaeae*. Tall shrubs, one of which in southern California is said to attain a height of 30 feet, cultivated chiefly for their large and fragrant leaves.

Leaves opposite, large and angular-lobed: heads small, disposed in a broad corymbose panicle; fls. with white rays and yellow disk: achenes sparingly pilose.—Two or 3 species, Mex. to Colombia. —The principal species of Podacium, *P. eminens*, is commonly cultivated, under the name of *Ferdinanda*'s, which is really the oldest generic name, but this name is also used for some species of Zaluzania. The distinguishing feature of *Podacium* is the shape of the achene, which is contracted at the base into a 2-winged stipe suggesting the shape of a foot. In the S. and E. U.S. they are grown in the warmhouse, but are quite hardy in the open in the S.—The fl.-heads are about 1 in. across, and about 20 or more in terminal flat-topped clusters, borne in winter and spring.

Emíniens, Baill. (P. paniculatum, Benth. Ferdinanda emíniens, L. Zaluzániemá emíniens, Hort. Cosmophyllum cacaliícórimum, C. Koch). A tall shrub, 9-15 ft. high, slightly branched: lvs. opposite, suborbicular or broad-ovate, oblique, keel shorter than the wings, longer than the wings, with a short recurved claw, broad-obovate, slightly incurved; stamens free or very short petiole, dark green above and with the slightly raised narrow midrib in a groove, slightly glaucous and lustrous and with a distinct midrib above, green and lustrous and with a distinct midrib above, more or less spreading, narrowly lanceolate, oblong, palmate, slightly incurved; stamens free or very slightly longer, with a fleshy receptacle nearly 1/2 in. broad: staminate fls. solitary or 1-2, sessile, 1-2 in. long: seed ovoid, 1/2 in. long, borne on a fleshy purplish violet color. They are also sometimes cultivated on any of the species which can be had in quantity.

A. Lvs. 1-3 in. long.
B. Under side of lvs. pale green or glaucenceous.
C. Midrib of lvs. distinct above; width of lvs. 1/2 in. or less.

Macrophylla, Don. (P. longifolia, Hort.). Tree, attaining to 50 ft., with horizontally spreading branches and pendent branchlets: lvs. alternate, pinkish when unfolding, more or less spreading, narrowly lanceolate, 1-8 in. long, narrowed toward the apex and obtuse at the base gradually narrowed into a short petiole, bright green and lustrous and with a distinct midrib above, paler below, 3-4 in. long and more than 1/2 in. broad: staminate fls. fascicled, sessile, about 1 in. long; seed ovoid, 1/2-1/2 in. long, borne on a fleshy purplish violet receptacle. Japan. S.Z. 2:133. S.I.F. 1:13. G.W. 14, p. 322. Var. 'Máiki, Sieb. (P. chinensis, Wall. P. macrophylla var. chinensis, Maxim. P. japonica, Sieb.). Branches upright, 1-2, more or less upright, linear-lanceolate, obtuse or obtusish, 1-2-3 in. long and 1/4-3/4 in. broad, with distinct midrib above; seed globose-ovoid, 1/2 in. long or slightly longer, Japan, China. S.Z. 2:134. R.H. 1848:41.—Several variegated forms of this variety are in cult.

Neáfrófílía, Don. Tree, to 70 ft., with spreading much-ranched branches: lvs. scattered, sometimes indistinctly whitened, spreading, lanceolate or narrow-lanceolate, gradually long-acuminated, at the base narrowed into a short petiole, dark green above and with the slightly raised narrow midrib in a groove, slightly glaucous beneath, 3-6 in. long, in young plants sometimes 10 in. long, about 1/2 in. broad: staminate fls. 2-ranked, sessile or 1-2, 1-2 in. long; seed ovoid, 1/2 in. long or slightly longer, with a fleshy receptacle nearly 1/2 in.
PODOCARPUS


cc. Midrib of lvs. indistinct above; width of lvs. 5/16 in. or less.

gracilior, Pilger. Tree, to 60 ft., with scattered or whorled branches: branchlets slender, by the recurrent lvs.: lvs. alternate, linear-lanceolate, gradually acuminate, more or less falcate, spreading, midrib indistinct above, 2-4 in. long, 3/8 in. broad; staminate lvs. 1-3, axillary, 3/4-1 1/2 in. long; seed subglobose, 3/8-3/4 in. long, on a scaly, not thickened stalk. Cent. Afr.

elongata, L'Hérit. Tree, to 70 ft., with more or less whorled, densely leafy branches: lvs. alternate, erect-spread, narrowly linear-lanceolate, gradually narrowed to the apex and acute, nearly pungent; midrib inconspicuous above, 1 1/2-2 in. long and about 2 1/2 in. broad; staminate lvs. solitary, axillary, sessile, about 3/4 in. long; seed globose, 3/8 in. across, with a short fleshy receptacle on a slender stalk about 3/4 in. long. S. Afr.

br. Under side of lvs. with 2 glaucous lines.

nubigena, Lindl. (Sazegdaiha gracilis, Hort.). Tree, or in cult., shrub: lvs. spreading, crowded, linear-lanceolate, acute and mucronate, pungent, somewhat revolute at the margins, dark green and with a prominent red midrib above, with 2 white bands beneath, 1 1/2-3 in. long: fls. dacrpidoides, near, spreading, 2-ranked, linear, acute or obtuse, abruptly narrowed into a short stalk or claw. New Zeal. H.I. 6: 543.

c. shinii, Maxim. 1 in. long, 2 1/2 in. wide. S. Z. 2: 135. R.H. 1914, p. 624.-P. saligna, R. Br. (Prumnopitys elegans, Phil. Stachycarpus andina, Poepp. (Prumnopitys laxa, Kunth.). Tree, to 60 ft., with spreading branches: lvs. lanceolate, acuminate, 2-5 m. long, 1 1/4-2 in. wide. Jamaica. H.I. 7:215. R.H. 1914, p. 77.-P. retinu, DC. (Ainsworthia canescens, A. Cunn. (P. affinis, Sond.). Rarely exceeding 1 ft.; lvs. mostly linear, or linear or linear-lanceolate, 1-2 in. long; involu­cral bracts slightly decurrent or not at all rugose; claws with broad scarious margins; rays 3-lobed slightly longer than the disk-fls.

aa. Lvs. 3/4-3 in. long.

alpina, R. Br. Shrub or small tree, attaining 15 ft., with spreading branches: lvs. indistinctly 2-ranked, linear to linear-oblong, obtuse, mucronulate, dark green, grooved or flat above, pale green beneath, 3/4-3 in. long: fls. dimcious, the staminate solitary or clustered, 3/4 in. long; seed ovoid, 3/8 in. long, on a fleshy receptacle, very short-stalked. Chile. G.C. III. 10:171.

a. Lvs. 3/8-3/4 in. long.

PODOPHYLLUM (from Tournefort's Oxylobium. 2725

PODOPHYLLUM. 2725

PODOPHYLLUM

 PODOCARPUS

PODOPHYLLUM (from Tournefort's anapodophyllum, duck’s-foot-leaf; from a fancied resemblance in the foliage). Berberidaceae. May Apple. Mandrake (erroneously). Herbs common in rich woods and copses throughout the eastern United States, a colony of which is most desirable for a wild garden.

Hardy perennials herbs: sepalis 6, petal-like; petals 6-9; stamens as many or twice as many as the petals;
Podophyllum

Podostigma (Greek words referring to the fact that the stigma has a foot or stalk). Asclepiadaceae. This includes a half-hardy tuberous-rooted perennial herb which grows a foot high or less in low pine-barrens from N. C. to Fla. and bears in summer small greenish yellow flies. The genus is closely allied to Asclepias, and is distinguished by having the hooded remote from the anthers at the base of the long column, while in Asclepia the hoods are approximate to the anthers. P. pedicellata, Vail. Lvs. opposite, linear-lanceolate, nearly sessile; peduncles terminal and axillary, umbellately several-flowered. The only species.—Advertised in 1881, but presumably not hardy N.

Podostemon

Podostemon (Greek, beard; alluding to bearded labelia). Orchidaceae. Hardy terrestrial orchids. Mostly small perennial herbs, with erect slender stems; lvs. opposite, rarely in 3s; sepals and petals free, erect or ascending; labelia sessile, with broad base, spurs, with longitudinal ridges.—About 40 species, N. and S. Amer., with exception of 2 Chino-Japanese species. Podostemae are delicate plants requiring care in planting. The woodland species should have rich leaf-mold, with deep shade; the swamp species require peat or suitable light, rich soil, moist yet not wet. All the species are preferably planted in spring.

AA. Sepals longer than the petals.

divaricata, R. Br. St. 1-2 ft. high, slender, bearing a solitary fl.: fl. 1 in. long; sepals dark; petals flesh-colored; lip as long as petals, greenish, veined with purple. July. Swamps. N. J. to Fla. B.M. 1: 468.

P. gynandra, Lindl.—Triphora.—P. verticillata, Nutt.—Isotria.

Heinrich Hasselbring.

POGOSTEMON (Greek, bearded stamen). Labiatae. This includes the plant which produces the well-known perfumes called patchouli, or in India pucha-pat. Herbs or subshrubs: lvs. opposite, rarely in 3s: fls. small, in solitary or panicked spikes formed of many dense whorls; calyx subequally 4-5-toothed; corolla-tube exserted or included; limb sub-2-hipped; lobes 4, lower usually longest; stamens 4, exserted, straight or declinate; filaments usually bearded; anther-cells confluent; nutlets smooth, ovoid or oblong.—About 40 species, 24 of which are distinguished in Flora of British India 4: 631.

Patchouli has a peculiar dry moldy smell and is one of the commonest perfumes in India. In the 1849's its presence was considered the sure test of a genuine Indian shawl, but the French manufacturers of imitation Indian shawls imported the perfume in the 1850's. Patchouli is no longer fashionable. Fuller accounts of it will be found in the "Cultural Industries of Queens-
land.” V. 8:2347 and Gn. 27, p. 447. The plant has no ornamental value. Live plants were introduced into southern California, and were offered in 1900 in the East.

Heyneanus, Benth. (P. Patcholity, Pellet.). PATRI­MOULI PLANT. Herb, 2-3 ft. high: lvs. long-stalked, ovate, acute, acuminate or obtuse, crenate, simply or doubly toothed: spikes terminal and axillary, forming a paned infl.; whorls usually separate, forming interrupted spikes; fls. whitish, tinged purple. India and Burma.

**POINCIANA** (M. de Poinci, governor of the Antilles in the seventeenth century). *Leguminosae.* Small mostly broad-topped unarmed trees, with large and very showy flowers; one of the most conspicuous trees in southern Florida and the American tropics. Leaves bipinnate with numerous small lfts. and with no stipels and inconspicuous stipules; fls. very showy, orange or scarlet, in large corymbose racemes, not papilionaceous, the 5 petals clawed and eroded or even fimbriate on the margin, the stamens 10 and free and exserted; fr. long and flat.—There are 2 or 3 species of Poinciana, all native to the oriental tropics. The genus has been confounded with Casalpinia, but the calyx-segms. are valvate, whereas they are strongly imbricate (or overlapping) in Casalpinia. The *P. pulcherrima*, known as “Barbados pride” and “bird-of-paradise flower,” is *Casalpinia pulcherrima*; *P. Gil­lesii* is *C. Gillesii*. *P. elata*, Linn., native to India, Arabia, and Trop. Afr., is planted in the Old World, but is not in the American trade. It reaches a height of 20-30 ft., with the petals scarcely exserted beyond the calyx.

**Conzattii,** Rose. Small tree, with grayish bark: lvs. glabrous, large, with commonly 4 pairs of pinnre; lfts. 4 or 5 pairs, oblong to obovate: infl. a sessile raceme; sepals highly colored, obtuse; petals yellowish red; pod scythe-shaped, pubescent. Mex.—Cult. in Mex. and S. Calif.

**POINSETTIA** (Euphorbia pulcherrima, which see), is one of the most popular plants for the Christmas season. It is a shrub of tropical America with inconspicuous flowers but with flaming red leaves or bracts (with variations to pink and white), clustered near the top. It is for these leaves that the plant is grown (Fig. 1440, Vol. II).

Poinsettias require rather a long period of rest. After the bracts are cut, lay them on their side near the pipes under a carnation-house bench. About the first of May is the best time to start them for cuttings. They should then be placed on a light bench in the full sun in a temperature of not less than 60°. The eyes will start into growth near the top of the cane, and by June one can take the first batch of cuttings. These are found most suitable for stock plants as they grow rather tall to be of much use for decorative purposes. Pot the cuttings singly in small pots in sand. It is better to have a little sphagnum moss in the bottom of each pot for the roots to grip. Place them in a tight case shaded from the sun. The temperature should never be less than 65°. Water the cuttings every morning until they root, except on dull days. When rooted, pot them in 3-inch pots in equal parts of loam, leaf-mold, and sand. The next shift may be a 6-inch pot, and a good fibrous loam with a sixth part of sheep-manure added. They will form a fine large bract in this size pot, and require no further potting although they should be fed with manure-water until the yellow flower appears in the center of the bracts. After the first batch of cuttings has been removed, the stock plants should be planted out-of-doors. One gets far better and as many cuttings by this treatment, and the cuttings now secured and rooted may be used in various ways. Twelve cuttings rooted as advised above and placed in a 10-inch pot make a fine specimen plant for Christmas. Others may be grown about 2 feet high for single-stem plants. The last cuttings to be rooted for the season should be secured not later than the middle of August, and they are excellent for making up shallow pans for centerpiece s for Christmas. Poinsettias should at all times be grown near the glass as possible, and during the summer months the house should have full air day and night. Never, however, allow the temperature to drop below 60°, and avoid draughts, as this will tend to make the foliage drop, and the retaining of the leaves is one of the attractive points in a well-grown plant of poinsettia. Insect pests that attack the poinsettia can be eradicated by the use of hydrocyanic gas, as advised for other plants.

George F. Stewart.
POISONOUS PLANTS. The plants that are injurious to man and the domestic animals may be divided into two groups: (1) those that cause injury by mechanical means; and (2) those that are poisonous.


The first group includes those plants which are mainly harmful to farm cattle, causing serious troubles which may result eventually in the death of the animal. This group includes such plants as the crimson clover, *Trifolium incarnatum*, spiny cacti (Opuntia), the hairs and spines of which form the hair-and-spine-balls known as phyto-bezoars. The branched hairs of the calyx of the crimson clover, if eaten by horses and cattle, when in full flower, are rolled together to form the hair-balls which have been responsible for the death of many animals. The spines of species of Opuntia in Mexico and the southwestern United States cause the laceration of the mouth and tongue of cattle and death has resulted in a number of cases, where these spines have been rolled into phyto-bezoars. *Aspergillus fumigatus*, which lives in the tomato and the potato. Not all animals are equally affected by the same poison, as for example, the Tarar which poisons men, dogs, horses, and sheep, but is innocuous to cows, pigs, and ducks. Some persons are susceptible to poison ivy, others are not. This susceptibility may be increased by sickness, or a rundown condition. Some animals acquire a craving for certain injurious plants, as, for example, the loco weeds of the United States, stemless loco weed, *Oxytropis Lambertii*, and in Australia, according to Maiden, the indigo plant, *Swainsona paeonifolia*. Robert divides poisonous plants into three groups: (1) irritants which cause gross anatomic changes, as croton-oil; (2) blood poisons, as ricin; (3) poisons which kill without anatomic changes, as morphin, digitalin, and atropin. The fourth class may be added, (4) skin-irritants, as poison ivy.

The most poisonous lower plants are fungi belonging to the genus *Amanita*. The two most virulent are the toadstools, *Amanita muscaria*, which contains mescarin, and *A. phalloides* with phallin. Fortunately, an antidote has been discovered for the first in the administration of hypodermic injections of atropin beginning with 1-100 of a grain, and increasing the dose to a strength of 1-60 of a grain. For phallin, no antidote is known. Of the higher plants, the most noted poisonous ones are: *Aconitum Napellus* (monkshood); *Delphinium Geyeri* (larkspur); *Oxytropis Lambertii* and *Astragalus nevadensis* (loco weeds); *Rhus radicans* (poison ivy), which is a serious skin-irritant; *Rhus vernix* (poison sumac), which is also decidedly toxic to the skin; *Cicuta maculata* (cowbane), which contains two poisons, conin and cicutoxin; *Conium maculatum*, the classic poisonous plant, from which came the death-draught of the philosopher Socrates; *Kalmia latifolia* and *K. angustifolia*, the two poisonous laurels; *Datura Stramonium* (Jamestown weed); *Atropa Belladonna* (deadly nightshade) and others too numerous to mention.

Popular interest usually attaches itself to the poisonous ivy, *Rhus radicans* or *R. Toxicodendron* (Fig. 3088), a root-climbing vine with tartane leaves, and the poison

![Leaf of poison ivy](image1)

![Poison sumac](image2)
POISONOUS PLANTS

sumac, *Rhus vernix* (Fig. 3089), with pinnate leaves. Both of these plants have white fruits and hence are easily distinguished from the non-poisonous sumacs. The poison ivy is everywhere in the eastern states along roads, fence-rows and uncultivated ground, while the poison sumac grows in swamps and is less common. Both are skin-irritants, causing what physicians call dermatitis. If the susceptible person thinks he has come into contact with the plants, he should wash his hands and face with alcohol, as this dissolves and removes the non-volatile oil, toxicodendrole. Smoke from a brushwood fire containing these plants is toxic, and so is the Japanese lacquer made from the inspissated juice of a sumac, *Rhus vernicifera*. Unfortunately, all parts of these plants are virulent and at all seasons of the year. One of the best remedies is an alcoholic solution of sugar of lead, and the extract of grindelia (sold at drug-stores) is sometimes used. Local remedies are fresh bean leaves, stems of touch-me-not (*Impatiens*) and plantain leaves (*Plantago lanceolata*). At least, these leaves allay the burning sensation of the inflamed skin. An authoritative work on toxic plants is the "Manuscript of Poisonous Plants," by L. H. Prince, professor of botany in Iowa State College of Agriculture, in two parts, Part I (1910) and Part II (1911) with a total of 977 pages. Other publications have been issued.

Two plants much in prominence at the present time in Wyoming on account of their poisonous effect on livestock are discussed by H. G. Knight, as follows: "Woody aster, *Xylorrhiza Parryi* (Fig. 3090), is found throughout the state of Wyoming, but is confined to certain districts characterized by a gumbo clay soil, more or less intermixed with gravel and containing more or less of alkali and other salts. This plant probably introduces itself due to the presence of alkaloids .. one of which at least is a ne:~r relative of the better known *Zygadenus reniformis*. In Wyoming the most common species of the *Z. intermedium* and the greatest losses noted have occurred in early spring when the plant is in bloom, and before early forage is plentiful. The plant grows on the sandy plain as well as in the drier and steeper foothills. It has been found that the poisonous properties due to the presence of alkaloids, one of which at least is new to science. An antidote has not as yet been determined."  

JOHN W. HARSHBERGER.

POIVREA (N. Poivre, 1719-86; intendant of Mauritius). *Combretaceae*. Mostly climbing shrubs: lvs. opposite or alternate, entire: spikes axillary and terminal; calyx 5-lobed; petals 5; stamens 10, protruded; ovary 2-3-ovuled: frs. yellowish white in terminal racemes, rather large: fr a caps. more or less contracted at base, not stipitate. N. Amer. Intro. abroad.

POLEMONIUM (ancient name, not explained; probably not from Greek polemos, war, but rather the philosopher Polemon). *Jacob's Ladder*. Greek

VALBRIAN. *Polemoniaceae*. Flower-garden herbs, with pinnate leaves and pretty blue, purple or white flowers.

Perennials, rarely annuals or biennials, tall or dwarf, often viscid, often with a creeping rhizome which is thick or slender: lvs. alternate, odd-pinnate or pinnatisect; fls. in racemes or thyrselike panicles; calyx increasing after anthesis; corolla tubular, funnel-shaped, broadly bell-shaped or subrotate, 5-lobed, the lobes mostly obovate; stamens 5, alternate, with corolla-lobes inserted near the base, included or exserted; caps. 5-valved. Closely allied to Gilia and distinguished by the decastrate stamens and the filaments usually plose-appended at the base.—Brand, in the recent monograph (Engler's Pflanzenreich, IV. 250, lft. 27, 1907) accepts '29 species; mostly W. N. American, extending into Mex., but also in Eu., Asia and 2 in. S. Amer.

This genus includes the Jacob's ladder, *P. caruleum*, an old-fashioned inhabitant of cottage gardens, which owes its popular name to the regular manner in which the numerous leaflets are arranged on the long leaves. It is a hardy perennial herb, growing 1 to 3 feet high and bearing five-lobed bell-shaped flowers of blue or white, and nearly an inch across. Probably the finest species, however, is the plant known to all gardeners as *P. richardsonii*, which is a form of *P. humile* (or *P. lonatum*) that has doubled or trebled in size in cultivation. A fine specimen of *P. richardsonii* may have a terminal cluster 6½ inches across and 5 inches deep, with two dozen flowers each 1½ inches across. *P. confertum* differs in the great density of its inflorescence, and by connoisseurs in alpine plants may be regarded as a very fine species. Most of the yellow-flowered forms are disappointing. Polemoniums are of easy culture in any deep rich loamy soil. *P. caruleum* and *P. reptans* do well in partly shaded places not too dry.

POKET PLANT: *Kniphofs*.

POKEWHEED: *Phytolacca*.

POLANÍSIA (Greek, many, unequal, referring to the stamens). *Caparridaceae*. Annual herbs, mostly glandular and having an unpleasant odor: lvs. palmately 3-5-foliolate, the uppermost reduced to bracts of the racemose fls.: fls. whiteish or yellowish; sepals 4, lanceolate, deciduous; petals glanded or clawed; receptacle depressed, bearing a gland at the base of the ovary; stamens 8 to numerous, somewhat unequal: fr: a nearly or quite sessile pod.—About 30 species, natives of temperate and tropical regions, of little value horticulturally. *P. trachypetra*, Forr. & Gray. A branchy glandular-pubescent viscosa annual, 1-2 ft. high: lvs. petiolated, with 3-5 oblong lfts.: fls. yellowish white in terminal racemes, rather large: fr a caps. more or less contracted at base, not stipitate. N. Amer. Intro. abroad.

POLEMÔNION (ancient name, not explained; probably not from Greek polemos, war, but rather the philosopher Polemon). *JACOB'S LADDER*. Greek

3090. Woody aster (Aster, or Xylorrhiza, Parryi), a poisonous plant of the Plains.
Polemoniums are easily raised from fall-sown seed. Also propagated by division. They are said to be impotent of soil on the leaves.

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1. **P. pauciflorum**, Wats. Perennial, erect and branched, somewhat villous, 1–2 ft.; lfts. 8–13 pairs, about 1 in. long; fls. yellowish, tubular, the tube 1–1 3/4 in. long, much longer than the lobes, solitary or loosely corymbose, long-pedunculate; stamens bearded at base, about equaling the corolla; caps. oblong. Mex.—The color is said to be a good clear yellow, tinged red outside. Offered by J. W. Manning in 1892, but subsequently dropped.

2. **P. confertum**, Gray. Perennial, with a thick woody rhizome, sticky, smelling of musk, 9–18 in. high; lfts. very small and so crowded as to seem whorled: infl. a dense head; fls. honey-scented, deep blue, Y2 in. across, the best of the genus, and in need of botanical study. Aside from references above, portraits occur in Gn. 73, p. 615; G.M. 45:494; Gn.W. 7, p. 356.—Intermediate between Polemonium and Gilia.

3. **P. mellitum**, A. Nels. (P. confertum var. mellitum, Gray). An attractive species with white or pale fls., the corolla campanulate to rotate, the tube mostly shorter than the lobes.

4. **P. humile**, Wildl. (P. Richardsonii, Graham). Low, slender plant from somewhat creeping rootstocks, about 9 in. high: lfts. 15–21, 2–6 lines long; fls. bell-shaped, blue or purplish. J. J. N. B. M. B. M. 2800 (yellow eye). G.C. II. 19:763. B.R. 1303 (as P. caruleum var. piliferum).—It has the odor of ripened grapes. Brand combines this plant with P. lanatum, Pallas, of the Arctic Zone, and the Altai region, making this form P. lanatum var. humile, Brand, with a wide range in the high N. P. Richardsonii, referred here, was raised from seeds collected at Great Bear Lake. The plant cult. as P. Richardsonii grows about 18 in. high, and bears profusely of bright blue fls. (varying to white in var. album, Hort.); probably the best of the genus, and in need of botanical study.

5. **P. pulchellum**, Gray. P. pulchellum, Bunge. P. lanatum var. pulchellum, Brand). Differs in having smaller fls. ranging from violet and lavender to nearly white and in the viscid pubescence, which is minute. Corolla-violet varying to white, and with narrower lobes. By Brand it is made to comprise the American forms passing as P. humile var. pulchellum, with much smaller fls.: sts. erect, more or less pilose and glandular-viscid, 10 or 12 in. or less high: radical lvs. numerous, the lfts. 17–27, small, o-vate, obtuse and entire; st.-lvs. few; fls. in terminal corymb, the corolla very variable, usually bicolored (blue with white tube), 5–8 lines long, the lobes oblong and much exceeding the short tube: caps. ovoid, much shorter than the calyx. High Rocky Mts. and northward. B.M. 1887.—Said to be an easy prey to snails, especially in winter, when they attack the rootstocks.

6. **P. reptans**, Linn. GREEK VALERIAN. Fig. 3091. Height 1 ft. or less; slender, weak and diffuse but never creeping (as the name would indicate): foliage not viscid or glandular; lfts. 5–8 lines long, the lobes oblong and much exceeding the short tube: caps. ovoid, much shorter than the calyx.

7. **P. carneum**, Gray. St. lax or loosely branching, 1–2 ft. high, with a horizontal rootstock: lfts. 5–17, often 1 1/2 in. long, ovate to oblong-lanceolate; fls. salmon or flesh-color fading to purplish, 1 1/2 in. in acros, the corolla-lobes rounded-ovate; calyx deeply 5-cleft, with ovate-oblong lobes. Mountain woods, Calif., Ore. G.C. III. 48:194.—Offered in Ore., 1892, but probably not in cult. now. Closely allied to P. reptans.

8. **P. foliolosum**, Gray. St. solitary and erect, 1–3 ft. tall, simple or branched, hairy at base and viscid above, from a woody short rootstock: herbage strongly-scented; lvs. many; fls. lanceolate to ovate-lanceo-

3091. Polemonium reptans. The leaflets are often much broader.
or both. The pollen is more or less moist and sticky, so that it is not easily blown away. Insects are probably attracted by the showy colors and by the perfume, both of which bespeak the presence of nectar. As the insect reaches down for the nectar, which is near the bottom of the flower, some parts of its body are almost sure to become dusted with pollen. When the insect visits another flower some of this pollen may be brushed upon the stigma and a fresh supply received. This pollen likewise may be carried to another flower, and so on. Thus cross-pollination, or the transfer of pollen from the anthers of one flower to the pistil of another, is accomplished.

Many flowers, notably the orchids, have special modifications of structure apparently developed for the purpose of securing cross-pollination by insects and preventing self-pollination. The bodies of some insects, also, have corresponding adaptations which insure the cross-pollination of certain flowers which they are in the habit of visiting most frequently. This correlation between flowers and their insect visitors has been the subject of extended observation. "Fertilization of Flowers," by Herman Muller, contains a bibliography of the subject up to 1886. For the distinction between fertilization and pollination, see the article "Fertilization," page 1221.

The value of crossing to plants was first clearly proved by Charles Darwin in 1839. From the observations of Kolreuter, Sprengel, Knight, and his own exhaustive experiments, Darwin showed that continued self-fertilization is likely to result in inferior offspring; while cross-fertilization, within certain limits, gives greater vigor to the offspring. Cross-fertilization between different flowers on the same plant usually has no appreciable advantage. The probable reason for this is that the plant resulting from the union of unlike parents, as in cross-fertilization, is more variable than one resulting from self-fertilization or crossing between different flowers on the same plant, and hence has a better chance of fitting into new conditions.

Plants are endlessly modified to secure cross-fertilization and avoid self-fertilization. The principal means by which this end is gained are: (1) Special contrivances in the structure of the flower which favor cross-pollination. (2) A difference in the time at which the pollen matures and the stigmas become receptive in the same flower (dichogamy). This condition is very noticeable in some varieties of orchard fruits. The premature of the pistil is more common than the premature of the stamens. (3) Self-sterility, which is the inability of a flower to set fruit with its own pollen. Self-sterility is not usually due to a deficiency of pollen or to defective pistils. The pollen-grains often germinate on the stigmas, but fertilization does not take place. The embryological reasons for this are not clearly understood. The ultimate cause of self-sterility in the grape has been studied by Dorsey. Cytological studies of the pollen of self-sterile varieties showed distinct degenerative processes in the generative nucleus, or arrested development previous to mitosis in the microspore nucleus. Dorsey concludes that self-sterility in the grape is not due to hybridity alone, as suggested by Beech, since there are both fertile and sterile hybrid varieties; but it is due also to deep-seated influences operating to produce declinism and disorganization, the native species of grapes being mostly docious. Dorsey finds the nuclei of the pollen of many self-sterile varieties of native plums to be degenerated and disorganized. Degeneration of the pollen cannot be the main cause of self-sterility, however, since two self-sterile varieties may be mutually fruitful when planted together. About sixty species of plants are known to be more or less self-sterile. (4) The separation of the sexes in different flowers or on different individuals. It is thought by some that there is a gradual evolution among some kinds of plants toward unisexuality, and that adaptations for insect-pollination, dichogamy, and self-sterility are steps in this process.

Self-sterility has an important economic aspect in the culture of certain fruits. It is common in varieties of pears, apples, peaches, and grapes; it is uncommon, or unknown in cherries, peaches, raspberries, currens, gooseberries, and strawberries. Whenever isolated trees or large blocks of a variety blossom full year after year, but drop most of the fruit before it is half-grown, the variety may be self-sterile, provided the failure cannot be attributed to excessive vegetative vigor, marked lack of vigor, disease (especially scab, brown rot, and fire blight), insect attack, unfavorable weather during the blossoming season, or other untoward circumstances. Self-sterile varieties are detected experimentally by inclosing the unopened blossoms in thin paper sacks, and dusting the pistils, when receptive, with the pollen produced by these blossoms; or by emasculating them and hand-crossing with pollen of the same variety. If very few fruits are produced from a large number of these selfed blossoms, but the variety fruits abundantly when crossed with other sorts, it is self-sterile. A few varieties of fruits are more or less self-fruitful, as distinct from self-sterile; they bear good fruit with their own pollen, but the fruits are seedless, as in the banana. Ewert found that many apples in Germany have this parthenocarpic development; that is, they grow without fertilization. It is not common in North American varieties of fruits.

Self-sterility is not a constant factor in any variety. It appears to be almost as easily influenced by the conditions under which the plant is grown as is the shape or color of the fruit. A variety is frequently self-sterile in one locality and self-fertile in another. Waite found several varieties of Japanese plums self-sterile, but concluded, "With plums, as

3098. Structure of the flower, to illustrate pollination.

1. Top.—The structure of a plum blossom: se, sepal; p, petal; sa, stamen; o, ovary; s, style; st, stigma. The pistil is composed of the ovary, style, and stigma. It contains the female part. The stamens are tipped with anthers in which the pollen, or male part, is borne. The ovary, o, ripens into the fruit.

2. Fuchsia, showing ovary at o, 3 stamens (one is removed) and the growing style.

3. Buttercup, showing many small pistils in the center and stamens surrounding them.

4. Bottom.—Peach, showing the 2-pored stigmas, and stamens included in the tube.
with other fruits, self-sterility is purely relative; under favorable conditions these varieties are able to set fruit without cross-pollination." Powell proved that in different parts of the Delaware-Maryland peninsula the Kieffer pear is self-sterile, partially self-fertile, or completely self-fertile. The Ben Davis apple is self-sterile in Vermont, according to Waugh, but self-fertile in Kansas, in the experiments of Greene. Backhouse found that the two sorts are nearly self-sterile in most of the Atlantic States, but usually self-fertile in the Pacific Coast. Beach found that varieties of grapes which are weakly self-fertile vary in this respect in different localities, and even in different parts of the same vineyard, being entirely self-fertile in one place and completely self-sterile in another. It is quite evident that the degree of adaptation of a variety to its environment of soil and climate has much to do with its ability to fruit abundantly with its own pollen.

It is not possible, therefore, to give a list of varieties that are self-fertile, and another list of those that are self-fertile, that would have more than local application. There are certain sorts, however, that are less dependable in this respect than others. Out of eighty-seven varieties of apples tested, fifty-nine were self-sterile, fifteen self-fertile, and thirteen partially self-fertile. Powell found practically all the commercial varieties of apples in Delaware self-sterile, except several summer sorts. Some of the prominent commercial varieties of peaches are frequently uncertain, while Angouleme (Duchess), Bosc, Flemish, and Seckel are usually self-fertile. Practically all the varieties of Japanese and native plums are self-sterile, the single exception, according to Waugh, being Robinon, and old Goosen, and Miners are frequently self-sterile in the experiments of Close, Whittem, and Howard, indicate that all the leading varieties of peaches are self-fertile, and are not benefited by cross-pollination. In Germany, however, Ewart finds peaches 'sparingly self-sterile.'

No cherries are known to be self-sterile, although Napoleon, Belle de Choisy, and Reine Hortense have that reputation among commercial growers.

Of one hundred and forty-five varieties of grapes tested by Beach, thirty-one were self-fertile, forty-one self-sterile, and seventy-three uncertain. Brighton, Herbert, Lindley, Merriam, Salem, Wilder, and other hybrid varieties are decidedly unfruitful with their own pollen; while Concord, Delaware, Diamond, Niagara, Winchell, and Worden are among those strongly self-sterile. Reimer found the Symonm and other varieties of the Muscadine grape so defective in pollen that they are fruitful only when planted near male vines of the Muscadine. No varieties of the quince, raspberry, currant, gooseberry, or strawberry have been found self-fertile, although many varieties have well-developed stamens and so must be planted near perfect-flowered sorts.

A self-sterile variety often may be made fruitful by planting near it another variety to supply pollen by top-grafting part of the tree with cions of another sort. No benefit is derived from other trees of the same variety, even if brought from a distance, since all are but divisions of the same original seedling. In the selection of a pollinizer, several points must be considered: (1) The two sorts must blossom approximately at the same time in order that cross-pollination may be possible. The transfer of pollen from one variety to another is performed mainly by insects. Waugh and Backhouse have shown that practically none of the pollen of the plum and other stone-fruits is carried by wind, it being moist and sticky. The same is true of pears, but apple pollen is somewhat drier and is wind-blowen to a slight extent. The honey-bee is the most important pollinizer. Hooper estimates in England 80 per cent of the cross-pollination is done by the hive bee, 15 per cent by various wild bees, especially the bumblebee, and 5 per cent by miscellaneous insects. In tree-fruits it is necessary to select varieties that come into bearing at about the same age, otherwise one might be without cross-pollination for the first two or three years. Several state experiment stations have published lists of varieties blossoming at the same time, for the guidance of the planter. See New York (Geneva) Bulletin No. 497. (2) There should be an affinity between the two varieties, so that the self-sterile sort may find the pollen of the other acceptable. This can be determined only by hand-crossing. Beach found that the pollinizer varieties Oregon and Seckel, practically incapable of fertilizing other varieties; but this does not hold for tree-fruits since two self-sterile varieties planted together usually are mutually fruitful. Powell found no affinity between Pargosa and Stayman apples; Kerr none between Mild (Greene) and Whitaker plums, and there are a number of other instances. Undoubtedly some varieties are more acceptable as pollinizers of a self-sterile variety than others. Spitzmbrg apple produced by Le Conte from Jonathan pollinized with Seckel averaged 144 grams in weight; from Baldwin pollinized, 157 grams. In general, however, varieties of the same species that blossom simultaneously cross-fertilize readily, and there is no appreciable and constant difference in the fruit. (3) In commercial orchards the pollinizer should be a standard variety, valuable for cross-pollination; if self-pollinated fruits, but there is rarely any other influence. The shape, color, flavor, and keeping quality remain the same, regardless of the variety selected. Powell proved that the change in the fruit. (4) It should produce a large amount of pollen. Winesap produces little pollen; it would be unsatisfactory as a pollinizer for other sorts; Grimes, Ben Davis, and Ruby are abundant pollen-bearers.

Cross-pollinated fruits may be larger and heavier than self-pollinated fruits, but there is rarely any other influence. The shape, color, flavor, and keeping quality remain the same, regardless of the variety selected. Powell found no change in the fruit. In commercial orchards the pollinizer should be a standard variety, valuable for cross-pollination; if self-pollinated fruits, but there is rarely any other influence. The shape, color, flavor, and keeping quality remain the same, regardless of the variety selected. Powell proved that the change in the fruit. (4) It should produce a large amount of pollen. Winesap produces little pollen; it would be unsatisfactory as a pollinizer for other sorts; Grimes, Ben Davis, and Ruby are abundant pollen-bearers.

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with their own pollen, 4 per cent of the self-pollinated blossoms producing fruit; but bore a much heavier crop when pollinated with Duchess, Lawrences, and other varieties, 76 per cent of the crossed blossoms producing fruit. Yellow Newtown is distinctly self-fertile in Oregon, yet Lewis noted a decided improvement in the fruit when Jonathan and Grimes pollen was used upon it. He concluded, "All varieties of pomefruits, at least of apples and pears, even though they may be termed self-fertile, are benefited by having other varieties planted with them pollinizers." The benefit will usually more than offset the slight inconvenience in orchard management occasioned by this mixed planting. The chief economic problem for the experimenter, therefore, is to determine what commercial varieties may be planted together for best results, and the rational course for the fruit-grower is to practise mixed planting on the basis of these experiments.

Those who wish to study the subject of fruit-pollination in greater detail should consult the following publications: Vermont Experiment Station Reports, 1896-1900; Delaware Experiment Station Reports, 1900-1902; Oregon Experiment Station Bulletin No. 104, Circular No. 20, Research Bulletin No. 1; New York (Geneva) Experiment Station Reports, 1902-1903; Experiment Station Reports, 1894-1896; New York (Cornell) Experiment Station Bulletin No. 181; North Carolina State Experiment Station Bulletins Nos. 201, 200; United States Department of Agriculture, Division of Vegetable Pathology, Bulletin No. 5; Minnesota Experiment Station Bulletin No. 144; Missouri Experiment Station Bulletin No. 117; Virginia Experiment Station Report 1909-1910. S. W. FLETCHER.


POLYANTHUS. - In common speech Polyanthus means the florists' flower supposed to be derived chiefly from Primula elatior or its allies. The "Polyanthus Narcissus" of trade catalogues is one of the forms of Narcissus Tazetta, an old synonym of which was Polyanthus. Polyanthus may also mean the tuberous, Foliathus, which see. There is no genus known as Polyanthus.

POLYBÖTRYA (Greek, many and grapes; referring to the massed sporangia). Polygalaceae. A small group of tropical ferns somewhat related to Dryopteris, but characterized by having the sporangia massed and covering the entire under side of the fertile lvs. as in Aceristrochium, to which the species have been referred: lvs. 1-4 times pinnate, the fertile lvs. reduced so in tissue that they consist of little more than leaf-skeletons, affording space for the production of the sporangia.

Osmundaceae, HBK. Rootstock wide, climbing, with long, linear scales: sterile lvs. 2-3 ft. long, the lower pinnae 8-10 in. long, with numerous slightly stalked segms., veins fine; fertile lvs. tripinnate, with the lower pinnae 1-2 ft. long, 4-8 in. wide, with narrow, cylindric segms. ½-3½ in. long. W. Indies to Brazil.—Probably the handsomest of the climbing kinds. Another cult. species sometimes included in this genus is designated here Olerantica cervina (Aceristrochium cervinum), which see. R. C. BENEDICT.

POLYCALYXMA: Myricacephalus.

POLYCYNÍCS (Greek, many and swean, probably referring to the lip and column which together bear some resemblance to a swan). Orchidaceae. Epiphytic herbs with very short vagnate 1-lvd. sts., scarcely thickened to a fleshy pseudobulb: lf. broad, plicate-veined, contracted to the petiole; scapes erect from the rhizome, few-sheathed; fls. rather large, pedicelled; sepalas subequal, free, spreading, narrow; petals similar to the sepals or at the base narrower and subspatulate, labelum affixed to the base of the column, spreading, sometimes 2-auricled at the base, column elongated, slender: fr. a caps.—About 7 species in Trop. Amer. P. Chittendenii, Hort. Infl. long and arching, bearing about 50 fls. which are 1 in. across; sepals broad, yellow, closely mottled with pale red-brown, the upper abruptly turned back; petals linear, twisted, yellow, slightly marked with red at the base; lip long, narrow, brownish with whitish hairs. Intro. from Guiana. Intro. and offered for sale there. The following species may have been cult.: P. babbià, Reichb. f. (Cynarales barbatum, Lindl.); P. gratiánea, Endres & Reichb. f.; P. lópidia, Lindl. & Reichb. f.; P. muscofera, Reichb. f. (Cynarales muscoferum, Lindl. & Paxt.); and P. vilítia, Reichb. f. (Utricularia vilítia, Lindl.). Warmhouse plants.

POLYCALYXMA. (Greek, much milk; from the old idea that some species increased the flow of milk). Polygalaceae. Milkwort. Annual or perennial herbs, subshrubs, shrubs or very seldom trees, sometimes planted in the open or some kinds raised under glass for the bloom. Leaves alternate or rarely opposite or verticillate, with or without stipules: inf. racemes or spikes, terminal, lateral, or forked, rarely axillary; fls. showy or small, colors various; calyx with very dissimilar sepalas, the lateral (inner) pair larger; petals rarely 5, usually reduced to 3; stamens 8; ovary 2-celled: fr. a compressed 2-celled wing-margined or wingless caps.—About 550 species scattered through the temperate and subtropical regions of the world and a few species in the tropics. Polygalas from a cultural standpoint may be grouped as hardy and tender species and the latter are sometimes cultivated under glass, frequently outdoors in the South, as in southern California. There are about
forty North American species but only a few of them have been offered by dealers in native plants. The hardy species should be grown in rather light soil, but they require some moisture and are best adapted to partially shaded positions. They may be raised from seed sown in the fall or early spring. The more commonly cultivated species are the exotic ones, especially the shrubby Cape kinds which grow from 2 to 4 feet or more high. Searing subterminal racemes of large flowers.

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**A. Plants hardy.**

1. **paucifolia**, Wild.  **FLOWERING WINTERGREEN.** Gaywings. Evergreen Plant. PRUNED POLYGALA. Fig. 3009. Trailer, 3–6 in. high: upper lvs. clustered, ovate, 1½ in. long; lower lvs. distant, small, and becoming mere bracts at the base: fls. bright rosy purple, varying to white, 1–4 in the axis of the upper lvs. or appearing terminal. May, June. New Bruns., to Winn. B.M. 2852 (petals white). B.B. 7: 361.

2. **Chamaebatites**, Linn.  **BOX-LEAVED MILKWORT.** Evergreen trailer: upper lvs. lanceolate or elliptical, mucronate; lower lvs. smaller, obovate: peduncles axillary and terminal, about 2-fld.; fls. as many as 10 on a stalk, typically yellow, more or less reddish toward the end of the keel; stamens united only at the base. April–June. Eu., in low heaths and woods to highest Alps. L.B.C. 6: 593. B.M. 316 (wings white; petals white at base, yellow or red at tip). Var. grandiflora, Gaudin (var. purpurea, Neill.), has purple wings, set off by yellow petals. Gm. 13: 36; 30: 148 (charming; wings rosy pink).

3. **Senega, Linn.**  **SENECA SNAKERoot.** Mountain Flax. Fig. 3100. Height 1 ft. or less: lvs. 1–2 in. long: fls. white or greenish, 1½ lines long; crest small, few-lobed. May, June. Rocky woods, New Bruns., or in Rockies. L.B.C. 14: 1380. B.M. 1051.

4. **virgata**, Thunb. Glabrous shrub, 2–5 or even 15 ft. high, with red-like branches terminating in many-fld., leafless racemes of purple or flesh-colored fls.; anterior sepals distinct; wings obtuse. S. Afr.—The
Solomon’s seal of our nurseries is the European several Himalayan and Japanese species. The common subject to drought. Easily propagated by division. Easily propagated by division. Shaded positions, although they do well in the open in equally desirable for all purposes. The Solomon’s seal multiflorum, likely the commonest species native to Europe. There are of English literature is P. officinalis. The common Solomon’s seal is connected with the horizontal rootstocks which are scarred by the death of the annual stems, each scar being likened to a seal (see Smilacina). Polygonatums are graceful allies by the cylindrical perianth-tube with short lobes distributed in the temperate regions of the northern creeping knotted rootstocks, sometimes planted. Our native species are presumably of the trade somewhat flattened, smooth, not roughened.

nn. Habit dwarf, 1 ft. or less high.

10. amatymbica, Eckl. & Zeyn. (P. acuminata, E. Mey. & Hort., not Willd.). Densely tufted, erect, 3-6 in. high; lvs. lanceolate-acuminate, pungently mucronate; racemes lateral, few-fl., spreading or reflexed; fls. small, wings green, keel and petals flesh-color to purple; keel with a many-parted crest. S. Afr.

—P. acuminata of the trade is probably not P. acuminata, Willd., which is Badiera acuminata. Badiera differs from Polygonia in having 2 of the sepals only a little larger than the others, instead of much larger.

Two other species have been recently intro. into cult.: P. brocktorfod, Tod., whose native country is not known, has erect growth, green very straight branches, long and very narrow lvs., and numerous reddish purple fls. Intro. into Calif.—P. Výšinský, Costa. A small plant 4 in. high, hardy or half-hardy in England, growing only a few inches high, with linear, evergreen lvs. and reddish purple fls. with a yellow keel. Spain. Closely resembles P. Chunneobusus, but has narrower lvs.

WILHELM MILLER.

F. TRACY HUBBARD.

POLYGONATUM (Greek, many knee; alluding to the numerous joints of the rootstock). Lílíceae. Solomon’s Seal. Perennial herbs, with simple stems from creeping knotted rootstocks, sometimes planted. Stems naked below, above bearing nearly sessile or half-clasping nervt lvs. and axillary nodding greenish fls.: perianth cylindrical, 6-lobed at the summit; stamens 6; ovary 3-celled with 2-6 ovules in each cell: fr. with a yellow keel. Spain. Closely resembles P. Chunneobusus, but has narrower lvs.

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AA. Lvs. alternate.

b. Perianth 2-3 lines thick.

c. Plant glabrous.

d. officinale. All. Height 1-1½ ft.: fls. 1 or 2 in the axis: lvs. oblong, 2-3 in. long, firmer than those of P. multiflorum: perianth-segns. greenish. Eu., Siberia.—P. ambiguus, Link, is offered as a distinct form abroad.

latifolium, Desf. (P. Thunbergii, C. Morr.). Height 2-4 ft.: fls. 1-5 in the axis: lvs. oblong, 3-6 in. long: perianth-segns. greenish. Eu., Asia.—Intermediate in habit between P. officinalis and P. multiflorum, but with earlier fls.

BB. Perianth 1½-2 lines thick.

c. Plant glabrous.

d. multiflorum. All. Height 2-3 ft.: lvs. oblong, 3-6 in. long: perianth-tube white; segns. greenish; filaments densely pilose. Eu., N. Asia, Himalayas. Gn 26, p. 236; 30, p. 49; 69, p. 172. V. 7:337. Var. floribundum, Hort., has rosy fls.—There are said to be varieties with double fls. and variegated foliage. The type seems to be more graceful than the varieties. This is the common Solomon’s seal of Eu., where it is also called lady’s seal and David’s harp.

e. commutatum, Dietr. (P. giganteum, Dietr.). Taller and more robust than P. biflorum, 1-8 ft. high: lvs. 1½-6 in. long, 3-4 in. wide: fls. 1-8 in the axis; filaments somewhat flattened, smooth, not roughened.

**Plant with lvs. pubescent beneath.**

*biflorum*, Ell. Fig. 3101. Height 8 in. to 3 ft.; lvs. 2–4 in. long, ½–2 in. wide; fls. often 2 in axils, sometimes 1–4, April–July. Woods, New Bruns. to Mich., south to Fla. Mn. 8:49.

*P. intermedium* as offered in the European trade is presumably not hardy in the northern states. *P. majus* is not known botanically, but it is said to grow 3 ft. high and bear pendent creamy fls. in May and June.

**POLYGONÉLLA** (diminutive of Polygonum). *Polygonées*. About 7 species of American plants closely allied to Polygonum and of no horticultural standing, although one or two names may appear in the trade. *P. polygama* was offered in Mass. in 1881, but it is probably not hardy N. The genus differs from Polygonum in having only the inner sepals erect and the calyx enlarged in fr., while in Polygonum all the sepals are erect and the calyx is not enlarged in fr.

*Polygama*, Gray (*P. parvifolia*, Michx.). Diffuse shrub; lvs. wedge-shaped, vertical, those on sterile shoots imbricated; racemes ½–1½ in. long, very numerous, in an oblong or corymbose panicle; fls. white, yellowish or rose-color; filaments all alike; stigmas nearly sessile. Aug., Sept. Dry sandy soil, Fls. to N. C.


**POLYGONUM** (Greek for many-jointed). Including *Persicaria, Bisória, Toetra*. *Polygonées*. **JOINTWEED.** **KNOTWEED.** **SMARTWEED.** Erect or twining plants, grown for ornament, the flowers and foliage often attractive.

Mostly herbs, annual or perennial, with small fls. on jointed pedicels in racemes, spikes or heads (sometimes solitary); lvs. alternate, simple, jointed to an ocrea or sheath which clasps or surrounds the st. and may at length split and become indiscernible: fls. apetalous; calyx gamosepalous, 4–6-petalled; stamens 3–9, sometimes exerted; ovary 1-loculed, with 2–3-parted style or stigma (latter capitate), ripening into a triangular or lenticular achene.—The species are perhaps 200 (if the genus is held to include Persicaria), of very wide distribution from arctic to tropical countries, and they are of widely different habit, from small annuals, slender twiners, to subshrubs, and ranging in habitat from dry open lands to deep woods and watery swamps. The calyx is corolla-like, often large enough and with sufficient color to render the infl. showy. Polygonum is closely allied to Rumex, the docks, and also to Fagopyrum, the buckwheat. Rumex differs in having an achene surpassing the calyx and in details of the embryo. Most polygonums are weedy plants, and only a very small proportion are of merit for cult. One of the commonest species is the doorweed (Fig. 3102), *Polygonum aviculare*. It is a decumbent wiry small-lvd. annual or perennial, growing along walks and in other hard dry soil, where it makes a sod-like mat. The axillary fls. are very small, seldom seen by others than botanists. Some of the cultivated kinds are annual, as *P. orientalis*, and this species is the only one that is known as a familiar flower-garden plant, although it is now little grown and the seed is difficult to secure in the trade. *P. sachalinense* is a robust coarse plant of some value where screening foliage is desired and to occupy intractable ground; it was once extravagantly advertised as a forage plant. *P. baldschuanicum* is an attractive and worthy climber, hardy in the northern states. *P. sieboldii* is one of the best of the species for the back or bold border and is useful for forming single clumps when strong herbaceous foliage effects are desired. The other species are employed mostly in wild gardening or for similar effects. The amorphous kinds make interesting subjects for bog gardens. The pink or red often curved spikes of the Persicaria group are sometimes very ornamental. The
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1. cilinode, Michx. Slender somewhat downy climber, mostly perennial: lvs. cordate-ovate to ovate-lanceolate, more or less angular or halberd-shaped at base: st. bearing a ring of retorse bristles at the base of each sheath (where the specific name): fls. white, in loose-pauciflorous racemes from the upper axils. Nova Scotia south and west. R.H. 1913, p. 149.—Sold as a cover-plant for rocks and as a denizen of shrub-masses.

2. baldschuanicum, Regel. Fig. 3103. Tall perennial climber becoming woody at the base; lvs. cordate-ovate or hastate, acuminate, slender-petioled; fls. small but very numerous, in terminal erect or drooping panicles, mostly rose-colored; fruiting calyx small, 3-sided, at first whitish and then becoming rose-colored: achene shining black. Bokhara. B.M. 7544. R.H. 1900, p. 35. Gt. 22, p. 391. G.C. III. 21:17; 41:399. Gn. 35, p. 454; 70, p. 274; 71, p. 19; 79, p. 41. G.M. 50:310. G. 35:657. G.W. 4, p. 253; 15, p. 626. Gn. 5:181.—A very vigorous and decorative hardy plant, climbing 20 ft. high, and, under favorable conditions, producing a profusion of pinkish, or sometimes whitish bloom; hardy N., and worthy greater attention. It was first described by Regel in 1884; bears the name of the town or place Baldschuian.

3. Auberti, Henry. Resembles P. baldschuanicum, but said to be inferior to it; climbing to 25 ft. and more, becoming woody at base: lvs. ovate-lanceolate, cordate, obtuse or very short-pointed, reddish bronze or pale green and when young red at the apex: fls. small, whitish, rose-colored or green, in slender axillary panicles 6-8 in. long. W. China, Tibet, discovered by P. Georgs Aubert, missionary. R.H. 1907, pp. 82, 83.—Sold to great rapidity, and to cover a large space; blooms in spring and again in autumn.

AA. Habit erect, or at least not climbing.

B. Plants annual, of erect habit, to be treated as flower-garden subjects.

4. orientale, Linn. (Persicaria orientalis, Schach). Prince's Feather. Fig. 3104. Tall-growing annual, much branched above, hairy: lvs. large, ovate or cordate-ovate or broad-ovate, acuminate; fls. more and more, ciliate and sometimes bordered at the summit: fls. bright pink, in close, cylindrical spikes that are arranged in open panicles, the stamens 7 and the achene lenticular. India. B.M. 213. J.H. III. 51:365. C.W. 6, p. 149.—An attractive old-fashioned plant growing as high as the fence. It is most easy of cult.; in fact, it usually self-sows in old gardens. In some places it has run wild. There are horticultural varieties, as var. variegatum, Hort., with foliages marked with yellowish white, and var. pumilum, Hort., with compact habit and the stature half that of the type.

5. Persicaria, Linn. Lady's Thumb. One of the annual smartweeds, but sold by seedsmen as a suitable plant for backgrounds: glabrous or nearly so, erect or somewhat diffuse, 1-2 ft. tall; lvs. lanceolate to linear-lanceolate, slightly ciliate, usually with a triangular or crescent-shaped spot near the middle of the blade (whence the name lady's thumb); sheaths short, hairy on the margin: fls. in short spikes, pink or greenish purple, the stamens 6 and the achene lenticular or triquetrous. Eu.—Naturalized everywhere about dwellings.

6. arenarium, Waldst. & Kit. (P. elegans, Ten.). Dwarf annual species with slender wiry branches and long internodes: lvs. small, linear-lanceolate, 1-nerved, bearing great numbers of little whitish fls. along the st., the terminal clusters leafless. S. Eu.—Offered in Calif. for rockeries and bouquets.

3104. Polygonum orientale. (X 10)

BB. Plants perennial, of various habit, usually with strong rootstocks, sometimes shrubby.

C. Species native: smartweed-like plants, sometimes offered for naturalizing in bog-gardens.

7. amphibium, Linn. (Persicaria amphibia, S. F. Gray). Much spreading and creepimg, rooting at the joints, at first more or less pubescent but becoming glabrous with age: lvs. rather thickish and large, oblong, elliptic or lance-linear, mostly obtuse or very nearly so; sheaths short, usually not fringed or bordered at the summit: fls. light rose-colored, in a short, dense, terminal spike, the stamens 6 and exerted, and the achene lenticular. In water or bogs, across the continent, and useful for planting in similar places.—When growing in water, the floating lvs. become long-petioled. Var. Hartwighii, Biesell (P. Hartwighii, Gray). Differs from the last in having many narrow-lanceolate lvs., bordered and fringed sheaths, and hispid sts., but the distinguishing mark is the foliaceous border on the sheath. Muddy places, across the continent.

cc. Species exotic, used mostly for borders, and appearing regularly in the trade, largely Himalayan and E. Asian.

d. Whole plant white-woolly.
recurred, acuminate, covered with down of the color of old silver; sheaths short, not ciliate: fls. small, red or copper-colored (varying to white), in racemes on slender forked peduncles, the stamine 6, and the achenes flat and shining black. Tropics and sub-tropics of Old World and, according to Hooker, of Amer. R.H. 1891, p. 567. Gn. 62, p. 345; 70, p. 167. G.W. 2, p. 419; 13, p. 390.—Perennial and not hardy in the N., but seeds sown early will produce excellent lawn specimens, which are interesting because of the gray foliage and leafy habit.

Dd. Whole plant green or grayish, not white-woolly.

E. Fls. greenish or white, in very slender and long interrupted flexuose or curving wand-like spikes.

9. filiforme, Thunb. Perennial, mostly somewhat hispid, 2-5 ft., with hollow branches: lvs. petiololed, pubescent; ovate or oval, short-acuminate: fls. very small, whitish (or rose-colored?), remotely placed in small, whitish (or rose-colored?), remotely placed in spikes 5-8 in. or more long; stamens exerted; styles 3. N. Eu. and N. Asia.

—The astrigent rootstock was once used medicinally, and has provided food in famine times. Var. superbum, Hort., is offered abroad, with conical heads of bright pink long-lasting fls.

11. amplexicaule, Don (P. ozyphillum, Wall. P. multiflorum, Hort.). MOUNTAIN FLEECE. Strong-growing tufted green-stemmed perennial with slender fl.-sts. 2-3 ft. tall, from a woody branching rootstock: lvs. ciliate-ovate to cordate-lanceolate, short-petioled or clasping, the margin wavy and crenulate, long-acuminate; sheaths 1-2 in. long and split or incurvate: fls. rose-red or white, rather large (sometimes 1/4 in. diam.) in strict long-peduncled spikes 2-3 in. long; the stamine 8 and exerted, the achenes trigonous. Himalaya, from 6,000-13,000 ft. altitude. B.R. 25:46. B.M. 6500.—An excellent border perennial, blooming in midsummer. Some, at least, of the plants that have been cult. as mountain fleece are a native polygonum (P. Muhlenbergii), which grows nearly throughout N. Amer., including Mex. Var. speciosum, Hook, f. (P. speciosum, Wall.), has larger deep purplish red or claret-colored fls.

12. affine, Don (P. Brunwos, Wall.). Tufted glabrous perennial, with flowering sts. 1/2 ft. or less high, from a woody prostrate rootstock: lvs. mostly radical, oblong-lanceolate to spatulate to lance-oblong; sheaths rather long, brown, split or entire: fls. bright rose-red, in dense, erect, terminal oblong spikes 2-3 in. long; the stamine 8, the achenes trigonous. Himalaya, at elevations of 9,000-14,000 ft. B.M. 6172.—An excellent little plant for cool places, blooming in autumn.


14. Posticus, Hamilt. Dwarf compact perennial, with long-creeping st., which is ascendent or decumbent and simple or branched: lvs. dark green and shining, 1-3 in. long, stalked, broad-lanceolate and narrow-acuminate, glabrous or somewhat hairy, ciliolate; stipules with stiff hairs longer than the sheaths: fls. small, rose-colored, in many erect filiform racemes or spikes that are sometimes several inches long. Himalaya and to China and Japan.

EE. Fls. white to purplish, in panicked or corymbose heads.

15. chinense, Linn. (P. cymosum, Roxbg. P. polycephalum, Wall. P. coromandum, Wild.). Shrubby perennial of diffuse or erect habit, 5 ft. high, from glabrous to glandular-pubescent, the many sts. angled and grooved: lvs. 3-5 in. long, stalked, variable in shape, from linear-oblong to deltoid, ovate or even broader, entire or crenulate, the petiole usually 2-erased at base; stipules long and oblique at top: fls. white, rose-color or purplish, borne in many little heads that are panicked or corymbose with usually glandular-hairy peduncles; perianth 5-lobed; stamens 8; Himalaya region and Ceylon to China and Japan, and the Philippines.

EEEE. Fls. white or greenish, in axillary clustered racemes or panicules or cymes, plants grown for their general foliage effects and bold habit, mostly tall and sometimes woody. (More or less diaocious or polygamous.)

F. Lvs. mostly on the lanceolate order, sometimes ovate, usually taper-based.

16. polystachyum, Wall. Shrubby, glabrous, or pubescent perennial, 3-6 ft., the branches grooved: lvs.
polygamous, deciduous: flowers small and whitish, very numerous, in drooping slender-panicled racemes, the stamens 8, and the achenes trigonous. Japan. B.M.6503. R.H. 1858, p. 631; 1894, p. 54. Gn. 26, p. 317; 49, p. 238. G. 3:143. G.M.31:176. V.17:161.—Recently intro. (in N. Amer. in 1894) for forage and for ornament. It is invertebrately persistent when once established, and may easily become a pest. For forage it has little merit where other things can be grown, for it is too coarse. For planting in rough places, where a thick cover is required, it is one of the best of all coarse herbaceous perennials. It is perfectly hardy in the N. and seems to thrive anywhere. P. Sieboldii was once distributed as sacaline, but that species is much smaller, with smaller shorter and square-based leaves, and with more profuse bloom.

22. Spáthii, Damm. St. erect, 10 ft. and more, thick, minutely puberulent but becoming glabrous, the young growth densely pubescent or somewhat hirsute: leaves petioled, cordate-ovate, acute or acuminate, the upper ones lanceolate, and attenuate at base, margin somewhat undulate and ciliate; sheath salverform, the limbus foliaceous, crenate and pilose: flowers in few-fld. paniculate spikes, short-pedicellate, carmine-red; stamens 5–6: achene lenticular. China.—Much like P. sachalinense, but differs in its flowers, and the pubescence or hairiness.

**POLYGONUM**

petiolated or nearly sessile, oblong-lanceolate, narrowing-acuminate, usually contracted and more or less cordate or truncate at base: flowers white or pink, ½ in. diam., in large thyrse-like spreading terminal panicles with branches erect or decurved and very slender pedicels; outer sepals much smaller than the inner. Himalaya, 7,000–14,000 ft. altitude; Afghanistan. G.C. III. 53, suppl. May 17. G.M. 52:929. M.D.G. 1896:373, 385. —An excellent plant for late autumn bloom, in moist places.

17. lichiangense, W. W. Smith. Closely allied to *P. polystachyum*, but branches and stipules setose, leaves setose above and densely cinerio-tomentose beneath: erect, with a woody base, 2–4 ft., the branches striate: flowers very short-petioled, 2–5 in. long, lanceolate or oblong-lanceolate, ciliate-acuminate, the margin more or less undulate; stipules about 1 in. long; flowers creamy white, in thyrsoid-paniculate clusters at nearly every node, the pedicels slender and about 1 in. long. Lichiang Range, China, 10,000–11,000 ft. altitude.—A recent intro. (with flower sprays said to resemble those of *P. baldschuanicum*).

18. campanulatum, Hook f. Pubescent or tomentose perennial, the stems creeping or stoloniferous at base, forking above, 2–3 ft.: leaves stalked, 3–6 in. long, elliptic, lanceolate or ovate, acuminate, the base narrow or rounded, more or less pubescent above and below: stipules large, mostly deciduous: flowers pale pink or red in autumn, in diversely branched nodding or drooping terminal clusters; perianth campanulate, ½ in. long or somewhat larger; stamens 8, with very long filaments. Himalayan region. G.C. III. 52:480.—Variable.

**vfl.** Lvs. much wider, on the oval or broad-oval order, usually (or at least the lower ones) very broad-based.

19. Sieboldii, De Vriese (*P. cuspidatum*, Sieb. & Zucc., not Willd. *P. Zuccarinii*, Small). Fig. 3105. Strong stout handsome bushy somewhat woody perennial (stems dying to the ground in winter), growing 4–8 ft. high, the stems gracefully curving outward: leaves short-oval to orbicular-ovate, truncate or slightly cordate at base, abruptly pointed, the strong side nerves uniting in marginal loops; sheaths short and hispid, in the upper part tomentose: sheaths elongated, the lower ones broader and truncate at the base, the upper ones attenuate at the base, revolute at the margins: racemes axillary and terminal, forming a large thyrse-like spreading terminal panicle; rachis fulvo-tomentose; pedicels white, and red. R.B. 35, p. 233. R.H. 1858, p. 631; 1894, p. 54. Gn. 26, p. 317; 49, p. 238. G. 3:143. G.M. 47:881. G.W. 2, p. 76. —A very effective plant for bold mass effects, perfectly hardy in every place known in the trade as *P. polystachyum*.

21. sachalinense, F. Schmidt. SACALINE. Fig. 3106. Polygonum sachalinense. (X ½.) Exceedingly vigorous plant, spreading rapidly from the tips of strong underground shoots, the reddish glaucous dead stalks often standing 8–12 ft. high through
POLYPodium vulgare. (X½)

Var. cimbricum (Fig. 3110) occurs in N. Y. and New England. Very many other varieties are cult. in England but unknown to American trade.

2. falcatum, Kellogg. Lvs. 12–15 in. long, 4–8 in. wide, on long, straw-colored stalks; pinna numerous, tapering to a slender point, sharply serrate. Calif. to Wash.

3. Pityllus, HBK. Lvs. 9–18 in. long, narrow-lanceolate, 1–2 in. wide; pinnae numerous, narrow, entire, blunt, the lower pairs scarcely smaller than those above; stalks blackish. Fls. and Trop. Amer.

4. pectinatum, Linn. Lvs. elliptic-lanceolate, 1¾ ft. long, 2–6 in. wide, cut to the rachis into horizontal entire or toothed pinnae, the lower ones gradually reduced to short, triangular lobes. Fls. and Trop. Amer.

aaa. Veins unifying, forming regular areoles each with a single free included veinlet.

b. Lvs. simple, undivided.

5. vaccinifolium, Langs. & Fisch. Fig. 3109. Lvs. small of two sorts, rising from slender, wide-creeeping rootstocks; sterile lvs. roundish or elliptic; sporophylls linear or ligulate, with large sori in a single row. Trop. Amer., from the W. Indies southward.

bb. Lvs. pinnate.

c. Fronds covered with flat scales underneath.

6. polypondioiides, Hitchc. (P. incisum, Swartz). Lvs. 2–6 in. long, an inch or more wide, with entire pinnae which are usually more or less revolute; veins indistinct, from the thick texture. Va. and S. Ill. to Brazil; commonly growing on trees in the southern states.—Known as resurrection fern from its ability to revive after long drying.

cc. Fronds smooth beneath.

7. californicum, Knuff. Lvs. 4–9 in. long, 1–5 in. wide, cut into finely toothed pinnae which are mostly confluent at the base. Calif.—Has much the habit of the European forms of P. vulgare.
8. Catharinum, Langs. & Fisch. Lvs. 6-12 in. long, 3-5 in. wide, with numerous nearly opposite pinnae which are dilated at the base, contracted just above the base, and slightly enlarged and bluntly rounded at the tip; sori large near the midrib. Brazil.

bb. Pinnae narrowed and distinct at base.

9. fraxinifolium, Jacq. Lvs. 2-4 ft. long, 12-18 in. wide, on firm stalks 1-2 ft. long; pinnae 4-5 in. long, with a tough, somewhat leathery texture and entire margin. Columbia to Brazil and Peru.

10. subauriculatum, Blume. Stalks 6-12 in. long, glossy, from wide-creeping rootstocks; lf-blades 2-3 ft. or more long, 5-12 in. wide; sori in a single row immersed in the leaf. India to Austral.

aaa. Veins (primary) distinct from midrib to the edge, connected by parallel transverse veins forming rows of similar areoles.

b. Lvs. elongate, simple, smooth beneath.

11. Phyllitidis, Linn. (Campyloneuron, Phyllitidis, Preal). Lvs. 1-3 ft. long, 1-4 in. wide, with an acute point, and the lower pinnae narrowed gradually; areoles in rows of 6-12, usually with 2 sori each. Fla. to Brazil. This species might more properly be placed in the genus Campyloneuron.

bb. Lvs. with under surface tomentose.

12. Lingua, Swartz. Lf-blades 4-8 in. long, 2-3 in. wide, the apex often cuspidate, the base narrowed or rounded; upper surface naked, the lower matted with reddish brown cottony scales, the sori in close rows of 4-6 each. Japan to Ceylon. This species and the next are often more properly listed in the genus Cyclophorus. There are a few crested and other horticultural forms.

13. tricuspe, Swartz. Lvs. hastate, 2-4 in. each way, with a central lanceolate-triangular lobe and spreading lateral ones which are more or less aruleid at the base. Japan and Korea.

POLYPÔTERIS (Greek words meaning many-winged or feathered; referring to the pappus). Compasillia. This includes a handsome, rosy-flowered hardy annual known to the trade as Palaf6xia Hookeriarna. Polyopteris is a genus of 4 species of N. American herbs; lvs. mostly entire; alternate heads of pedunculate, rose-purple or flesh-colored fls. borne in summer and autumn: involucre broadly bell-shaped or top-shaped; bracts commonly in 2 series, more or less colored and petal-like toward the tips: rays wanting 4-6, deeply 3-cleft, rose-red, about 1/2 in. long and showy. Sandy plains. Neb. to Texas. B.M. 5549.—Handsome plant; sometimes treated as an everlasting.

N. TAYLOR.

POLYRRHIZA (Greek, many root). Orchidaceae. Epiphytes: sepals and petals spreading, labellum 3-lobed, lateral lobes small, angular, middle one with spreading lobes; spur long, filiform; column short; pollinia 2. The following are intro. into American horticulture:

1. Lindenii, Rolfe (Dendrophiilaz Lindenii). Scap leafless, bearing a single white fl.; sepals and petals lanceolate; divisions of midlobe of labellum lanceolate; caps. smooth. On Oreocord Regia, and live oaks, S. Fla.

funalis, Pitz. (Dendrophiilaz funalis, Hort. Geo- chilles funalis, Lindl. Aegri-rhizum funalis, Lindl.). Leafless, roots numerous, fleshy; peduncles 2-4 fl.; white, sepals and petals oblong-lanceolate; labellum 3-lobed, with a long horn. Mountains of Jamaica.

OAKES AXES.

POLÝSCIAS (many and shade; referring to the abundant foliage). Araliacae. Large shrubs or trees, glabrous, comprising the pinnate-leaved tender aralias of greenhouses, grown for the ornamental foliage.

Leaves pinnate, with variable lfts., in many horticultural forms much cut, modified and often variegated: fls. very small, usually 5-merous (sometimes 4-merous), the calyx truncate or toothed, the petals valvate, the ovary 5-8-loculed; the styles usually of the same number and distinct. About 70 species are described, introduced from India, Trop. Afr., and Pacific Isls., some of which probably belong in other genera. Recent introductions from New Caledonia and other islands have given interesting forms for the cultivator. In cult., very rarely flowering; some specimens of P. fruticosus known to be 15 years old or more have never blossomed. From the temperate Aralia, comprising the Hercules’ club, the genus is easily told by its lack of spines and also by the technical floral characters of little value to horticulturists, as the tender sorts rarely flower. From Panax, the ginseng, the genus is separated by its woody habit. From Fatsia, the true Polycsias is distinguished by having the pedicel usually articulated beneath the fl. The genus Dianysgotheca is distinguished by digitate lvs. of many lfts., and 4-celled anthers and 10-celled ovary.
of the cultivated forms, many of which are not only variable but the flowers and fruits may be unknown. Any arrangement of these forms must be considered to be tentative.

Four distinct types or forms of tender greenhouse aralias are illustrated herewith. Fig. 3111 is the Aralia Chabrieri of gardens. It has very long glossy stiffish long-pointed leaves with a dark red midrib, the margin entire or remotely denticulate and more or less revolute. These leaves are opposite or nearly so on short side branches, as if parts in a compound leaf, and apparently confusion has arisen in descriptions. In the illustration, a leaf is shown at a, in the axil of which is a branch bearing the leaves. This plant, which is cultivated in its juvenile state, has been little understood botanically. It is not an aralia nor of the aralia family, although referred doubtfully to Polyscias. It is now considered to be Elmodendron orientale (see page 1107, where the matter is left in doubt). Harms, an authority on these plants, has recently gone over the subject (Gt. 62, pp. 533-5, and 63, p. 117), and has concluded that the plant is E. orientale. Guillaumin (R.H. 1912, p. 491) considers it to be an Elmodendron but not E. orientale. The long linear leaves with red mid-nerves are merely the young form of the species, and they pass into the broad-lanceolate or shorter oval or obovate thick leaves of the mature plant. Aralia Chabrieri apparently appeared first under this name in 1881 in the catalogue of Van Geert, Ghent. For portraits of it, see R.B. 13:20 (1887); R.H. 1891, p. 224; Gn. 30, p. 576.

The florists' plant shown in Fig. 3112 is Dizygotheca elegantissima, Vig. & Guill. (Arala elegantissima, Veitch). Very similar plants are Aralia Veitchii, Hort. Veitch, and its var. gracillima, Hort. Bull. (A. gracillima, Hort. A. gracilis, Lind. R.H. 1877, p. 38), its var. robusta, Hort., and A. Kerchoveana, Hort. It is not unlikely that all the plants mentioned above in this paragraph are foliar forms of one species, representing a juvenile state of a Dizygotheca (page 1062), although it is possible that other generic disposition will be made of these things when the different forms and the flowers and fruits are known. These names, as represented in plants in the trade, however, are of two groups: (1) Aralia Veitchii, A. Veitchii robusta, and A. gracillima with undulate nearly or quite entire leaflets, which may be tentatively called Dizygotheca Veitchii, Hort.; (2) the other group is A. Kerchoveana and A. elegantissima, with strongly notched-toothed leaflets, which are about 1 in. broad in the former and about half as wide in the latter; the former is Dizygotheca Kerchoveana, Hort., and the latter D. elegantissima, Vig. & Guill.

The plants shown in Figs. 3113 to 3117 are by some referred to Nothopanax; but until their position is better determined, they may be described tentatively under Polyscias. Nothopanax as understood by Harms has leaves primarily digitate whereas Polyscias has leaves on the pinnate order; as defined by others, however, Nothopanax comprises species with leaves simple, pinnate or pinnately compound. As in many of the aralias, the leaves in this general group are very variable. Harms calls attention to the fact that in Nothopanax the leaves may be different on the same plant in successive ages. On the young plants the leaves are mostly digitate with the leaflets often once-pinnatisect; older plants have simple leaves and the leaflets entire or toothed or once-pinnatisect, or sometimes only digitate leaves.

The culture of the several kinds of plants known to florists and greenhouse men as aralias is not difficult. Among the most desirable tropical kinds, are those known in the trade as Aralia (Elmodendron) Chabrieri, A. elegantissima, A. Veitchii, A. gracillima, A. leptophylla (all Dizygotheca), A. monstrosa, A. Victoria, A. plumatum, (all Polyscias) and others. Aralias are increased by cuttings and by grafts. A. leptophylla, and the forms of A. Veitchii, are rarely propagated except by grafting. The stock considered by many to be the best to use is A. reticulata (probably Oreopanax reticulatum, Fig. 2676, Vol. IV, which is Meryta Denhamii). Cuttings of it about the thickness of an ordinary pencil may be secured, and established in small pots, when they may...
be cut back to a little above the base, and the cion inserted. Either the cleft or wedge method has been successful. They must be kept in a night temperature of not less than 70°F., and placed in a tight moist case until they unite. Aralias may also be propagated from cuttings, eyes, or pieces of the root. A plant that has become bare of leaves may be cut down near the pot; the stem should be cut-in 2-inch lengths, and put in in eye-cuttings, in a brisk heat in the propagating-bed. The old stool may be put in bottom heat, when many of the varieties will throw several nice cuttings from the base. These should be removed with a heel, when about 6 inches long, and put in as cuttings, in a bottom heat of about 75°, and potted off when rooted. To procure root-cuttings, one of the strongest plants should be turned out of the pot, and the soil washed out of the roots with a hose. Cut the stronger parts of the roots in 2-inch lengths, and place in small pots. The end nearest the stem should be nearest the surface of the pot. Plunge the pots in a tight case, in 70° to 75° bottom heat, and water carefully until they throw up shoots. Watering with soot-water gives a nice gloss to the foliage. Aralias must at all times be shaded from strong sunshine. Watering with soot-water gives a nice gloss to the foliage. Aralia, or Panax, Victorine may be treated the same as the other aralias. Insect pests can become numerous for the first time, as follows: first described in Bull's Catalogue of 1874: 100. A. Guilfoylei, Baker (Terminalia elegans, Hort. Gliae Pinnata paniculata, DC.). Erect glabrous shrub: Ivs. orbicular to oblong, either nearly entire or with small and remote teeth, the base obtuse or heart-shaped, the apex acuminate: fls. 5-7 in each umbel of the pane. Malay.-The Arita latifolia of gardeners may not be the above plant, and it seems to be little cult.

Fruticosum, Hems (Panax fruticosum, Linn. Aralia fruticosum, Hort. Nothópanax fruticosum, Mii. Panax erectum, Hort, at least in part). Fig. 3113. Erect shrub, to 6 or 8 ft. high, glabrous, the young branches with prominent lenticels: lvs. more or less irregularly pinnately 3-compound and very acute apices, the whole I. having a much-divided soft appearance: inf. terminal and in the upper axils, 3-6 in. long and many-fl., the fls. umbelate and short-pedicelled: fr. broad-ovoid, compressed, more than 1 in. long. Polynesia to India, commonly cult., and in many I. forms. In some cases the lvs. are much cut and the segms. are reduced to very narrow even to linear or thread-like forms. Var. plumata, Bailey (Panax plumatum, Hort. Nothópanax fruticosum var. plumatum, Merr.), has smaller lvs., 8 in. or less long, the ultimate segms. much smaller and finer and mostly lanceolate or linear-lanceolate. See also Panax Deleauanum, suppl. list, p. 2748.

Bulce, Bailey (Aralia Guilfoylei, Bull. Nothópanax Guilfoylei, Merr.). Figs. 3114, 3115. Erect glabrous shrub, to 15 ft. and more, not much branched, with bright green usually white-edged foliage: lvs. large, often 16 in. and more long, regularly pinnate, with more or less spotted or lined petiole which is expanded and clasping at base; lts. stoutly short-petioled, well separated from each other, ovate to elliptic-ovate to nearly orbicular, tapering or rounded or truncate at base, with distinct and mostly rather remote short teeth which are sharply acuminate-pointed, in the usual cult. forms with white margins or variously white-shaded and blotched; terminal lft. large, often 6 in. long and 5 in. wide. Plant ed in tropical countries about yards and for screens or hedges, and probably native somewhere in the Pacific Isls.; often called "wild coffee" and "coffee tree," probably from the foliage. It may be seen now and then in greenhouses, although mostly in the smaller and cut-lvd. forms. It appears rarely to produce flowers. Its origin is not traced; by some it is thought to be a modified form of P. pinnata or some related recognized species. F. M. 1874: 100. A. Guilfoylei appears to have been first described in Bull's Catalogue for 1873 under "new plants announced for the first time," as fol-

3116. Polyscias Guilfoylei var. laciniata
lfts. are long-lanceolate or narrow-lanceolate, 3118); as commonly seen in cult. young plants, the lfts. are variable, often very oddly so and of different sizes and shapes, the margins white and deep-toothed; one of the many lF.-forms which are named laciniiata, monstrosa, etc. RH. 1891, p. 225. Gn. 39, p. 565. A form with golden green variegation is Panax monstrosa aureum of the lists. Var. Victoria, Bailey (Panax Victoria, Rod. Aralia Victoria, Hort. Nothopanax fruticosum var. Victoria, Merr.). Fig. 3117. A small close-growing plant (as seen in cult.) with much-divided lfs., the lfts. or segms. small and of different sizes and shapes. A good compact form, frequent in green-houses, which constantly sends up new stalks and yields recurring tasselled light green white-margined foliage; recommended as a good table plant. G.C. II. 19:405. I.H. 31:521.


Balfouriana, Bailey (Aralia Balfouriana, Sander. Panax Balfourii, Sander). Compact and bushy shrub, in cult. well furnished with foliage from base to top: st. bronze-green, speckled with gray: lvs. with long slender petioles (3-5 in. long) which are more or less marked and lined and dilated-clasping at base; lfts. usually 3, long-stalked, orbicular or reniform in outline, cordate at base, very obtuse or broad at apex, coarsely crenate or crenate-dentate, the teeth apiculate and sometimes with minor spinulose serratures, margined or blotched with white. Intro. from New Caledonia.—Throught to be a form of P. pinnata by some. R. Rumphiana, Harms, is to be studied in this connection.

cerifolia, Bailey (Aralia cerifolia, Moore. Panax filicifolium, Hort. A. speciabilis, Hort.). Fig. 3118. Strong erect glorious shrub, with large lenticels and usually with purplish branchlets: lvs. variable, even on the same plant as it attains age (as in Fig. 3118); as commonly seen in cult. young plants, the lfts. are long-lanceolate or narrow oblong-lanceolate, narrowed at base, and deeply pinnatifid, the narrow acute segms. being spinulose-serrate; on older shoots or plants, the lfts. may be much larger and broader, still narrowed at the base, and merely spinulose-dentate; if the plant matures it produces also very broad-ovate or broad-oblong thick nearly or quite entire lfts., with broad or truncate or even subcordate base, very unlike those already described. Pacific Bull. I. H. 23: 240. J. H. III. 48:337. R. H. 1891, p. 224. Gn. 39, p. 565.

3118. Polyscias cerifolia. All leaflets from the same plant. (X 1/4)

Known in some places in tropics as "angelica."

The above account comprises the cult. aralioids that are most likely to be met with and to be referred to this group. Undoubtedly some of the garden names under Panax belong in Polyscias. The following are names under Panax (not under Polyscias) which are in doubt or which combinations appear not to be recognized under Polyscias: Panax cochlospermum DC. (Nothopanax elcho-spermum, Merrill). Erect shrub, to 10 ft.; lvs. simple, 2-5 in. across, nearly orbicular, cordate, somewhat resemble above, remotely spinulose-dentate. Cult. in Pacific tropics.—P. crassum, Bull (Nothopanax crasatum, Merrill). Shrub, to 6 ft.; lvs. triangular, compound, the lfts. deeply incised and toothed, oblong-ovate to broad-ovate, green, the lateral ones overlapping. Probably Brazilian, but probably disseminated in tropics.—P. Deleuaunii, Hort., is properly P. fruticosum var. Deleuaunii, N. E. Br. A variation with irregular pinnate lvs. and dentately cut segms., the ultimate segms. variable, but cuneate at base, toothed and white-toothed. Polynesia. I.H. 48:320. Known also as Aralia Deleuaunii.


—P. acuminatum, Bull. Erect shrub, to 10 ft.; lvs. simple, 2-5 in. across, nearly orbicular, cordate, sometimes resemble above, remotely spinulose-dentate. Cult. in Pacific tropics.—P. fruticosum, Bull. St. marked with pulv. spots; lvs. 3-pinnate, the lfts. linear-lanceolate and white teeth, the ultimate divisions spiny-toothed.—P. fruticosum, Bull. St. marked with pulv. spots; lvs. 3-pinnate, the lfts. linear-lanceolate and white-toothed. Polynesia. —P. lepidum, Bull. Compact: lvs. internately divided, the end division largest; pinnules or ultimate lfts. obliquely obovate, the central one in each case small (sometimes almost rudimentary) and more or less covered by its 2 lateral ones, the margins spinulose-toothed and cut. Brazil—Recent. Scarce known in cult. in Amer.—P. Mastersonii, Sander. Of climbing habit, with long-stalked pinnate lfts. about 2 ft. long, the petiole greenish, tinged with pink and marked with white, the lfts. oblong-lanceolate and toothed. Goertzen, G.C. III. 23:242.—P. multifidum, Hort, is properly P. fruticosum var. multifidum, N. E. Br. Compact plant, with 3-pinnate lvs. or linear or linear-lanceolate segms. 5-8 in. long, or less long, with braly teeth. Brazil. —P. Minya, Myxell. (Aralia splendidissima, Hort.) Tree in its native place, with drooping, shining green pinnate lfts. 3-4 ft. long, and many oblong-lanceolate lfts. 3-6 in. long; umbels of brownish red, in long, terminal panicles, 8. Sea Isls. Austral. B. M. 6178. Of climbing habit, with long-stalked pinnate lfts. oblong-ovate, toothed and somewhat spiny, sometimes with deep incisions. Brazil.—P. erinaceum, Bull (Nothopanax erinaceum, Merrill). Slightly branched shrub, to 10 ft.; lvs. long, pinnate, the 11-17 lfts. narrow-lanceolate and deeply blunt-toothed, sometimes pinnately lobed, irregular in shape. Ils. greenish white, the panicle terminal or in the upper axile; fr. about 1 in. long, purple. Probably Brazilian, but widely cult. in tropics.—P. acuminatum, Hort. & Maxim. = Acanthopanax sessiliflorus, p. 192.
Seals convivial or subgenual, the lateral ones con­
trast with the short foot of the column into a mentum;
column short: flowering st. short, few-lvd., pseudobulbous.—About 80 species. For cult., see Orchid.

luteola, Hook. (Dendrobium polybotchum, Swartz). Height 6-12 in.: lvs. oblong-linear or lanceolate-oblong,
exceeding by the st.: fls. small, greenish yellow; lip
3-lobed to the middle. S. Fls. and Trop. Amer.

P. acrostichoides, Kraenzl. Fls. small, yellow; upper sepal with short, obtulate, spur-like appendage attached to back a little above base. Trop. Afr.—P. biocera, Rolfe. Plant very small, sta­tufied: lvs. lanceolate-oblong; sepal 3-5 in. long; fls. small; sepals light purple; petals cream-white. Seychelles.—P. nymphaeoides, Rolfe. Lvs. oblong or linear-oblong, 2-4 in. long; sepal 2 in. long, 1- or few-fl.; fls. green, with brown on foot of column and base of lip. Trop. Afr.—P. crenata, Rolfe. Lvs. linear-oblong, 4-6 in. long; racemes densely-branched, sparingly branched at base; fls.


George V. Nash.

POLYSTICHUM (Greek, many rows; referring to the sori). Polypleurum. A group of ferns mostly of tem­
perate regions, some species of which do well in living-
rooms.

Veins free and the roundish sori covered by indusia
that are peltate and attached to the stat. leaf by a short cen­
tral stalk. They are mostly easily grown and thrive
best in shade. One species is very commonly grown for
fern-dishes. All the species have also been described
by some authors under the genus Aspidium. For cultu­
re see Ferns.

INDEX.

Polystichocystis, 2.
acrostichoides, 2.
aculeatum, 6.
norak, 6.
angulare, 8.
aristatum, 13.
Braunl, 9.

A. Lvs. simply pinnate throughout.

B. Lower pinnate gradually reduced to mere lobes.

1. Lonchitis, Roth (Aspidium Lonchitis, Swartz).
Holly Fern. Lvs. 9-20 in. long, rigid, the pinnae
broadly lanceolate-falcate, the lowest triangular. N.
Eu. and Amer., mostly in high latitudes.

Bb. Lower pinnate scarcely if any smaller than
those above.

3119, 3120. Fls. growing in large, tufted, tufted:
rows of lvs. 6-8 in. high, the pinnaceous lanceolate, somewhat
falcate, and serrulate with appressed teeth; spore-bearing
pinnas contracted, with confluent sori. E. U. S.—
One of our commonest species. The common name is
due to the evergreen character of the lvs., which are
picked by the thousand and sold in bales to florists.

3. munitum, Kauff. (Aspidium munitum, Kauff.). Stalks 4-12 in. long, chaffy at base or throughout;
pinna long, linear-acuminated, serrat or doubly seri­

4. lepidocalon, Hook. Stipes densely clothed with
large, heart-shaped scales: fls. short, with 12-15
pairs of pinnae, unequally-sided, scarcely toothed;
sori usually in two rows. Japan.

3119. Christmas
fern.—Polystichum acrostichoides.

AA. Lvs. with auricles of pinnae forming distinct Ists.
5. viviparum, Fée. Lfs. 12-18 in. long, 4-6
in. wide, with numerous lanceolate pinnae; lower basal
margin obliquely truncate; sori in 2 or 4 rows. W.
Indies.

AAA. Lvs. bipinnate in the lower two-thirds.

B. Pinnules auricled.

6. aculeatum, Roth (Aspidium aculeatum, Swartz).
Lfs. 2 ft. or more long, 6-8 in. wide; pinnules
twice as long as wide, with very conspicuous basal
auricles, Eu. and Calif. Hardy.—P. proliferum, Hert.,
is an Australian fern producing buds on the lvs. A
large number of varieties are grown and offered for
sale by English florists, but they are not of a sort to
be of value in American trade.

7. Tsus-sinense, J. Smith (the name is often incor­
rectly spelled tenaumense in the trade). Fig. 3121. Lvs.
commonly 6 in. long, 2-3 in. wide, the petioles slender,
dark, the lvs. dark green.—Somewhat like P. aculeatum
but well distinguished both in size and general appear­
ance. This is one of the ferns commonly used for
fern-dishes.

8. angulare, Willd. Lfs. 1-2 ft. long, rather
narrowly lanceolate-falcate; pinnules nearly triangular, two-
thirds as broad as long, more or less incised. Eu.—
Another favorite with English growers who offer many
varieties. Hardy. See P. aculeatum above.

9. Braunl, Lawson. Lfs. 18-24 in. long, nar­
rowly elliptic-lanceolate; pinnules 7-10 pairs to each
pinna, broad, the upper basal edge parallel with the
racing edge and mountain regions of eastern
America.—Sometimes con­

3120. Details of tip of fertile leaf of Polystichum
acrostichoides. a, sor; b, indusium.
Pinnules scarcely auricled.


11. *amabile*, Blume. If.-blades 1 ft. or more long, 6–9 in. wide, with a lanceolate terminal pinnæ and 3–6 pairs of lateral ones; pinnules sub-rhomboideal, the upper and outer portions sharply spinulose serrate. India, Japan, and E. Indies.

AAA. Less than twice pinnate in the lower pinnæ.


Subacute, irregularly crenulate: pinnæ 3–7 in. long, terminal and axillary; calyx-tube short, stellate-tomentose; petals wanting: caps. obtuse, sparsely stellate-tomentose. Austral. and New Zeal. – Cult. in Calif. for ornament. Von Mueller in his "Select Extra-Tropical Plants," says it is "a tree attaining a height occasionally of 60 ft., but mostly smaller." The foliage is devoured with avidity by pasture animals, often in preference to ordinary good feed."

P. vaccinifolia, R. R., an Australian species with ovate or nearly orbicular lvs., cream-colored fls. in ovoid terminal panicles and with broad petals, has been cult. in England. G.C. 111: 35–359.

F. Tracy Hubbard.

POMEGRANATE is the vernacular of *Punica Granatum*, a small tree of southern Asia, grown both for ornament and for its edible fruit (Fig. 3122). *See Punica.* It is somewhat grown in the open in the southern states, and also as a pot- or tub-plant in greenhouses in the North.

The natural habit of the pomegranate is of rather bushy growth, but by careful training a tree 15 to 20 feet may be produced. This, however, seems possible only in the southern sections of the United States. A great many shoots spring from the base of the plant; these should be cut out, as it is contended that they withdraw the nutrient which should go to the fruit-bearing stems. The branches are slender, twiggy, nearly cylindrical, somewhat thorny. The leaves are large, long, narrow, glossy green and with red veins. The flowers have a red thick fleshy calyx, crowned with bright scarlet crumpled petals and numerous stamens. The fruit is globular, topped with a crown-like calyx, and the interior consists of numerous seeds enveloped in a bright crimson or pink-colored pulp, seeds being arranged in segments, separated by a thin skin, and very acid in the typical variety. A cooling acescent drink, known as granadine, is made from the pulpy seeds, with the addition of water and sugar. This is much used in the South, and in certain parts of Europe, and is especially grateful in fevers. This plant will succeed as far as the 35th degree of latitude north, but during extreme cold periods, the plants are sometimes injured by cold in that latitude. For higher latitudes it should be cultivated in tubs, and given a conservatory during winter. For some sections of the South it is used for hedges. The fruit begins to ripen about September and can be kept for several weeks.

The pomegranate is multiplied by hardwood cuttings planted in open ground during February, or by layers and also by softwood cuttings during summer. As the plant forms many shoots, these are often used, as they usually are provided with rootlets. In Florida, Georgia, Alabama, Louisiana, and some of the other southern states, pomegranates are grown commercially and are shipped to the northern and eastern markets. There is a growing demand for the fruit of the pomegranate.

The pomegranate is supposed to have been introduced into southern Europe by the Carthaginians, whose Latin name of "Punica" was thus given and derived. A reference is also found in the sacred scriptures. *Theophrastus* described it 300 years before the Christian era, and Pliny considered it one of the most valuable fruits, both as to its beauty and medicinal properties. The bark of the
The pomegranate is a native of some parts of Asia, and by some botanical authors is said to be found also in northern Africa and China. Although of such ancient origin and cultivation, there are but few varieties of the fruit-bearing section disseminated in this country and Europe, but, according to Firminger, several fine varieties have been grown in Bengal from seed brought from Cabul, one being seedless, another growing to the size of “an ordinary human head” and still another as large as a small shaddock.

Varieties grown for fruit.

**Acid, or Wild.**—With a sharp acid pulp; fruit often very large, from 3 to 4 inches diameter and with a bright-colored rind.

**Dwarf.**—A form of the Acid variety, of very low and bushy growth; flowers single: fruit from 3½-2 inches diameter; pulp very acid. This can be grown in a pot, as it fruits very abundantly.

**Pomegranate** (Dutch, *pomplemoes*, perhaps from Dutch *pompemoe*, *pumpkin*, and old Javanese, *limoes*, a citrous fruit). A name sometimes used in East India instead of the more common pummelo for forms of *Citrus grandis*.

**PONCIRUS** (French, *ponceiro*, a kind of citrus). *Rutaceae*, tribe *Citrea*. Small spiny deciduous tree native to North China, extensively used as a stock for oranges, also grown for hedges and often for ornament in regions too cold to permit of the culture of citrus fruits.

This plant has been usually referred to *Citrus*, although DeCandolle, Rafinesque, Miquel, Penzig, Hance, Makino, and other botanists referred it to other genera. It differs from *Citrus* in having deciduous trifoliate leaves: flower buds formed in early summer and passing the winter protected by bud-scales: flowers borne on old wood in early spring and nearly sessile, with petals opening flat and narrowed to a claw-like base:

**Varieties for ornament (non-fruiting).**

**Double Dwarf,** or *Punica nana racemosa*.—Of dwarf growth, with bright scarlet double flowers, which are borne in clusters. This is especially desirable for growing in pots, as its flowers are abundant and lasting.

**Double Red.**—With a very large calyx, from which protrude numerous large bright scarlet petals, larger than those of the common single type. These are produced in abundance during summer and fall and resemble a bright scarlet pompon.

**Double Variegated,** or Legrellei.—A very handsome variety with very large flowers, the petals being striped and mottled with yellow and scarlet. Double red blooms will frequently be found on the same stem with variegated blooms. As this is a sport of the Double Red it frequently reverts.

**Double Yellow.**—Similar to the above in shape of flower, but latter are of a pale yellow color.

**Double White.**—Form of flower is similar to Double Red, but color is pure white.

L. A. BERCKMANS.

STAMEN SUMMARIZED.

POMPELOE (contraction of *pomplemoes*). A name sometimes used in the East Indies for pummelo and in the United States for the grapefruit. Inasmuch as there are very many different varieties of *Citrus grandis*, it seems best to retain pummelo in its common East Indian sense as a generic term for all of them and to apply to the special form grown in the West Indies and the United States its old name grapefruit. The use of pome (a mere variant of pummelo) for the grapefruit is likely to lead to confusion, especially as growers, shippers, dealers, and consumers all continue to use the name grapefruit. See Pummelo.

WALTER T. SWINGLE.

**POMOLOGY:** Fruit-growing, page 1290.

**POMPLEMOOSE** (Dutch, *pomplemoes*, perhaps from Dutch *pompemoe*, *pumpkin*, and old Javanese, *limoes*, a citrous fruit). A name sometimes used in East India instead of the more common pummelo for forms of *Citrus grandis*.

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**POMOLOGY:** Fruit-growing, page 1290.

**POMPLEMOOSE** (Dutch, *pomplemoes*, perhaps from Dutch *pompemoe*, *pumpkin*, and old Javanese, *limoes*, a citrous fruit). A name sometimes used in East India instead of the more common pummelo for forms of *Citrus grandis*.

**PONCIRUS** (French, *ponceiro*, a kind of citrus). *Rutaceae*, tribe *Citrea*. Small spiny deciduous tree native to North China, extensively used as a stock for oranges, also grown for hedges and often for ornament in regions too cold to permit of the culture of citrus fruits.

This plant has been usually referred to *Citrus*, although DeCandolle, Rafinesque, Miquel, Penzig, Hance, Makino, and other botanists referred it to other genera. It differs from *Citrus* in having deciduous trifoliate leaves: flower buds formed in early summer and passing the winter protected by bud-scales: flowers borne on old wood in early spring and nearly sessile, with petals opening flat and narrowed to a claw-like base:

**Varieties for ornament (non-fruiting).**

**Double Dwarf,** or *Punica nana racemosa*.—Of dwarf growth, with bright scarlet double flowers, which are borne in clusters. This is especially desirable for growing in pots, as its flowers are abundant and lasting.

**Double Red.**—With a very large calyx, from which protrude numerous large bright scarlet petals, larger than those of the common single type. These are produced in abundance during summer and fall and resemble a bright scarlet pompon.

**Double Variegated,** or Legrellei.—A very handsome variety with very large flowers, the petals being striped and mottled with yellow and scarlet. Double red blooms will frequently be found on the same stem with variegated blooms. As this is a sport of the Double Red it frequently reverts.

**Double Yellow.**—Similar to the above in shape of flower, but latter are of a pale yellow color.

**Double White.**—Form of flower is similar to Double Red, but color is pure white.

L. A. BERCKMANS.

STAMEN SUMMARIZED.
fruits. It is especially well adapted to rather rich somewhat moist, sandy loam soils, preferably with a clay subsoil, such as are common around the Gulf Coast. It is not at all adapted to light sandy soils, nor is it at all adapted to light sandy soils, nor

It is especially well adapted to rather rich somewhat moist, sandy loam soils, preferably with a clay subsoil, such as are common around the Gulf Coast. It is not at all adapted to light sandy soils, nor to strongly calcareous soils. Almost all kinds of citrus

fruits grow readily on trifoliate stock but are dwarfed somewhat and usually forced into early bearing. The Satsuma orange as grown commercially in this country is practically limited to this stock as it does not grow at all on sour orange stock and succeeds only very imperfectly on sweet orange stock. Trifoliate stock is also very widely used in Japan. In the states south of the Potomac and Ohio rivers the trifoliate orange is sometimes used for hedges, for which purpose it is well adapted because of its dwarfed habit, strong thorns, handsome flowers, foliage, and fruits. Even in winter after the leaves have fallen its twigs remain green. It is very widely used for hedges in Japan. P. trifoliata is also of value as an ornamental tree for lawn planting, for which purpose care should be taken to secure large-flowed flowers. It can be grown for this purpose as far north as Philadelphia. The trifoliate orange shows surprisingly little variation. Millions of seedlings are grown every year in the larger citrus nurseries of this country but it is rare to see any perceptible variation in the character of the leaves and twigs. The flowers, however, do show variation, often having a partial staminity of the petals (rarely complete) which makes them smaller and less handsome than the normal large flowers. The fruits are usually spherical but rarely are somewhat elongate and papillate, much like a very small lemon. WALTER T. SWINGLE.
to Piscidia but differs from it by having the pods short, compressed, smooth, and 1-seeded instead of elongated, winged, and several-seeded.

**PONGAMIA**

**PONGAMIA**

**PONTEDÈRA (G. Ponteders was an Italian botanist, 1858-1875). Pontederiaae.** Terrestrial, glabrous or pilose herbs which sometimes reach a height of 40 ft. Grown in S. Calif.

**PONTÉRICEVA (named in honor of M. de Ponthieu).** A tall erect tree or climber, with glorious flowers naked but from a cup-shaped disk, and in slender mostly drooping precocious catkins in which the subtending scales are toothed, cut or cleft at the apex; stamens few or many, usually numerous, on distinct filaments; pistillate filaments with mostly a single 1-seeded ovary with short style and 2-4 often lobed long stigmas: fr. small 2-4-valved caps., containing cottony seeds, the mature catkin sometimes with a necklace-like or moniliform character; lvs. alternate, stalked, mostly broad: buds scaly, often resinous.---Species probably about 35-40, in the northern hemisphere, mostly extra-tropical, although very many more than this have been described, some of them being hybrids. The poplar of lumbermen is the tulip tree. (See *Liriodendron*).

Botanically the poplars comprise a most bewildering group, and there is wide divergence of opinion and practice as to the limits and names of species. Many of the cultivated forms are assumed to be hybrids, but the origin of most of them, so far as parentage is concerned, can be little more than conjectured. It is likely that seedlings of some of these hybrids break up into forms much resembling the parents, and thereby still further contribute to the bewilderment. The trees being dioecious, the herbarium specimens may not represent both sexes; as the catkins appear in advance of the foliage, the specimens may not represent the same plant or type; the foliage is very various, sometimes even on the same tree, and specimens are likely to be taken from the lower part of large trees where the leaves are small or from the terminal shoots of young trees on which the leaves are large and have a different character. Of some kinds only one sex is known. The habit of growth is also very characteristic even in species or forms on which the foliage is very similar, but this character is of course not represented in botanical specimens. It will be seen, therefore, that the usual herbarium collection may not have full value in the determination of species. There is naturally a tendency to place great stress on leaf-forms in the description of species, even though in some groups practically the whole range of forms may be found on single trees. These difficulties are particularly marked in this country in the *P. deltoides-angulata* group.

With regard to the variability of the leaves of Populus, Schneider writes in "Planze Wilsoniana," "it is helpful to keep the following in mind. L. A. Dode was the first who clearly described the variation of the leaves according to the age of the plants, the position of the branches, and the climatic and other conditions under which they were produced... I think it sufficient if we distinguish three different kinds of leaves: (1) the leaves of the older or suckers (folia turbinum radicum); (2) the leaves of the normal but not the vigorous shoots of the young plants (folia ramorum [sed non turionum] plantae juveniles); and (3) the leaves of the old trees (folia arboris adultum fructiferae). The leaves of the third kind we usually find at the ends of vigorous branches of young plants when they are growing well and becoming mature. If we compare leaves of different species it is necessary to be very careful only to compare the same kinds of leaves.
What has been said about the dependence on leaf-characteristics in descriptions applies also to the horticultural descriptions; it is much needed that the cultivated poplars shall be studied with the purpose to correlate all the characters of habit, leaves, buds, twigs, bark, flowers, and fruit.

Probably some of the difficulty in distinguishing native species of Populus is due to the fact that we have not always recognized the presence of European or other hybrids in this country. It is not unlikely that some of these forms appear even in places remote from habitations, as do the introduced tree willows, and that they have been confused with the native kinds.

There appear to be few important growing collections of poplars in this country, nor are the important upright specimens in different parts been looked up and studied. Many of the European nursery forms have been introduced here and there; but for ornamental planting practically only two kinds are much called for, the Lombardy and the so-called Carolina, with “Russian poplars” and “Norway poplars” in the prairie and plains country. This is a pity, seeing that some of the forms are most interesting in habit and foliage, and in the red coloring of petioles and midribs, combined with other good features. The hybrid poplars have not been given sufficient attention in North America. Some of the first-generation hybrids are remarkably vigorous. The Russian poplars are referred to several kinds, mostly, apparently, forms or hybrids of P. balsamifera allies. A very large collection of Asiatic poplars was made at the botanic gardens at St. Petersburg and also at the agricultural college at Moscow. The late J. L. Budd introduced many forms and they have become widely distributed in the prairie regions. It would not be strange if substitutions had been made in the course of time.

The Norway poplar of the interior region is very much like P. Sargentii in foliage, but it holds its leaves three weeks later in autumn than the native cottonwood and the central trunk does not break up so quickly, thereby making a better timber tree; it is a very rapid grower. It has proved to be a very valuable tree for Minnesota and the Dakotas and other parts, and is hardy in Manitoba. On account of its very rapid growth and the straight strong trunk, it has been called the “Sudden Sawlog poplar.” It appears to have been introduced into North America from Russia by Budd, and is said to have been discovered on the eastern slope of the Altai Mountains. It was disseminated in part in this country by Norwegian settlers and thereby got the name of Norway poplar. Its botanical position or name is undetermined.

Poplars of various kinds are considerably planted on the prairies and plains and form characteristic features on the landscape. Many of them withstand the trying climatic conditions and also grow very rapidly. The many kinds of cultivated poplars, which have been largely introduced or tried in these regions, stretching into Canada, need careful study by the systematicist. They are particularly numerous in the tamarac or balsam-poplar group and are not well understood. In the irrigated regions of the Rocky Mountain country, the Lombardy poplar has long been a familiar object along ditches and thoroughfares.

The poplars are amongst the easiest of all trees to propagate and to grow. They come readily from hardwood cuttings, as do willows and currants. The weeping varieties are grafted head-high on erect kinds, P. granulata, or its derivatives apparently being used as a stock. Poplars thrive in almost any soil, although the cottonwood is most at home in lowlands and along streams, at least in the East. For shelter-belts they are very useful because of rapid growth and great hardness.

In Europe, where fagots and other similar materials are desired, poplars are often headed-back severely or pollarded, but this practice is very little known in North America. The poplars are also useful for temporary shelter for other trees and bushes. In this respect the common aspen (P. tremuloides) is a valuable tree in the reforestation of American lands. It springs up quickly in clearings, and during its comparatively short life holds the soil and protects other vegetation and finally contributes its own substance to the maintenance of the stronger forests. In this way it probably has exerted an effect upon the configuration of our forest areas and upon the fertility of the land from remote time. The same qualities make it valuable, in many cases, in extensive ornamental plantings.

The fault in the planting of poplars is the tendency to plant too many and to allow them to give character to the place. About summer resorts, for example, poplars and willows are used much too freely. They give the place a look of cheapness and temporariness. They are planted in such places because they grow rapidly and thrive in unfavorable conditions; but it is better to use them for temporary effects, allowing better trees, that are planted with them, gradually to take their place. The legitimate common use of poplars in ornamental grounds is the production of minor or secondary effects. As a rule, they are less adapted to isolated planting as specimen trees than to use in composition,—as parts of general groups of trees,—where their character will serve to break the monotony of hardier foliage. The poplars are “gay” trees, as a rule, especially those, like the aspens, that have a trembling foliage. Their leaves are bright and the tops thin. A few of them in judicious positions give a place a sprightly air. This is particularly true of the common aspen, P. tremuloides, of the woods. Its light twinking foliage and silver-gray limbs are always cheering and its autumn color is one of the purest golden yellows of our landscapes. It is well to have a tree of it standing in front of a group of maples or evergreens. Its whole expression is then one of familiarity.

On the other hand, the poplars have their interest as specimen trees as distinctly as do other kinds of trees, but one seldom sees well-grown mature examples. The age characters of some kinds of poplars, both in structure and in bark, are at times so interesting as to be of especial interest as those of maples and oaks or other trees. Of many of the planted poplars, old specimens are practically unknown to the public.

The cottonwood (P. deltoides) is one of the best poplars for permanent planting. It makes a noble tree, of durable and substantial appearance. But like the aspen, it is cheerful and restive. One is not moved to lie under it, as one is under a maple or an oak. Its leaves

3126. Populus canescens above, and P. alba var. pyramidalis (P. Balsams). (X 1/2)
of the common white poplar or abeke are frequently useful, although most of them sprout badly and may become a nuisance. The Lombardy poplar (P. nigra var. italica) is probably the most striking and distinct tree that is suited to planting in the North. As single specimens scattered here and there in mixed plantings, or when seen over or behind buildings, it may be most picturesque and satisfactory; but the tendency is to plant it too freely. The very fact that it is emphatic is the reason why it should be planted sparingly when artistic effects are desired. The catkins of poplars, particularly the staminate ones, are usually attractive, as they appear in early spring; but they are of short duration. Fig. 3190.

The following sketch includes all the poplars known to be offered by American nurserymen or to be subjects of rather general planting, together with exotic forms that are likely to appear in this country. For literature, see Weamal, DC Prod. 16, pt. 2, pp. 329–31; Sargent, Silva of North America, vol. 9 (quoted below as S.S.). A very recent careful treatment of the poplars appears in Volume VII of Elwee & Henry, "Trees of Great Britain and Ireland;" from this work some of the following characterization is drawn. Subsequently, the black poplars (P. nigra-deltoides group) have been worked over by Henry in Transactions of the Royal Scottish Arboricultural Society, 30, pt. 1.

For the purposes of this popular treatment, the species of Populus may be thrown into six groups:

I. The white poplars; Nos. 1–3.

II. The aspens; Nos. 4–7.

III. The black poplars and cottonwoods; Nos. 8–14.

IV. The large-leaved poplars and cottonwoods; Nos. 15, 16.

V. The balsam poplars and tacamahas; Nos. 17–28.

VI. The variable-leaved poplars; No. 29.
Asia.—The typical form of P. alba is less grown here than the varieties with lobed and very white-bottomed (and sometimes variegated) lvs. In old places and yards it is sometimes found, but var. nivea and in newer grounds var. pyramidalis are more frequent. Var. globosa, Spach. Dense small tree or shrub, oval in outline of head: lvs. small, deltoid-cordate, slightly lobed, gray beneath and pinkish when young. Of horticultural origin. Var. pendula, Loud. Branchlets drooping. Var. Richardi, Hort. Lvs. yellow on upper surface.

Var. nivea, Wedd. (P. nivea, Wild. P. argéntea, Hort. P. arenhbergià, Hort.). This is the commonest form of white poplar in this country. It is known by the

branches. This tree is met with occasionally. Its horticultural value is not greatly different from that of P. alba var. nivea. According to Elwes & Henry, P. Bogueana, Dode, is a vigorous form of this species in which the lvs. on long shoots are 5 in. or more in length and breadth; appears to be sold by some nurseries abroad as P. tomentosa. Forms of this species are probably hybrids with P. tremula. Eu.

3. tomentosa, Carr. (P. alba var. tomentosa, Wess. P. alba var. denudata, Maxim. P. pekinensis, L. Henry, P. glabra, Dode). WHITE POPULAR of China. Large tree, similar to P. alba: lvs. thick, on long shoots of mature trees large (4-6 in. long), triangular-ovate, not lobed, the broad base truncate or subcordate, acuminate, margin sparingly sinuate-toothed, shining dark green above and glabrescent beneath; on short shoots small, ovate or triangular, cuneate, sinuato-toothed, glabrous beneath; on vigorous shoots white-tomentose beneath. N. China, where it makes a large tree, and is planted in temple gardens; the restless lvs. suggest the sound of falling rain. R.H. 1903, p. 355.—Hardy in Mass., but is said not to prop. from cuttings.

II. ASPENS. Lvs. not lobed, broader-based than ovate form; mature lvs. green or at least not whitetomentose, glabrous or nearly so beneath, those on strong-growing and short shoots not prominently different; petiole usually distinctly flattened; terminal buds not large or glutinous; trees of small or intermediate stature, usually with trembling foliage.

4. trémsula, Linn. EUROPEAN ASPEN. Fig. 3127. Open-headed light-leaved tree, becoming 50-60 ft. tall, but mostly small and of relatively slow growth, producing suckers: lvs. small and thin, round-oval, more or less whitened beneath when young, bordered with deep and rounded incurved teeth; if-stalks long, slender and flattened, giving a restless motion to the foliage: If.-l uds small, catkins small, with hairy scales and stigma deeply divided; stamens usually 6-8. Widely distributed in Eu. and Asia, in this country known chiefly in its grafted weeping form (var. pendula, Hort.). The eastern Asiatic and Chinese form is made var. Davidiiana by Schneider: always a slender tree, rarely exceeding about 60 ft.; young lvs. reddish purple and handsome as they unfold: suckers freely: there is a pubescent form of this variety.—The drooping form of the European aspen is perhaps the best weeping among the poplars. The spray is light, airy, and fountain-like, quite unlike the more common weeping forms of the native P. grandidentata, which present a stiff angular form, a combination that is rarely pleasing. A characteristic feature of this tree is the production of its very long catkins that appear in earliest spring, even before our native poplars are in bloom. The staminate or male catkins are particularly pleasing, and planters should choose that sex, if possible. Var. pyramidalis, Hort., is a slender pyramidal form. Var. Frémyi, Her. Lvs. rhombic in outline, cuneate at base, ciliate, pubescent beneath when young. France, Germany. Var. villosa, Wedd. Hair on young growths. Var. pseudograndidentata, Aschers. & Graebn., see description under No. 5. P. adenopoda,
Maxim. (P. tremula var. adenopoda, Burkill. P. Sülz., Pampan.), is a recent Cent. Chinese species (allied to P. tremula) not in the trade: lvs. long-stalked, broad-ovate, long-acuminate, serrate, soft-pubescent, at least on young trees, those on old mature trees closely crenate, greenish beneath. It is growing at the Arnold Arboretum and in the Rochester parks, where it is doing well.

5. grandidentata, Michx. LARGE-TOOTHED ASPEN. Tall straight tree, becoming 75 ft. high, with brittle wood and dull gray bark which with age is marked by plates but scarcely by ridges: lvs. roundish ovate, at the apex blunt or gradually narrowed and acute, with large irregular sinuate teeth, white-woolly when young but becoming glabrous: catkin-scales shallowly lobed, 5-6-divided: fr. slender, long-pedicelled. Distinguished from P. tremula by much larger and thicker lvs., which are bluish or rusty white beneath, more ovate in outline, with larger and more spreading teeth, outer lf.-stalks and larger lf.-buds. Nova Scotia to Minn., Tenn., and N. C. S.S. 9:488.—The lf.-form is variable and botanical varieties have been made from them. In its normal or erect form it is rarely cult., but the weeping kinds, under a variety of names, are frequently seen. Most, and perhaps all, of these varieties originated in Eu., where the tree, like the cottonwood and the common aspen, were early intro. The winter twigs of the weeping varieties have a characteristic weak or zigzag growth. These weeping forms are very likely hybrids, sometimes distinguished as P. tremula var. pseudograndidentata, Acsch. & Graebn. (P. pseudo-grandidentata, Dode). Fig. 3128. Buds at maturity short, thick and somewhat viscid: lvs. much like those of P. tremula but larger, 3-4 in. diam., thicker, the margin with cartilaginous edge at maturity. The forms known as P. gr. pendula and Parasol de St. Julien are by some referred to P. tremuloides, but these names have applied in this country at least to plants of the above series. The P. gr. of authors is confused. P. grandidentata is a common tree in the E. U. S., growing under a variety of conditions, as on dryish banks and slopes and near swamps and streams.

6. tremuloides, Michx. AMERICAN ASPEN. Fig. 3129. Small weak tree, abundant northward and southward, and botanical varieties have been made from them. In its normal or erect form it is rarely cult., but the weeping kinds, under a variety of names, are frequently seen. The name P. gr. pendula is an old name said to have been given from a N. American Athene, and as it is a very early name it is used by Koch in place of P. tremuloides. The P. gr. of some authors perhaps applies to this species through some error; see No. 5. The name P. gr. appears to have originated with Aiton, who apparently gave the name because he found it cult. as the “Athenian poplar;” it is probably the same as P. atheniensis, Ludw.

7. Sieboldii, Miq. Fig. 3131. Tree, 20-30 ft., of spreading habit, suckering freely, with rather dark and heavy foliage: lvs. large, round-ovate, with a short triangular subacute apex, at the base truncate or gradually narrowed into a short petiole, dentate-ser­rate, with shallow glandular-incurved teeth, more or less whitened beneath. Japan; the wood used for matches and the tree less abundant than formerly.—Hardy in W. N. Y. Said by Wilson to be a tree of medium size in Japan, very like P. tremula in general appearance, and suckers freely. P. rotundifolia, Griff. (P. rotundifolia, Hook. f.), is very similar, but the lvs. of old branches are more or less cordate at base: lvs. 3-4 in. across, long-petioled, orbiculate, sinuate: fruiting catkins 3-5 in. long and very slender, with a tomentose rachis: caps. only ½ in. long, with a very short pedicel. Himal­aya region; probably not in cult. in this country. P. rotundifolia var. Duclosiana, Gombocz. (P. Duc­losiana, Dode. P. macranthòa, Lev.), of S. W. China, has still longer fruiting catkins (6-10 in. long) and longer-pedicelled caps.

III. BLACK POPLARS AND COTTONWOODS. Lvs. not lobed, mostly wider and broader-based than ovate in form; mature lvs. hard or firm in texture, green on both surfaces, mostly with a clearly marked translucent or hyaline edge (which may appear as a thin indurated line in the dried specimen); petiole commonly flattened, at least toward the blade; terminal buds medium-large and more or less viscid, but not markedly odo­rous: mostly large trees.

8. nigra, Linn. BLACK POPULAR. Tree of medium to large size, with smooth twigs and lvs. somewhat resembling those of the cottonwood, but generally smaller and much less deeply toothed, longer in proportion to their width and often with a tapering or rounded base, with no cilia or hairs on margin and no terminal gland; if.-stalk much flattened, so that the foliage moves freely in the wind: stamens 12-25; stigmas and

3130. Stamine catkins of an aspen. (X 3/4)
The tree usually has a pyramidal habit of growth and a dark cast to the foliage. It is a less lustrous tree than the cottonwood and grows more slowly. **Populus betulifolia**, Torr. (**P. betulifolia**, Pursh. **P. hudsonica**, Michx. **P. nigra** var. *hudsonica*, Schneid.), has the young growth and the petioles downy. B.M. 8298. Specimens of this plant were found along the Hudson by Michaux, who thought it an American species and published it early in the century as *Populus hudsonica*. Pursh, in 1814, published it again as the "birch-leaved poplar," *Populus betulifolia* from trees found near Lake Ontario. Although it was found half wild in N.Y. about a century ago, it does not appear to have increased itself in Amer., and the variety is probably of European origin. **P. nigra** is rarely seen even in cult. grounds. It is sometimes spontaneous in the E. Variable in cult. and grown in European collections under a variety of names. With the exception of var. *italica*, these forms are little known in this country. **P. vestitensis**, Dode, is a form of moderately strong growth; branches spreading; lvs. rhomboidal, dark green. The two main forms or types of the black poplar are the glabrous or smooth (var. *typica*, Schneid.), var. *beticifolia*, Pursh. **P. fastigiata**, Poir. **P. pyramidalis**, Borkh. **P. nigra**, Moench. **P. sinensis**, Dode.). **Lombardy or Italian Poplar.** Figs. 3132, 3133. Differs from the typical black poplar (**P. nigra**) in its tall narrow growth, glabrous young shoots, a confirmed habit of suckering from the root and generally a more tapering base to the lvs.: buds small: lower branches of the head taking a strong upward direction so that it has no hanging or drooping spray; holds its green foliage late in autumn. It is a staminate sport from **P. nigra** var. *typica*, originating in the plains of Lombardy about 1700-20 and now widely spread over the world by means of cuttings. **Lombardies** have been reported but they are of different origin and are usually broader-headed trees. With age, the Lombardy poplar becomes one of the most striking and picturesque trees, particularly when some of the sprouts are allowed to grow about the old stock, as in Fig. 3133. In the northernmost states it is not long-lived. **P. thesestina**, Dode, from Morocco, is apparently a form of the Lombardy poplar type with whitish or gray bark: tree very large: lvs. very large, almost triangular, toothed, shining, with Carmine petioles.

**Var. plantierensis**, Schneid. (**P. plantierensis**, Dode). Similar to Lombardy poplar but with reddish pubescent petioles and short-pubescent branchlets. Of horticultural origin, in the nursery of Simon-Louis at Plantieres, near Metz, France. This is the fastigiate form of *P. nigra* var. *betulifolia*; probably not in commerce in this country. Both sexes are known.

**AA. Lf.-margins more or less distinctly ciliate.**

9. **Fremontii**, Wats. **Western Cottonwood.** Large tree with trunk sometimes 5-6 ft. diam., very large head of stout spreading somewhat pendulous branches, and bark on mature trunks deeply and broadly ridged: lvs. deltoid or roundish (on young shoots reiform or rhombic), broader than long, with a broad acute apex or sometimes even rounded at apex, cuneate or truncate at base, coarsely irregularly serrate with incurved gland-tipped teeth, thick, firm and shining at maturity, 2-3 in. long; petiole to 2½ in. long and often pubescent; glands absent at base of l.: catkins 1½-4 in. long, the pistillate fls. on short pedicels and with thin brown filiform-lobed scales; stamens 50-70: caps. ovate, to 1½ in. long. Banks of streams. W. Texas, S. Colo., Utah, Nev., Calif. S.S. 9:496.

10. **Wisliceni**, Sarg. (**P. Fremontii** var.? **Wisliceni**, Wats.). **Valley Cottonwood of the Rio Grande Valley, W. Texas, New Mex., and adjacent parts of Mexico, differing in having slender-pedicelled pistillate fls.: lvs. deltoid, sharply acuminate, truncate or slightly cuneate at base: pistillate catkins very slender (2-6 in. long). S.S. 14:732.—A similar tree of Mex., where it is also often planted for shade (and to be looked for in
New Mex., Ariz. and S. Calif.), is P. mexicana, Wesm. (P. MacDougalii, Rose): a tall tree sometimes 80 ft. high, lvs. longer-pointed, the petioles not flattened: fls. shorter-stalked than in P. Wiesneri and longer than in P. Fremontii: caps. 0.5-1.5 in. long: it is closely related to P. Fremontii, differing chiefly in the larger disk of the pistillate fls., in the rhombic lvs. of the young shoots and which often appear with the deltoid lvs. on old shoots. S.S. 14:71.

11. deltoides, Marsh. (P. deltoides, Auth.) SOUTHERN COTTONWOOD. CAROLINA POPULAR. Large native tree with deeply furrowed or ridged dark-colored or gray-brown bark in mature specimens, and a deliquescent habit. (top breaking up into many strong branches of about equal importance), the branches widely-spreading and the top relatively thin and open; branchlets usually terete except on very strong shoots: lvs. large, triangular-ovate, very acuminate: cambium of the stem marked by deep furrows; petioles flattened. "In P. deltoides var. monilifera, showing the spreading open growth.

3134. Eastern cottonwood—Populus deltoides var. monilifera. (×54)

3135. Winter buds of Populus deltoides var. monilifera (×34)

3136. Young tree of Populus deltoides var. monilifera, showing the spreading open growth.

and nerves), the basal glands usually 2. Canada to Pa. and probably farther south.

Some of the cult. forms of this group are fairly distinct in foliage and aspect, and they appear to be associated with particular horticultural names in the nurseries. A golden-lvd. tree is known as var. Van Etten or var. aurea (really a form of P. serotina). This is one of the best of yellow-lvd. trees, and generally holds its color throughout the season. Like all trees of this unusual character, it should be used cautiously, and the best effects are obtained when it is planted against a group of trees so as to appear as if naturally projecting from the other foliage. Some of the most ornamental specimens of cottonwood are those with reddish fl.-stalks and midribs. Taking all things into consideration, the cottonwood is one of the best of the poplars for general ornamental planting. It grows rapidly and in almost every soil, and yet it possesses elements of strength and durability which most of the poplars lack. Its foliage is always bright and glossy, and the constant movement of the broad rich green lvs. gives it an air of cheeriness which few trees possess. This tree or P. Sargentii has been much used on the prairies and in western towns, much too abundantly for good landscape effects. The rapid growth of the tree gives a feeling of luxuriance to plantations even when most other trees appear to be weak or starved. The cottonwood thrives best on rather low lands, and yet it is generally an admirable tree for high and drier areas. Spontaneous forms of introduced hybrids have probably been confused with P. deltoides, obscuring the definition of the species, as, particularly, P. Eugei and P. angulata.

A poplar in Mont. and Idaho allied to this species has been provisionally referred to P. Besseyana, Dode (Bull. Torr. Club, 39:302). The fl.-bases are rounded or subacute and more or less serrate; glands small; petioles flattened. "In P. Sargentii, the lvs. are flabellate-cordate, with an open concave sinus at base, which is toothless. The lvs. much resemble P. acuminata but are broader and less cuneate at the base, and in the latter species the petals are terete." It is probable, however, that P. Besseyana, Dode, is P. angulata, Ait.

12. Sargentii, Dode (P. deltoides var. occidentalis, Rydb. P. occidentalis, Brit. P. monilifera var. occidentalis, Henry). GREAT PLAINS COTTONWOOD. Lvs. unusually smaller and with relatively longer abrupt acumination, broader at base and with fewer rather coarser teeth; young branches light yellow, shining: buds often pubescent: pedicels shorter than the caps.

Some of the cult. forms of this group are fairly distinct in foliage and aspect, and they appear to be associated with particular horticultural names in the nurseries. A golden-lvd. tree is known as var. Van Etten or var. aurea (really a form of P. serotina). This is one of the best of yellow-lvd. trees, and generally holds its color throughout the season. Like all trees of this unusual character, it should be used cautiously, and the best effects are obtained when it is planted against a group of trees so as to appear as if naturally projecting from the other foliage. Some of the most ornamental specimens of cottonwood are those with reddish fl.-stalks and midribs. Taking all things into consideration, the cottonwood is one of the best of the poplars for general ornamental planting. It grows rapidly and in almost every soil, and yet it possesses elements of strength and durability which most of the poplars lack. Its foliage is always bright and glossy, and the constant movement of the broad rich green lvs. gives it an air of cheeriness which few trees possess. This tree or P. Sargentii has been much used on the prairies and in western towns, much too abundantly for good landscape effects. The rapid growth of the tree gives a feeling of luxuriance to plantations even when most other trees appear to be weak or starved. The cottonwood thrives best on rather low lands, and yet it is generally an admirable tree for high and drier areas. Spontaneous forms of introduced hybrids have probably been confused with P. deltoides, obscuring the definition of the species, as, particularly, P. Eugei and P. angulata.

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The Lafayette tree at Geneva, N. Y., named for General Lafayette, and one of the largest trees in the state.

13. angulata, Ait. Hybrid Carolina Poplar. Fig. 3138. For more than a century considered to be a native tree in the S., although by most botanists not clearly separated from P. deltoides, but At Ion's original specimens are interpreted by Henry to represent a hybrid of P. deltoides and P. nigra var. typica; similar forms are known in Europe and are planted in this country: known in both sexes: strong-growing tree with mostly prominently ridged or angled branchlets: lvs. triangular-ovate, always longer than broad, at the base truncate or more or less cordate, at the apex acute or short-acute, at maturity glabrous and firm in texture but slightly pubescent when young, glands 2-6 at base of blade or on apex of petiole, the margin except at apex with narrow translucent border, crenate-glandulate and ciliate with the teeth close together; petiole flattened; cattkins 2-3 in. long, with small cucullate or concave-dentate (not ill-form-lobed) scales; stamens 30-40. Henry suggested that the floral characters (as seen in At Ion's type) may be a mutation under European conditions, inasmuch as cattkins with the scales of the species described by At Ion appear not to have been identified from this wild in N. Amer., but later he has proposed the hypothesis of the hybrid origin and this seems to go far toward clearing up the difficulties of this perplexing group. The tree is still recognized as cult. in England and France, where it was known as early as 1750. In general, the longer-than-broad lvs., which are merely acute or short-acute rather than long-acute, and with deeply cordate or truncate base, distinguish this form. It is a loose open grower, with nothing of the strict narrow shape of the common Carolina poplar of the streets, which is probably P. Euge nei. It is hardy in N. Y. How extensively P. angulata occurs as a planted tree in N. Amer. should be made a subject of inquiry.

14. Eugenie, Simon-Louis. Eugenie Poplar. Figs. 3139-3141, but known apparently to horticulturists as Carolina poplar: strict-growing strong staminate tree mostly with a markedly excurrent trunk (st. or bole continuing through the top or head) and with many strongly ascending branches, making the top narrow and almost columnar or pyramidal and often foliaged, but with more or less hanging small spray on the under side or bottom of the head, the tree shedding its branches or little twigs freely: lvs. mostly triangular-ovate (broadest below the middle) and long-acute-pointed, truncate or slightly cuneate-truncate at base, crenate-serrate with close mostly incurved teeth, petioles flattened; cattkins 2-3 in. long, with small cucullate or concave-dentate (not ill-form-lobed) scales; stamens 30-40. Henry suggested that the floral characters (as seen in At Ion's type) may be a mutation under European conditions, inasmuch as cattkins with the scales of the species described by At Ion appear not to have been identified from this wild in N. Amer., but later he has proposed the hypothesis of the hybrid origin and this seems to go far toward clearing up the difficulties of this perplexing group. The tree is still recognized as cult. in England and France, where it was known as early as 1750. In general, the longer-than-broad lvs., which are merely acute or short-acute rather than long-acute, and with deeply cordate or truncate base, distinguish this form. It is a loose open grower, with nothing of the strict narrow shape of the common Carolina poplar of the streets, which is probably P. Eugenie. It is hardy in N. Y. How extensively P. angulata occurs as a planted tree in N. Amer. should be made a subject of inquiry.

In this account, the poplars of this group in E. N. Amer. (east of the Mississippi) are assumed to be of a single species, P. deltoides, and what has been thought to be P. angulata of the southern states is taken as the type of the species, and the true P. angulata is considered to be a hybrid that is more or less planted. Whether other species are involved is to be determined by much further study of the unquestioned native forms. It is not unlikely that there are unrecognized natural hybrids. Teisström considers that there are species in Maryland, P. virginiana, P. deltoides, and P. angulata (Rhodora, xvi. 206, 1914). The H-forms in cult. are very confusing if one desires to find separable types without numberless intermediates. Taken in a broader sense, P. deltoides may be considered to range through the country east of the Rocky Mts., being represented in the S. by the type form, and in the W. by var. occidentalis (P. Sargentii). In a still wider sense, P. Fremontii and P. Wislizenii may be regarded as geographical forms.

Very recently, A. Henry has distinguished 3 forms of the eastern cottonwood, and has taken up the name P. deltoides although not certain as to the original application of it. The 3 forms are: (1) P. deltoides var. monilifera, Henry (P. monilifera, Ait.), the form of the northeastern country: lvs. deltoid-ovate, about 3 in. long and wide, abruptly contracted into a long non-serrated apex, the base wide and shallowly cordate, bearing 2 glands at the junction with the petiole in front, the margin densely ciliate, both surfaces and petiole glabrous except for a few evanescent hairs on midrib and main nerves. O.C. Ill. 306-4. (2) P. deltoides var. occidentalis, Ryd. (See P. Sargentii, No. 12). (3) P. deltoides var. missouriensis, Henry (P. angulata var. missouriensis, Henry). Lvs. similar in shape to those of var. monilifera but larger, being 5 or 6 in. long and wide, both surfaces and the petiole pubescent with some of the pubescence remaining in summer, the lateral glands 3 or 4. La. to Mo., also in Ga.

The botanical names of these forms are confused. If it is assumed that there is only one species in this group, then we may apply to it the name P. deltoides, modified from Marshall, 1785, or P. canadensis, Moench, 1785, but the descriptions under these names are not sufficient to designate the species if we undertake to define them closely. P. monilifera, Fouq., and P. carolinensis, Moench, are undeterminable from the descriptions. There is every probability that Marshall in his "Arbustum Americanum" (1785) meant to designate the Carolina poplar by his P. deltoides growing poplar was found in 1852 as a chance seeding in the Simon-Louis nursery, near Metz, France; it is supposed to be a hybrid between the Carolina poplar (male) and P. regenerata (female) and it has the marks of the two. It is now one of the horticultural poplars and is often confounded with the native cottonwood. Henry writes that the original tree is, in his opinion, "the most wonderful tree in Europe in point of vigor, as it measured in 1913, when 81 years old, no less than 150 ft. in height and 25 ft. in girth at 5 ft. above the ground, and appears to be still growing rapidly. Another tree, a cutting of the last, planted in 1870, was 140 ft. high by 15 ft. in girth." Some of the tall Carolina poplars planted in the eastern parts appear to be P. Eugenie, or a very similar hybrid.
The first undisputed binomials, reinforced by specimens, appear to be those of Aiton, 1780, P. monilifera and P. angustata. It is unfortunate that Marshall's P. deltoidea has been revived in order to satisfy the demand for priority; it is not Latin; it may be rendered "as the species meant by Marshall, but the other very early names, should be discarded. Marshall's name, as the other very early names, should be treated between the parents (P. angustata, pistillate, and P. trichocarpa) in width and color of lvs., the under surface pale gray; resembles P. angustata in having coarsely serrate often coriaceous leaves, in bearing rounded polycarpic. A plant of "astounding vigor," issued from a cross made at Kew in March, 1912. G.C. I. 56:67.


P. ligilata, Henry (probably P. nigra var. betulifolia and P. serotina). Tall pistillate tree with pubescent branchlets, described by Henry as follows: Bark similar to that of P. serotina; young branchlets with minute pubescence, glabrous and yellowish brown the second year; buds small, viscid; lvs. about 2 1/2 in. wide and long, truncate, rounded or cuneate at base, with a short non-seriated, acuminate or cuspidate apex, create-serrate, teeth incised-ciliate till late summer; glands minute, often absent, petiole reddish-brown, with minute pubescence; pistillate catkins 2-2 1/2 in.; glabrous; pedicels short, ovary globose, in a cup-shaped obtuse hand, with 2, rarely 3, dilated spreading stigmas; fruiting catkins 4 in.; cap. 2-valved.

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IV. **Heavy or Large-leaved Poplars or Cottonwoods.** Less large and broad, rounded or cordate rather than truncate at base, not lobed, the petiole cylindrical or channelled, not flat, more or less pubescent but becoming mostly glabrous at least above; terminal buds medium to large size, more or less glabrous but scarcely balsamiferous; trees, mostly of good size.

15. *lasiocarpa*, Oliver (P. Fargesii, Franch.). Tree, 50-60 ft., with angular stout more or less pubescent young shoots and large viscid buds: lvs. very large (often 10-14 in. long and 8-9 in. wide), ovate or broadly-oblung, acute or short-acuminate, evenly glandular-crenate-serrate, red-veined, deeply cordate at base and biglandular, more or less tomentose beneath but becoming glabrous above; petiole nearly cylindrical, red; stipules oblong-lanceolate; catkins 4-6 in. long or longer in fruit, the polygamous fls. short-pedicelled; bracts ovate or obovate, finely laciniate; stamens 23 or more in the male fls. and 3-6 in the hermaphrodite fls.; caps. ovoid and densely woolly, to 1⁄2 in. long. China, common at 4,000-6,000 ft. B.M. 8625. R.H. 1911, p. 365. R.B. 35, p. 312. G.M. 51:763. —P. Wilsonii, Schneid., is a rare tree in W. China, with a pyramidal or columnar head of short spreading branches and strikingly handsome dark bluish green paper-like broad-ovate or roundish or broadly ovate-oblong more or less cordate-based and obtuse; lvs. which are less deeply cordate than those of *P. Jancocarpa*, and less broadly oblong; it is also distinguished by its habit, the glabrous and purple rather than tomentose and yellowish branchlets, and the lvs. bluish green above and rather whitish gray beneath.

16. *heterophylla*, Linn. **Swamp or Black Cottonwood. Downy Poplar.** A swamp species of irregular branching habit, only rarely planted, reaching 80 ft. and diam. of trunk of 3 ft.: lvs. densely tomentose when young, but becoming glabrous with age or remaining floccose beneath, 4-7 in. long, broad-ovate in outline, obtuse or somewhat acute at apex, more or less truncate or subcordate or rounded at base, serrate, the petiole terete and tomentose or nearly glabrous: staminate catkins stout but rather short, stamens 12-20 and scales filiform-lobed; pistillate catkins slender but rather short, becoming erect or spreading; caps. ovoid-acute, on slender pedicels. Conn. to Ga., La., Ark. and S. Mo.; near the coast in the northern states. S.S. 9:489.

V. **Balsam Poplars. Tacamahac.** Less not lobed, varying from broad-ovate to narrower; mature lvs. whitish but not cottony-tomentose beneath, not clearly transluscent-edged; petals cylindrical or 4-angled, mostly grooved on upper side; terminal buds large to very large, very viscid and balsamiferous in odor: mostly large trees.

**a. Branchlets terete, without projecting ridges or ribs** (except sometimes on strong young shoots).

**b. Petioles and branchlets mostly glabrous.**

17. *balsamifera*, Linn. **Balsam Poplar. Tacama­hac.** Figs. 3142, 3143. Tall upright tree, with a narrow top and glabrous twigs: lvs. thick and firm, erect, whitened beneath, usually smaller than in most poplars of this group, glabrous except that petals are slightly pubescent, ovate-lanceolate or oval, tapering toward the top and obtuse or narrowly rounded at base, finely and obtusely toothed: catkins drooping, slender but rather densely fdl., appearing in very early spring; ovary 2-carpelled: caps. pedicelled. Mackenzie River to Newfoundland and to Brit. Col., southward in the northern tier of states; not in Asia. S.S. 9:490. —P. Michauxii, Henry (P. Michauxii, Dode. *P. condicans*, Amer. Auth. in part, not Ait.), is a form with slightly cordate or rounded-based ovate lvs. and slightly pubescent on petioles, veins beneath and twigs. G.C. III. 59:230. —The native *P. balsamifera* is sometimes seen about farm buildings and roadsides, where it makes a durable and interesting tree. The dull whiteness of the under side of the leaves affords a pleasant variety and contrast in its foliage, and the fragrance of the resinous buds in spring is agreeable to most persons. It is a desirable tree for occasional planting, but, like the Lombardy, it generally appears to best advantage when placed amongst other trees. It is a harder tree than the Lombardy, and does not run quickly to such extravagant heights. In cult., it seems to present a variety of forms or else enters into a number of hybrids. The true *P. balsamifera* is said to be rare in cult. in Cent. Eu., and only in the male.

In Mont. and Idaho is a balsam poplar with sessile 3-carpelled caps., as in *P. trichocarpa*, although differing in other fr. characters from that species; lvs. usually broader than in *P. balsamifera* and often subcordate, glabrous. This form Rydberg considers to be *P. hastata*, Dode.

In the Himalayan region, *P. ciliata*, Wall., belongs to this group, but it is probably not in cult. in this country: lvs. ovate or ovate-cordate, acuminate, glabrous except for the gland-ciliate unequal teeth, the base 3-nerved: a large tree, with lvs. 3–7 in. long.

18. *fortissima*, Nels. & Maeb. (P. angustifolia, James, not Weinn. *P. balsamifera* var. *angustifolia*, Wats.). Fig. 3144. **Narrow-leaved Cottonwood.** Small pyramidal or conical tree (reaching 60 ft. in the wild), with slender twigs and small buds, and soft clear green foliage: bark rough-furrowed: lvs. small for the genus, lanceolate or ovate-lanceolate, short-stalked, green on both surfaces, finely and remotely serrate: catkins short, densely fdl.: ovary somewhat 2-lobed. Interior region from Assiniboia to Neb. and Ariz., and westward; common along mountain streams at middle altitudes in the Rocky Mts. S.S. 9:492.—*Common street tree in parts of the W. and sometimes planted at the E. for ornament.*
19. acuminata, Rydb. (P. coloradensis, Dodg.) SMOOTH-BARKED COTTONWOOD. Tree slender, with smoother and lighter-colored bark than in P. fortisitma: lvs. long-petioled, rhomboid-lanceolate, acuminate, serrate only at the middle; pistillate catkins slender. Eastern slopes of Rocky Mts.—A well-shaped and attractive tree in cult., the lvs. long-acuminate and somewhat drooping. P. Tweedy, Brit., is allied to this species and perhaps a variant of it, with mature lvs. broadly ovate or some of them even orbicular, and ciliate at base. Wyo.

20. candicans, Ait. (P. Tacamahaca, Mill. P. ontariensis, Desf. P. balsamifera var. candicans, Gagnep. P. macrophylla, Hort.) Balm of Gilead. Ontario Poplar. Strong-growing spreading pistillate tree, much planted in Eur. as "the balsam poplar" and esteemed for its vigor and hardiness and the resinous fragrance of its large buds in springtime: lvs. broad and heart-shaped, very hairy (as are also the twigs), the lf.-stall usually hairy and somewhat flattened. G.C. III. 19:219. Apparently a hybrid, the origin of which is in doubt; the native tree usually confused with this is P. balsamifera var. Michauxii, and sometimes also the supposed hybrid, P. Jackii.—Aid to be sometimes grown under the names of P. suaveolens and P. balsamifera. It is very different from the balsam poplar in method of growth, as it has none of the pyramidal or spire-like tendency of that species, but usually makes a broad and irregularly spreading top. The Balm of Gilead makes a good street tree, and is perhaps the best of the older poplars for shade, but it is not known how extensively it is planted in N. Amer.; it is probably of European origin. Well-grown trees of the form passing under this name in the U. S. have the darkest and richest foliage of any common poplar, and this character makes the tree valuable in heavy smoky and dusty locations, as it soon becomes grey.

21. Jackii, Sarg. (P. Baileydna, Henry). Fig. 3145. A supposed hybrid of P. deltoides var. monticola and P. balsamifera, found as if native in Mich. and Que.: intermediate between the two parents, with toere glabrous twigs: lvs. large, broad-ovate, cordate at base, biglandular, slender-acuminate, the margin with scattered deciduous hairs and a translucent border, the under surface pale but scarcely whitish, the petioles channeled but not compressed, 4-angled in cross-section. G.C. III. 19:231.—The buds are less viscid than those of P. balsamifera, and the leaf-serratures are not so sharp. It makes a broad-headed branching tree. The range of this tree is not known.

22. tristis, Fisch. Small tree with viscid pubescent buds which are often attended by persistent ovate-acuminate stipules: lvs. narrowly ovate, 4 in. long and one-half as broad, ciliate, acuminate, subcordate or rounded at base. Cent. Asia, Himalaya.

23. Maximowiczii, Henry. Japan Poplar. Very large tree, to 100 ft., and 3-4 ft. diam., with densely pubescent pale brown branchlets: lvs. about 4 in. long, nearly orbicular, oval or broad-elliptic, broadest above the middle, subcordate, cuspidate, pubescent on ribs and nerves of both surfaces, whitish or slightly rusty beneath, finely and sharply serrate and ciliate: fruiting catkins 7-10 in. long, remaining unopened on the tree till late summer or autumn, the caps. glabrous. E. Siberia, N. Japan.—Hardy and desirable, making a shapely head and bearing attractive foliage. It is sometimes confused with P. suaveolens. Wilson speaks of this tree as a magnificent poplar, the largest in eastern Asia, the trunk reaching 5 or 6 meters in girth.

24. suaveolens, Fisch. (P. balsamifera var. suaveolens and intermedia, Loud.). A comparatively slow-growing tree of close, upright habit: young branches slightly pubescent above nodes: lvs. very thick and hard, finely serrate, oval to ovate and ovate-lanceolate in outline, and prominently whitened beneath, commonly rather small for this group, the margin ciliate, and finely crenate-serrate: twigs hard and cylindrical. Siberia, Mongolia, China.—It is considered to be a valuable tree for hot and dry interior climates; and it also has distinct merit for ornamental planting. It eventually becomes a large tree. The Populus laurifolia and P. bibrice pyramidalis of some American nurserymen are apparently variations of this type. P. Przezdziecki, Maxim., is probably a form of this with glabrous branchlets and petioles. P. szechuanica, Schneid., a common tree in forests of Province Szechuan, W. China, growing to a large size: in habit and general appearance resembles P. suaveolens but the branchlets are more massive and the branchlets stouter: lvs. very large even on old trees, on suckers or very strong shoots usually ovate-elongated and the base either slightly or distinctly cor-
date or rounded and sharply glandular-crenate-dentate, on the old branches broad-ovate or ovate-orbicular with rounded or more or less cordate base and the margin more or less distinctly glandular-dentate. Grows at the Arnold Arboretum and the Rochester parks. P. yunnanensis, Dode, is allied to P. szechuanica but is insufficiently understood.

3146. Leaves of Populus laurifolia as illustrated in Ledebour’s “Icones Plantarum.” (Reduced.)

25. laurifolia, Ledeb. (P. balsamifera var. laurifolia, Wesm.) Fig. 3146. Tall tree with gray-brown bark and smooth angled twigs: lvs. ovate to ovate-oblong to ovate-lanceolate or even narrower; acuminate, sometimes undulate, rounded at base, finely toothed and somewhat ciliate, green above, more or less pubescent on midrib at maturity, whitish beneath: stamens 20–30; pistil 2, 2-valved; staminate catkins about 3 in. long, pistillate 4–5 in. Siberia.

26. Lindleyana, Carr. (P. laurifolia var. viminallis, Dipp.) Fig. 3144. Lvs. mostly willow-like, long-elliptic, distinctly acuminate, or oval-elliptic on the older shoots, rounded at base, with pubescent petioles, fls. and fr. Perhaps a horticultural group, to which are probably to be referred the garden names P. crispa (with more or less crisped or crinkled margins), P. Dudleyi and P. salicifolia. As seen in cult. in this country (and very infrequent) it is a small or medium-sized tree, of slender growth and more or less ciliate. The color of its foliage is grayish green, and in this respect it affords a contrast to the native species. P. fortissima seems to be rather the better tree of the two, although P. Lindleyana has a more striking appearance. The botanical status of these trees is not clearly defined. By some, P. Lindleyana is referred to P. laurifolia, but the tree in cult. seems to be distinct.

27. Simionii, Carr. (P. laurifolia var. Simionii, Regel, P. balsamifera var. Simionii, Wesm. P. brevifolia, Carr.). A strong strict tree, not large, with lvs. differing from those of P. candicans in having a rounded or tapering base and much finer teeth, but otherwise they are somewhat alike: shoots reddish brown and spotted, deeply grooved, somewhat drooping: lvs. small, mostly oval and tapering both ways, hanging on slender petioles. Amoor Valley to China, where it is common. G.W. 15, p. 246.—Intro. into France about 1861 by M. E. Simon, and somewhat planted in this country. It has been planted as far north as Man. with entire success. It is a very rapid grower, and is useful where quick-growing windbreaks are desired. There are fastigate and weeping forms. Shape of lvs. variable, those on vigorous shoots being round-ovoblate, acute-based, and mostly rounded at apex.

28. trichocarpa, Tott. & Gray. BLACK COTTONWOOD. Very large tree, to 300 ft. and trunk to 8 ft. diam., with wide head and top and upright branches: lvs. varying from narrow- to broad-ovate, truncate or cordate at base, acute or taper-pointed at apex, finely serrate, to 8–10 in. long, shining green above and rusty but becoming whitish beneath. Grows at the Arnold Arboretum and the Rochester parks. P. yunnanensis, Dode, is allied to P. szechuanica but is insufficiently understood.

29. euphratica, Oliver (P. diversifolia, Schrenk, P. ariniâ and P. Litwinowiana, Dode). Medium-sized tree,
to 50 ft., attaining 2 ft. or more in diam., with pubescent not viscid buds and lorate branches: lvs. on young shoots broad-linear (0–6 in. long) or oblong, short-stalked, entire; on short shoots or older parts half as long, ovate to rhomboic or orbicular and more or less lobed or cut, at base rounded, cordate or cuneate, the long, ovate to rhombic to orbicular and more or less not viscid buds and terete branches: lvs. on young stalked, entire; on short shoots or older parts half as broad-linear (3–6 in. long) or oblong, short-lanceolate, entire. P. Denhardtiorum, Dode, a tree

PORÁNA (native name). Convolvulaceae.

Large twining annual herbs or shrubs, sometimes grown for ornament.

Leaves petioled, ovate, entire: infl. cyamoïdes or racemose; fls. purple, steel-blue or white; sepal in fl. small, narrow, in fr. all or 3 much enlarged; corolla campanulate or funnel-shaped, wide or narrow-mouthed; limb 5-lobed, nearly entire or lobed; ovary 2-celled, 4-ovuled: fr. a globose membranous oblong or obconic caps. indehiscent or 2-valved.—About 15 species from Trop. E. Afr., oriental tropics and N. Australia. 1 species reported from Mex. The two following species have been intro. into S. Calif., but are said to be hardly worth growing. P. paniculata, Roxb. Strong shrubby climber often 30 ft. high in E. Trop. Afr. from sea-level to 1,500 ft. altitude, differs from P. euphratica has a shaggy bark: lvs. ovate-elliptic to reniform, never lanceolate, entire. P. Denhardtiorum, Dode, a tree <, ut, and disk. orbicular; pistillate disk tubular and cleft: has a shaggy bark: lvs. ovate-elliptic to reniform, never lanceolate, entire. P. Denhardtiorum, Dode, a tree

PORTLANDIA (named in honor of a duchess of Portland). Rubiaceae. Glabrous shrubs and small trees, useful for the ornamental bloom.

Leaves opposite, thick-leathery, petioleate, oblong or linear-oblong; stipules between the petals, connate with the petiole forming a sheath, deciduous: fls. large, 1–3-fl. on axillary peduncles; calyx 5-lobed, persistent; corolla large, subcampanulate or funnelform, 5-lobed; stamens 5; ovary 2-celled: fr. an obovoid-oblong caps., truncate or cylindrace, leathery.—About 10 species. Mex. and W. Indies. Put little known as horticultural sub ject; probably useful far S.

platantha, Hook. Low shrub 1½–3 ft. high, glabrous: lvs. opposite, nearly sessile, elliptical-ovate, acute, evergreen, subcoriaceous; stipules broadly triangular, obtuse: calyx-lobes 4, spreading, leafy, lanceolate; corolla white, broadly funneliform approaching to campanulate, 5 lobed, the lobes spreading, ovate. Amer. B.M. 4534.—Requires moist tropical greenhouse heat and a mixture of loam and leaf-mold or peat-soil. Prop. by cuttings.

pterosperma, Wats. Fig. 3148. Shrub or small tree, 2–10 ft.: lvs. thin and deciduous: fls. numerous upon the young slender branches, 2 at nearly every node, pure white, funneliform, nearly 3 in. long; lobes of the corolla triangular, folded edge to edge in the bud so that it is strongly angled. Mex. G.F. 2:269 (adapted in Fig. 3148).—Probably hardy in the Gulf states and possibly in cult.

Other species which may appear in cult. are P. coccei, Swartz, a Jamaican species with scarlet fls. and yellow anthers; and P. grandiflora, Linn., a native of the W. Indies with white fls. reddish inside at the throat and 3 in. long, growing 10–14 ft. high.
**PORTULACÉA (Latin name, of uncertain history).** *Portulacaees*.- *PURSLANE.* Low fleshy often trailing annual or perennial herbs, one of which is a common flower-garden plant, and one of which is sometimes grown in its horticultural form as a pot-herb.

Leaves mostly alternate, thick, sometimes terete, entire: fls. mostly terminal; usually with 5 distinct petals and with several to many stamens, both borne on the calyx or receptacle-rim; fr. a small conical circumsiccise capsule. (Fig. 3149), containing many small seeds.—About 40 species in the tropical and temperate regions, mostly American. The fls. of *Portulaca* open in direct sunshine, but close in shadow. Two annual species are in cult., both thriving in the hottest exposures.

grandiflora, Hook. *Rose Moss.* Fig. 3150. St. slender and terete, prostrate or ascending, not rising over 6--12 in., hairy in tufts at the joints: lvs. scattered or somewhat clustered, short and terete: fls. large (usually 1 in. or more across in the cult. forms), terminal and subtended by clustered lvs., in many bright colors, soon withering: seeds small, metallic-gray or gray-black. Brazil and S. B.M. 2885. R.H. 1877:90. Gn. 45, p. 436. G. 31:718.—Said to be perennial under glass. Runs into many garden forms, as: Var. Thellusoni, Hort. (P. Thellusoni, Lindl.), with handsome orange-scarlet fls. B.R. 26:31. R.H. 1852:5. Var. splendens, Hort. (P. Gilliesii, Hook.), light red-purple. B.M. 3064. Var. albiflora, Hart., clear white. Var. sulphurea or Thurburnii, Hort., dark yellow. Var. caryophyllodes, Hort., red, striped white. Var. Bedmanni, Hort., clear white and purple-striped.—Colors usually they are sown directly where the plants are to stand. The soil need not be rich. The plant makes excellent edgings, and is good for growing in dry rockwork. A large patch of it gives a brilliant display of color in sunny weather, but the fls. do not open in dull weather. Seed of the double varieties produces more or less single-fld. plants; unless saved from cuttings of double-fld. plants, but the singles usually bloom earlier than the doubles. Let the plants stand 10--12 in. apart. They are tender to frost. The plant often self-sows, and in some places it persists about the old gardens. *Portulaca grandiflora* was first described by Hooker in 1829 in the "Botanical Magazine." The fls. were described as "orange-colored, or of a very bright reddish purple." The plant was discovered by Dr. Gillies, growing in light sandy soil, in various situations between the Rio del Salado, or western boundary of the Patagonias, and the foot of the mountains near Mendoza. On the western side of Rio Desaguadero plants were in great profusion, giving to the ground over which they were spread a rich purple hue, here and there marked with spots of an orange color, from the orange-colored variety which grew intermixed with the others."

oleracea, Linn. *PURSLANE. PUSLEY.* Fig. 3151. A common trailing weed in sandy ground, but also in cult. in improved strains as a pot-herb: fls. small, spatulate or narrow-ovate, very obtuse, thick, dull green or reddish: fls. small, yellow, the 7--12 stamens sensitive to a touch. Widely distributed in many countries; probably native to the southwestern parts of the U.S., but it is considered that it is intro. into the E. and N. In sandy and loamy soils it is one of the commonest and most persistent of weeds, but it is little known on heavy lands. The common wild plant is prized for "greens" in some regions, but the French upright forms are much better, as they are larger and more tender; these improved varieties look very different from the common "pusley;" they are easy of cult. For a discussion of the nativity of puslane in N. Amer., see Gray & Trumbull, Amer. Jour. Sci. 25, p. 195.

**PORTULACÁRIA (similar to Portulaca).** *Portulacáceae.* Glabrous shrubs or small trees; lvs. opposite, obovate, fleshy: fls. small, rose, fascicled in the upper axils, forming a leafy panicle; sepals 2, short; petals 4--5, longer; stamens 4--7, inserted at the base of the petals; ovary free, 3-coroled, 1-ovule, caps. 3-winged, indehiscent. Two species, S. Afr. *P. africana, Jacq.* Small tree, 10--12 ft. high; branches opposite: lvs. ovate-roundish, 4--6 lines long; peduncles compressed and branched; pedicels terete: fls. small, pink. S. Afr.

**POSQUÉRIÀ (from a native name in Guiana).** *Rubiáceae.* Glabrous shrubs or small trees with terete branches, for the warmhouse, of which only one has appeared in the American trade, although some other species are rather commonly cultivated abroad.

Leaves opposite, coriaceous, entire; stipules between the petioles, rather large, deciduous: fls. in terminal corymbs, fragrant, white, rose, or scarlet; calyx 5-toothed; corolla long-tubed, limb 5-lobed; stamens &
The potato is closely allied, botanically, to several powerful narcotics, such as tobacco, henbane, and belladonna, and also to tomato, eggplant, and capsicum. Potatoes contain a small amount of a somewhat poisonous substance. When exposed to the direct rays of the sun and "greened," the deleterious substance is so greatly increased that the water in which they are boiled is not infrequently used to destroy vermin on domestic animals. In any case, the water in which potatoes are cooked should not be used in the preparation of other foods.

The potato is a native of the elevated valleys of Chile, Peru, and Mexico, and a form of it is found in southern Colorado. It probably was carried to Spain from Peru early in the sixteenth century. It seems to have been introduced into Europe as early as 1565. Sir Walter Raleigh, in 1585, is said to have brought back the potato from the "new country". Recent investigations, however, seem to give the credit of introducing the potato into England to Sir Francis Drake, in 1586. As Batatas virginiana, it was figured and described by Gerarde in 1637. It is probable that these circumstances led erroneously to giving the credit of introducing the potato to Raleigh instead of to Sir John Hawkins. The wild varieties in their native habitat still bear a close resemblance to cultivated varieties except for the enlarged vine and abnormal development of the tubers in the latter. In the seventeenth century the potato was cultivated in gardens in several European countries. It was recommended by the Royal Society of London in 1663 for introduction into Ireland as a safeguard against famine. The cultivation of the potato as a field crop became somewhat common in Germany soon after 1772, at which time the grain-crops failed and potatoes were a welcome substitute for the bread-corn. It was near the middle of the sixteenth century before it acquired any real importance in Europe, outside of Ireland and a few restricted localities in other countries. As late as 1771 only a white and red variety were mentioned in one of the most important English works on gardening. The plants were enormously productive, but the tubers were poor in quality, so that in fact that their chief use was as a food for domestic animals; and only when the bread-corns failed were they used to any extent, and even then only as a substitute. By 1840 the potato had been largely substituted in Ireland for the cereals and other similar food-crops, as the yield of potatoes in weight exceeded by twenty to thirty times the yield of wheat, barley, or oats on an equal area of land. This large dependence on a single food-crop finally resulted in a wide-spread famine. The potato blight which appeared in the United States in 1845 devastated Ireland in 1846. During two years, 1846 and 1847, a conservative estimate places the numbers who perished for want of food or from diseases caused by a meager

3182. Underground parts of potato plant, showing the fibrous roots and the stems ending in tubers. The old seed-piece is seen near the bottom.
diet of unhealthy and unnutritious food at 600,000. By 1848 the plague had virtually disappeared.

The roots of the potato are distinct from the tubers. Usually, two to four roots start from the stalk at the base of each underground stem which, when enlarged at the end, forms the potato. (See Fig. 3152.) Roots may, also start where underground stems are wanting. The potato is a perennial plant. The accumulated starch in the tubers furnishes an abundant supply of nourishment for the plants growing from the eyes or buds until they are well above the ground. So much food is stored that infrequently small young tubers are formed on the outside of the potatoes left in the cellar during the summer. Potatoes grow from 2 to even 3 feet high, have smooth, herbaceous stems, irregularly pinnate leaves, and wheel-shaped flowers, varying in breadth from 1 to 1½ inches and in color from bluish white to purple. They bear a globular purplish or yellowish fruit or seed-ball of the size of a gooseberry, containing many small seeds. As many as 257 seeds have been found in a single seed-ball.

The cultivated potato today has undergone a remarkable change since its first introduction into Europe by the Spaniards. Some of this change has been brought about by better cultivation, but most of it is due to breeding. The tubers of the wild *S. tuberosum* were small and attracted little attention. Heriot, in his report on Virginia, describes the plant "with roots as larger as a walnut and others much larger; they grow in damp soil, many hanging together as if tied on ropes." The modern potato has been bred so that the hills contain four to six tubers of uniform size, weighing, perhaps, two pounds. (See Fig. 3153.) The uses of the potato are wide and varied, but taking the world over, its greatest value is as a food-crop. It is probably eaten by a greater proportion of the earth's inhabitants than any other crop except rice. It is extensively used for the manufacture of starch. The great potato-growing sections of the United States, especially Aroostook County, Maine, have many starch factories, where the tubers which are oversize or under-size or otherwise not fitted for ordinary food purposes are converted into starch. The price ordinarily paid for potatoes for starch-making is considerably less than that for eating, and unless the price for eating goes very low, good marketable tubers are not used for starch. The potato has many other uses which have been much less developed in the United States than in Europe, but there is a rapidly increasing tendency for their uses in the arts here. It is used in the textile industries, in the manufacture of woolen, linen, and silk goods; for the manufacture of potato flour, glucose, syrup, candy, desiccated potatoes for food, industrial alcohol, mucilage, dye, starch-feed, and so forth.

The dry matter of potatoes is composed largely of starch. A high starchy content is desirable because it makes a mealy potato which is demanded in America. Being deficient in nitrogen, the potato is ill adapted for an exclusive diet and should be used in connection with food containing a high percentage of proteins, such as lean meat, peas, beans, and eggs. The lack of vegetable fats may be supplied by butter, gravy, or oatmeal. The composition of the potato varies widely. An average of 136 analyses is as follows:

<table>
<thead>
<tr>
<th>Water</th>
<th>Ash</th>
<th>Protein</th>
<th>Starch</th>
<th>Fat</th>
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</thead>
<tbody>
<tr>
<td>cent</td>
<td>cent</td>
<td>cent</td>
<td>cent</td>
<td>cent</td>
</tr>
<tr>
<td>Potato</td>
<td>78</td>
<td>1.1</td>
<td>2.2</td>
<td>18</td>
</tr>
<tr>
<td>Oatmeal</td>
<td>7.9</td>
<td>2.2</td>
<td>14.7</td>
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</tr>
<tr>
<td>Graham Flour</td>
<td>13.1</td>
<td>1.8</td>
<td>11.7</td>
<td>59.8</td>
</tr>
</tbody>
</table>

The nutritive ratio of wheat is 1 to 5.37, almost perfect; that of potatoes 1 to 18.29, much too wide. Many foods in their natural state, as potatoes, are much too deficient in mineral matter. Notable among these are rice and wheat flour—the former containing but 0.4 per cent and the latter 0.5 per cent of ash.

The main potato industry in the United States is confined to several potato-growing sections in widely separated parts of the United States. The most important of these are Aroostook County, Maine; the Norfolk and Eastern Shore trucking regions of Virginia and Maryland; the Red River Valley of Minnesota and North Dakota; the Kaw Valley of Kansas; the Greeley and Carbondale districts of Colorado; the Twin Falls country of Idaho, and the San Joaquin and Sacramento valleys of California. In these regions, the climate and soil are perfect for the best potato-production.

### Varieties

There are many hundred varieties of potatoes. The older varieties run out in the course of time and are supplanted by new ones. The running out is largely due to the fact that growers, as a rule, do not practise seed-selection. The new varieties are ordinarily produced either from hybridized seed or from both mother. The latter are somewhat common. Red tubers are now and then found in white hills, and vice versa. Other differences are taken advantage of by breeders. Of the many varieties listed in seedsmen's catalogues and found on the market, however, only a very few are of commercial importance. Fitch, of the Iowa State College, has made a thorough trial for a number of years of all varieties of commercial importance in the United States and Europe. He also made a canvass in person and by letter of the markets of the United States and Europe. The result was that only a few varieties were found to be of much market value. He lists the following varieties as being the most valuable in the United States and Europe in order of their importance: Rural New Yorker, Green Mountain, Early Ohio, Burbank, Irish Cobbler, Bliss, Triumph, Peerless (Pearl). Many other varieties, of course, have local importance and perhaps outyield the standard varieties named above.

New varieties are being produced constantly, a very few of which may prove to be better than the standard sorts, but most of them are worthless. William Stuart, of the United States Department of Agriculture, has recently made a very comprehensive and admirably arranged classification of potatoes, as follows:

3153. Potato, to show the difference in the progeny or yield of two tubers. One tuber cut into four pieces yielded the product from four hills shown in the left-hand column; another tuber similarly cut and planted, yielded the four hills shown in the right-hand column.
Group 1.—Colored.
Tubers: Roundish; skin creamy white. Sprouts: Base, leaf-scales, and tips slightly or distinctly tinged with reddish violet or magenta, sometimes the color is absent. Flowers: Light rose-purple; under intense heat may be almost white.

Group 2.—Triumph.
Tubers: Roundish; skin creamy white, with more or less numerous splashes of red, or carmine, or solid red; maturing very early. Sprouts: Tubular, leaf-scales, and tips less or more deeply suffused with reddish violet. Flowers: Very light rose-purple.

Group 3.—Early Michigan.
Tubers: Oblong or elongate-flattened; skin white or creamy white, occasionally suffused with pink around bud-eye cluster in Early Albidio Sprouts: Base light rose-purple; tips creamy or light rose-purple. Flowers: White; in sections 1 and 2; rose-lilac in section 3.

Group 4.—Rose.
Tubers: Round, oblong, or ovoid; skin flesh-colored or light pink, with numerous small, raised, russet dots. Sprouts: Base, leaf-scales, and tips creamy white to lilac. Tubers: Base, leaf-scales, and tips purplish magenta. Eyes should be supplied with an abundance of time and labor which the grower has at his disposal,

Potato fields should be given frequent and thorough tillage to keep down the weeds and conserve soil moisture. These cultivations should be shallow to prevent injury to the roots. The soil is cultivated until the plants are large enough nearly to fill the rows and have begun to "set" tubers. Further tillage is likely to injure the plants and reduce the yield.

After the plants are mature, the tubers are dug either by hand or with an elevator digger drawn by two or more horses.

YIELDS
The yield of potatoes to the acre in the United States is meager, the average yield for the ten-year period 1900-1909 being 91.4 bushels. Under favorable soil and climatic conditions, with rational methods of procedure, 200 to 400 bushels are not uncommon, and under superior conditions more than 1,000 bushels to the acre have been secured. By dividing the eyes and planting them in the greenhouse in the winter, and after a little time re-dividing them, continuing this until many plants were secured, one grower was enabled to raise 2,558 pounds of potatoes in the open ground in six weeks. Two other growers, secured, by similar methods, 2,349 pounds and 2,118 pounds. The low yield of potatoes to the acre in the United States is meager, the average yield for the ten-year period 1900-1909 being 91.4 bushels. Under favorable soil and climatic conditions, with rational methods of procedure, 200 to 400 bushels are not uncommon, and under superior conditions more than 1,000 bushels to the acre have been secured. By dividing the eyes and planting them in the greenhouse in the winter, and after a little time re-dividing them, continuing this until many plants were secured, one grower was enabled to raise 2,558 pounds of potatoes in the open ground in six weeks. Two other growers, secured, by similar methods, 2,349 pounds and 2,118 pounds. The low average yield is due, in part, to the ravages of the many enemies of the potato plant, which, uncontrolled, sometimes destroy the crop, and usually seriously diminish the yield. In the United States, the potato is not so universally used or so productive as in Europe, though its use as a food is steadily increasing. In common commercial culture, the yield as well as quality may be greatly enhanced by care in selecting seed. The progeny of two similar potatoes is shown in Fig. 3153, showing the inherited performance of the tubers.
The average annual production in the United States from 1881 to 1890 was 169,899,653 bushels, while the yield in 1913 was 331,525,000 bushels, which sold for an average farm price of 48.9 cents a bushel. New York stands first in potato-production, producing 53,215,000 bushels of the total yield. The crop of Europe aggregates more than the entire wheat-crop of the world. The production of the European countries for 1913 was:

<table>
<thead>
<tr>
<th>Country</th>
<th>Production (bushels)</th>
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<tbody>
<tr>
<td>France</td>
<td>477,111,000</td>
</tr>
<tr>
<td>Austria</td>
<td>424,457,000</td>
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<tr>
<td>Germany</td>
<td>1,088,591,000</td>
</tr>
<tr>
<td>Russia</td>
<td>1,374,430,000</td>
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<tr>
<td>United Kingdom</td>
<td>283,912,000</td>
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<tr>
<td>United States</td>
<td>76,382,000</td>
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<tr>
<td>Russia</td>
<td>1,274,439,000</td>
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<tr>
<td>France</td>
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</tbody>
</table>

Potatoes as a field crop and market-garden or truck crop.

The chief difference between potatoes as a field crop and a market-garden or truck-farm crop is that in the former case they are grown in rotation with other long-season plants and consequently may occupy the ground for the entire growing season, while in the latter they occupy the ground only a few weeks and are usually preceded and followed by some early or late garden crop the same year. In the North the crop is usually grown in the spring and early summer, but in the South it may be grown either in the early spring or late fall. The spring crop is grown to supply the demand for new potatoes in the early markets while prices are high, but the fall crop is mostly consumed locally either for table purposes or for seed for the next spring crop. In the trucking region of the upper South, the spring crop is planted in January, February, or March and harvested in May and June, and the fall crop in July or August and harvested in October or November.

The favorite Virginia rotation starts with potatoes planted in February and harvested in June. Cowpeas are sown immediately for a summer cover-crop; these are plowed under in August as a means of improving the soil, and spinach is planted in September. This crop is harvested in January or February and garden peas are planted in rows 5 or 6 feet apart. The peas are interplanted in late March with cucumbers. The peas are harvested in April and May, and the cucumbers in June and July. The ground is planted to kale in August, which is harvested in midwinter and potatoes planted again in February or March. A second two-year rotation starts with potatoes planted in February followed by cowpeas or an annual grass for forage. Winter cabbage is transplanted to the field in November or January. Corn is planted after the cabbage is harvested in May or June. Cowpeas are planted between the rows of corn at the last working. The cornstalks remain standing in the field until late fall when the grain is harvested and they and the pea-vines are worked into the ground to supply organic matter.

Since earliness, productiveness, and resistance to disease are the main requisites for truck-farm potatoes, the varieties that meet the requirements are limited. In the South Atlantic and Gulf states, Bliss Triumph is the leading variety, while in the Carolinas and Virginia, Irish Cobbler is the favorite; but in the upper Mississippi Valley, Early Ohio undoubtedly is the lead.

Seed grown in Maine, Michigan, Wisconsin, or other northern states will produce potatoes of marketable size five to ten days earlier than locally grown seed. Consequently truck-farmers who wish to cater to the early market depend upon the northern tier of states for their seed-supply; but those who wish to sell on the midseason market are now largely using locally grown seed. Plants from northern-grown seed suffer more severely from certain diseases than do those from local seed, hence the extreme earliness of the crop from the northern seed is, to a marked degree, compensated for by the healthier vines and larger yield from local seed.

The seed-stock to be used in producing the home or locally grown seed is obtained from the North in the winter or early spring, and held in cold storage until July or August, when it is planted. The tubers are harvested after the vines are killed by frost in October or November, and are placed in farm storage until needed for planting.
The land should be broken with a turn-plow a month or six weeks in advance of planting the potatoes, if the preceding crop in the rotation will admit. It is best to apply the stable-manure to some preceding crop in order that it may be well decayed before the tubers are planted. After the ground is thoroughly harrowed, the rows should be marked out about 3 feet apart. If drainage is not good it is well to open the furrow with a small turn-plow in order to expose a large surface to the action of the sun, air, and frost. A few days before planting, the furrows should be reopened, the fertilizer required distributed in them. It should be thoroughly mixed with the soil to prevent its coming in direct contact with the seed-tubers when they are planted.

In forcing potatoes, especially in the cooler season of the year, it is customary to use from 1,500 pounds to 2,000 pounds of fertilizer analyzing 6 to 6 per cent nitrogen, 6 to 7 per cent phosphoric acid, and 6 per cent potash, to the acre. The potatoes will not use all of this, but that remaining after they are harvested is available for subsequent crops. About one-third of the nitrogen in the fertilizer should be obtained from nitrate of soda, and the other two-thirds from high-grade tankage, blood, and fish-scrap. By using nitrogen from the sources mentioned, the plants are enabled to obtain a constant supply throughout their growing-season. The phosphoric acid is obtained from acidulated South Carolina rock, and the potash, preferably, from sulfate of potash. Some growers apply about 1,000 pounds of the fertilizer in the rows before the tubers are planted and the balance as a side or top dressing when the plants are well started.

Whether the potatoes are to be planted by hand or a power planter, it is better to apply the fertilizer before planting, as much better distribution may thus be obtained. The larger number of truck-farmers follow the practice of hand planting, but the larger growers are now using horse-power machines. From three to five barrels of northern-grown seed and from two to three barrels of home-grown seed are usually required to plant an acre. The seed-pieces are placed 14 to 16 inches apart in the rows and are usually placed from 2 to 4 inches below the surface-level of the ground. The hand-planted tubers are covered by turning two furrows over them with a small turn-plow, thus forming a ridge 8 or 9 inches high above the tubers. If the discs of the power planter do not form such ridges, it is customary to add additional soil with the plow. These high ridges protect the seed-tubers against unfavorable weather conditions and enables them to develop strong roots before the sprouts appear above the ground, thus insuring rapid development when the season opens.

As soon as the tubers have formed sprouts an inch or two long, a light harrow is dragged diagonally across the ridges to kill any weeds that may be starting, and to provide a mulch over the row. A second dragging is given a week or ten days later, or just before the sprouts appear above the surface. The first working is given as soon as the plants have the row well outlined; subsequent cultivations are given at intervals of a week or ten days, a small quantity of soil being worked against the plants, thus forming low ridges at the later cultivations. If proper attention is given to the early cultivation, little or no hoe work need be expected.

The season for harvesting depends more upon market conditions than upon the maturity of the crop. If prices are high, digging may be started when the yield will not be over thirty or forty barrels to the acre, but if prices are moderate with indications for a steady demand, harvesting may be delayed for two or three weeks. In the meantime the yield will have increased from 25 to 50 per cent.

The crop is usually turned out of the ground with a plow while the vines are still green. The vines are then pulled out of the ground with most of the tubers attached. These are carefully pulled from the roots, and the others picked out of the loose soil and placed into piles on the ground. They are then graded by hand and packed in barrels for shipment. Great care is used in handling the new potatoes to prevent unnecessary bruising.

Mechanical diggers have not given satisfaction in the trucking region of the South, primarily because they bruise and break the skin, thus causing the tubers to present discolorations when placed on the market.

T. C. JOHNSON.
**POTENTILLA**

soil. *P. tridentata* is an attractive evergreen species forming thick mats. It does well in any fairly rich soil in open or partially shaded positions. Potentillas are propagated by division or seed, the hybrids only by division. *P. fruticosa* may be increased by greenwood cuttings. (F. W. Barclay.)

Hybrid potentillas (Fig. 3157) have nearly all the good qualities in a border plant,—handsome foliage and free-blooming habit. They continue in bloom from spring until autumn, although most profusely in June and July. They cannot be said to be reliably hardy in the latitude of Boston, probably not above Washington. They do not grow over 2 feet and seldom need staking. A heavy soil suits them best. Choice varieties are propagated by division of the rootstock in spring; cuttings will not root. They run mostly in shades of maroon, scarlet, and orange, often beautifully banded with yellow. They bear seed freely, and when carefully hybridized one may get a very fine strain with a good proportion of double blooms. Seedlings bloom the second year. Some of the species make neat rock-plants, especially *P. cinerea*.

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**ARTIFICIAL KEY TO THE SPECIES.**

A. St. distinctly shrubby, diffusely branched. 1. *fruticosa*

AA. St. herbaceous or merely suffrutescent.

a. Basis low, plain, 6-7-foliolate. 2. *alba*

b. Basis low, plain, 6-7-foliolate. 3. *alba*

c. Lvs. white-tomentose, at least beneath. 4. *alba*

d. Lvs. cymose. Lfts. whitened both sides. 5. *albicans*

e. Basal lvs. palmately 5-7-foliolate. 6. *alpica*

f. Lfts. lateral, solitary at the nodal: Lfts. usually green above. 7. *Hippiana*

g. Carpels dorsally furrowed: peduncles and sts. pilose: tomentum lustrous. 8. *Anserina*


c. Lvs. green both sides. 10. *Rubra*.

d. Lvs. white, rose, or dark purple; infl. more or less lax, diffusely cymose; petals exceeding the sepals. 11. *Arguta*.

e. Lfts. round-elliptic or rhombic-ovate; carpels glabrous, smooth or rugulose: infl. glandular. 12. *Gordonii*.

f. Lfts. oblong or ovate-oblong or oblong-lanceolate: infl. not glandular. 13. *Thurberi*.


cc. Lvs. purple or rose. 16. *Thurberi*.

d. Lvs. and sts. velutine with yellowish hairs; lvs. almost tomentose beneath. 17. *Hematochrous*.

dd. Lvs. and sts. not yellowish hairy; lvs. green both sides. 18. *Gordonii*.


ff. Lfts. minute, 1/16 in. long, dissected: petals shorter than the sepals. 20. *Villosa*.


BB. Lvs. palmately 5-7-foliolate. 23. *Bipinnata*.

c. Lvs. white: lvs. white-silky or glaucous beneath. 24. *albicans*.

d. Lvs. white-woody or white stipitate-glandular, at least beneath. 25. *Gordonii*.


ff. Carpels without stolons; sts. much exceeding the lvs., without the above hairs. 27. *arguta*.

ff. St. 6-16 in. high: lvs. 7-9 lines broad. 28. *arguta*.

g. Stipules of basal lvs. broadly ovate or ovate-lanceolate; stolons scarcely elongated, clothed with dead stipules. 29. *alpestris*.

HH. Stipules of basal lvs. linear, elongated; stolons much elongated, rooting, not clothed with dead stipules. 30. *Anserina*.

CC. Lvs. purple or rose. 31. *alveareous*.

d. Lvs. and sts. velutine with yellowish hairs; lvs. almost tomentose beneath. 32. *hematochrous*.

dd. Lvs. and sts. not yellowish hairy; lvs. green both sides. 33. *salesoviana*.

e. Lfts. 5: petals clear purple with dark veins and dark spot at base: basis dorsally rounded: glandular. 34. *Nepalensis*.

ff. Lfts. minute, 1/16 in. long, plants low. 35. *alpestris*.

eas. Lfts. large, obovate, showy. 36. *Thurberi*.

bb. Lvs. palmately 5-7-foliolate. 37. *Bipinnata*.

c. Lvs. white: lvs. white-silky or glaucous beneath. 38. *albicans*.

d. Lvs. white-woody or white stipitate-glandular, at least beneath. 39. *Gordonii*.

e. Carpels with abundant rooting stolons; sts. scarcely exceeding the basal lvs.; pilose with long horizontal yellowish hairs: lvs. tomentose. 40. *Cinerea*.

ff. Carpels without stolons; sts. much exceeding the lvs., without the above hairs. 41. *arguta*.

ff. St. 6-16 in. high: lvs. 7-9 lines broad. 42. *arguta*.
POTENTILLA

Section I. TRICHOCARPÆ. Carpels completely or in part pilose (except *P. palustris*): receptacle long- and dense-pilose.

Subsection A. RHopalostylE. Style clavate.

1. fruticosa, Linn. St. shrubby, much branched, and often pubescent; leaves narrowly lanceolate or serrate, glabrous above, and silky beneath; vibes. 3-7, 6-12 lines long, oblong-linear, acute, silky, with revolute margins; flowers numerous, bright yellow, showy, 8-16 lines long; receptacle, carps, and disk all long-hairy; style subterminal, slender, not dilated. June-Aug. Boggy or dry, calcareous soil, Eu., Asia, N. Amer. J.H. III. 31:602.

—A useful shrub, flowering throughout the summer. Var. subvirginiana, Bean, is similar but has yellow flowers. China, and cult. Var. dahurica, Lehmann, is white-flowered. B.C. 10:914 (as *P. glabra*).

2. Salesoviana, Steph. Sts. 12-24 in. high, woody at base, laxly cymose above, and silky villous: vibes. broadly scarious, fuscous; basal lvs. pinnate; lfts. 7-9, rarely 5, lower much smaller, all short-petiolate, oblong or cuneate-oblong, coarsely and sharply serrate, thick or coriaceous, green and glabrous above, pale appressed pilose below, often furfuraceous and cuneate; vibes. 1 1/2 in. broad; sepals purple outside, yellowish within, twice as long as the appendages; petals broadly obcordate, emarginate, twice as long as the sepals, white; carpels pilose; style subterminal, filiform or slightly swollen at the middle. June-Aug. Asia. B.M. 8837.

—A beautiful and striking plant of dry stony places.

Subsection B. NEMATOSTYLE. Style filiform.

Series A. SuFFRUTICULOSÆ. Suffruticosæ: fl.-bearing sts. terminal on the determinate plants axis.

2. Salesoviana, Steph. Sts. 12-24 in. high, woody at base, laxly cymose above, and silky villous: vibes. broadly scarious, fuscous; basal lvs. pinnate; lfts. 7-9, rarely 5, lower much smaller, all short-petiolate, oblong or cuneate-oblong, coarsely and sharply serrate, thick or coriaceous, green and glabrous above, pale appressed pilose below, often furfuraceous and cuneate; vibes. 1 1/2 in. broad; sepals purple outside, yellowish within, twice as long as the appendages; petals broadly obovate, entire, about equaling the sepals, lilac or white; filaments and anthers purple; carpels pilose; style subterminal, slender, not dilated. June-Aug. S. Eu.

3. palustris, Scop. (Comarum palustre, Linn.). Suffruticosæ: stolons long, creeping and branched: aerial sts. ascending,ual, in to 2 ft. long, glabrous, laxly cymose above and more or less pilose; vibes. pinnate, long-petiolated; lfts. 2-3 pairs, contiguous, thick, not veiny, sessile, oblong-lanceolate, 1-3 in. long, evenly and sharply serrate, green above, glaucous beneath, often pubescent, rarely silky; lfts. few; sepals dark purplish, large; petals small, ovate-lanceolate, acuminate, pale purple, often villous or ciliate, shorter than the sepals; receptacle spongy; carpels glabrous; style slender, filiform. June-Aug. Very wet marshes, Arctic, and temperate Asia. A most striking species for aquatic gardens. See *Comarum*.

4. tridentata, Soland. Caudex thick, branched: st. erect, 20 in. high or more, few-lvd., dichotomously branched and laxly corymbose above, glaucous-hairy and hispate: basal lvs. long-petiolate, pinnate; lfts. 2-4 pairs, decreasing downward, distant, round-elliptic or rhombic-ovate, lateral sessile, terminal sessile or

5. ambiguus, Camb. St. slender, subepent or ascending, tufted and branched, woody below: vibes. ter-
stalked, margin irregularly biserate, pilose and green on both faces, often glandular: fls. ½–1 in. broad, long-pedicelled; appendages much shorter and narrower than the sepals, often bi- or trifid; petals obovate, entire, equaling or much exceeding the sepals, white; carpels smooth or rugulose; style slender, glandular-thickened in the middle. May–July. Eu., Asia, and mountains of W. N. Amer.—Grows well in dry soil.

11. arguta, Pursh. Similar to P. rupestris, but with a more strict habit, more glandular-hirsute pubescence, more congested inf., and smaller cream-colored petals which scarcely exceed or are shorter than the sepals; calyx enlarging more in fr., and receptacle becoming elongated, much swollen and almost fleshy. June–Aug. N. Amer.—Good for dry rocky soil.

12. glandulosa, Lindl. Similar to P. rupestris and P. arguta: differs from the former in its golden yellow or pale yellow fls., and from the latter both in the color of the fls., and in the dichotomous and laxly cymose inflorescence. June–Aug. W. N. Amer.—Grows well in dry sterile ground.

Subsection II. CONOSTYKON. Style subterminal, conical.

Series 1. ERIONOTRICHÉ. Plant with some true tomentum.

13. Hippiana, Læhn. St. erect, 1–2 ft. high, silky, lady-cyme above: basal lvs. rather large, pinnate; lfts. 3–5 pairs, whitish-silky above, white-tomentose beneath, uppermost somewhat confluent, the others decreasing regularly toward base of fls., obovate-cuneate, 1–2½ in. long, obtusely incised-toothed: fls. ½–1 in. broad; appendages nearly equaling the calyx, acute; petals obovate, recurved, slightly exceeding the sepals, bright yellow; carpels glabrous, rugose; style papillose-thickened at base, tapering above to the enlarged stigma. June, July. W. N. Amer.

14. gracilis, Douglas. Erect and rather tall, about 2 ft. high, more or less white-hairy, erect-branched and cymose-paniculate above: basal lvs. long-pedicelled, digitate; lfts. 5–7, obovate or obovate-lanceolate, 1–2 in. long, deeply and regularly incised-dentate, sparsely pilose or glabrous and green above, white-tomentose beneath: fls. 6–9 lines broad, showy; petals obcordate, exceeding the acuminate sepals, yellow; carpels glabrous and smooth; style subterminal, slender, thickened at the base. June–Aug. W. N. Amer.

15. nepalensis, Hook. (P. formosa, Don. P. Tonguei, Hort.). St. stout, erect or ascending, 1–2½ ft. high, purplish: the branches laxly paniculate or raceme-like, hissute, trichomes white: lvs. long-pedicelled, usually 5–foliolate, often 12 in. long; lfts. obovate-oblong, 2–3 in. long, veiny and rugose, crenate-serrate except toward the base, with broad and short subacute teeth, green both sides, sparsely appressed-pilose: lfts. long-pedicelled, showy, 9–12 lines broad; calyx purple within; petals broadly obcordate, deeply emarginate, nearly twice the length of the sepals, clear purple with darker veins and dark-purple base; carpels glabrous, rugulose; style subterminal, thickened at the base, tapering above. July, Aug. Himalayas.—The branches elongate zigzag-like during the summer. A fine species.

16. Thürberi, Gray. Similar to P. nepalensis, but finely glandular-hairy all over: lvs. mostly 7-foliolate; petals dark purple and scarcely exceeding the sepals; inf. inf. more cymose. June–Aug. New Mex. and S. Calif.—Good for border planting.

17. hematocurus, Læhm. St. stout, ascending, 8–16 in. high, densely cymose above, pubescent or canescent with yellowish hairs: basal lvs. with long and stout pedicles, palmately 7– rarely 5-foliolate; lfts. oblong-obovate, obtuse, thick, elevated-veiny beneath, crenate-serrate with small teeth, velvety above with yellowish subapressed hairs, more or less densely white-tomentose below: fls. on thick pedicels, 9–10 lines broad; sepals purple within; petals broadly obcordate, longer than the sepals, dark purple; carpels glabrous, smooth; style subterminal, red, much thickened at the base. June–Aug. Mountains of Mex.—This is the yellow-pubescent cultivar, stem and leaves yellow, stamens dark purple.

18. argyrophylla, Wall. (P. nudicaulis, Royle). Sts. erect, 8–16 in. high, nearly simple, leafy, cymosely few-fl., above puberulent and whitish tomentose: basal lvs. large, long-petioled, mostly ternate; lfts. subsessile, broadly obovate or elliptic-ovate or obovate-oblong, more or less rugose beneath, coarsely incised-serrate with acute teeth, more or less densely silky above, rarely subglabrate, densely white-tomentose beneath: fls. long-pedicelled, showy, 1½–1½ in. broad; petals broadly obcordate, twice the length of the sepals, yellow; carpels glabrous, smooth; style subterminal, greatly thickened at the base. June–Aug. Himalayas.—This species and the next are two of the most common species in cult., and are extensively hybridized with each other and with P. argyrophylla, giving rise to most of the hybrid potentillas of the trade. (Fig. 3157.)

19. atrosanguinea, Wall. Similar to P. argyrophylla, but larger, more branched, lvs. less heavily silky-glossy and less white-tomentose beneath, usually more bluntly toothed; petals, stamens, and styles dark purple. June–Aug. Himalayas.—Parent of many garden forms.

20. villosa, Pall. Sts. stout, ascending, 4–12 in. high, few-fl., cymosely few-fl., densely silky-villos: basal lvs. long-petioled, ternate; lfts. sessile or nearly so, thick and veiny, suborbicular-cuneate, 9–15 lines long, lateral oblique at the base, all coarsely crenate-serrate with short teeth, margin somewhat revolute, densely silky-pilose above, densely white-tomentose beneath: fls. 9–12 lines broad, showy; sepals and bracteoles equal; petals broadly obcordate, 2–3 times the length of the sepals, golden yellow; carpels glabrous, smooth or rugulose; style subterminal, conical, moderately thickened at the base. June, July. Arctic Asia and N. W. Amer.—Showy, with beautiful fl.-rosettes.

21. argentea, Linn. Sts. several, ascending, rarely prostrate, slender, 4–20 in. long, laxly paniculate or corymbose above, white-tomentose: basal lvs. long-pedicelled, palmately 5– rarely 7-foliolate; lfts. broadly cuneate-obovate, 4–14 lines long, coarsely and regularly incised-dentate with 2–5 pairs of teeth, margins revolute, from green and glabrous to densely silky or tomentose above, densely white-tomentose below; inf. very rarely tomentose and green beneath; fls. long-pedicelled, 5–7 lines broad; petals obovate, emarginate, scarcely exceeding the sepals, sulfur-yellow; carpels glabrous, rugulose; style subterminal, conical, papillose-thickened at the base. June–Aug. or Oct. Eur. and Asia, intro. in N. Amer.—Good for dry, sterile soil. Var. calabra, Sir. (P. calabra, Ten.). Lfts. dilated-flan-shaped, incised on outer edge, whitened on both sides: plant low; st. stout, declined, condensed-cymose; fls. relatively large. Italy.

Series B. ORTHOTRICHÉ. Plant with no true tomentum; pilose and often glabrous.

22. récta, Linn. Sts. stout, erect, strict, 12–28 in. high, leafy, dichotomously much branched and widely corymbose above, hissute or pilose and pubescent, and more or less glandular: basal lvs. large, long-petioled, palmately 5–7-foliolate; lfts. 2–4 in. or more long, the outer smaller, all usually sessile, oblong-obovate, regularly and coarsely serrate-dentate, green both sides, villous and rugose, thin: fls. 8–12 lines broad; petals obcordate, deeply emarginate, equating or somewhat exceeding the sepals, yellow to golden yellow; carpels glabrous, rugulose; style subterminal, much swollen at the base. June, July. Eu.—Very handsome and showy. Var. sulphurea, Lam. Petals sulfur-yellow, much exceeding the sepals: st. and lvs. lighter
green. Widespread in Eu. Intro. as a weed in E. N. Amer.

23. laciniata, Waldst. & Kit. (P. laciniata, Amer. Hort.). St. stout, erect, forming clumps. 12-20 in. high, mostly reddish; laxly corymbose above, long-pedicled, with soft spreading hairs: basal lvs. palmately 7-foliolate, rarely 5-foliolate; lfts. green and pilose on both surfaces, not rugose, the terminal twisted, all oblong-oblanceolate-oblong, 2-4 in. long, lanceate-pinnatifid, with 6-12 pairs of lanceolate or linear and incised teeth; fls. and general habit as in P. recta, to which it is closely related.

S. Eu.

24. grandiflora, Linn. Sts. ascending or erect, from a thick caudex, 4-15 in. high, the erect branches of the cyme few-fl., densely villous above, eglandular: basal lvs. long-petioled, mostly ternate; lfts. 7-15 lines long, lateral obliquely obovate, terminal cuneate-obovate, all incised-serrate toward the apex with 6-10 ovate or oblong acutish teeth, pubescent above, densely short-pilose beneath;ثار fls. subterminal, flattened; fls. and cauline lvs. slender-petioled, palmately 5-foliolate; lfts. small, sessile, cuneate-obovate or cuneate-oblong-obovate, 4-6 lines long, the outer smaller, all entire below, denticate toward apex with 5-7 pairs of short acutish or obtuse teeth, green and subglabrous above, densely pilose and suberose beneath: lfts. 1 in. broad; petals large, broadly obovate, emarginate, much longer than the sepals, golden yellow; carpels glabrous, striate-rugose; style thickened at the base. July, Aug. Alp.-A good border plant.

25. pyrenica, Ram. St. stout, arcuate-ascending from a thick subcespitose caudex, 4-10 in. long, racemously few-fl-d. above, pilose or somewhat canescent: basal lvs. both short- and long-petioled, palmately 5-foliolate; lfts. small, sessile, cuneate-obovate or cuneate-oblong-oblanceolate, 4-6 lines long, the outer smaller, all entire below, denticate toward apex with 5-7 pairs of short acutish or obtuse teeth, green and subglabrous above, densely pilose and suberose beneath: lfts. 1 in. broad; petals large, broadly obovate, emarginate, much longer than the sepals, golden yellow; carpels glabrous, striate-rugose; style thickened below. July, Aug. Pyrenees.-Closely related to P. grandiflora.

Subsection C. GOMPHOSTYLE. Style subterminal, rarely lateral, clavate: plant with no true tomentum.

26. dubia, Zimm. Cespitose, forming mats, runners with ascending, prostrate or ascending, ½-2 in. long, scarcely as long as the lvs., 1-fl., rarely 2-3-fl.; lfts. pilose, eglandular: basal lvs. short-petioled, ternate; lfts. small, 4-5 lines long, broad, the outer strongly oblique, the terminal slightly petioled, all with 2-3 pairs of ovate, acute, or obtuse teeth, light green and glabrous above, stiprose on the veins beneath: fls. small, 3-6 lines broad; appendages broad, obtuse or rounded; petals broadly obovate, slightly emarginate, exceeding the sepals, yellow; carpels glabrous, smooth or rugose; style somewhat thickened below. July, Aug. Mountains of Eu. G. 36:1483.-The smallest of European potentillas.

27. alpstris, Hall. f. Caudex densely clothed with stipules; runners almost wanting; st. slender, arcuate-ascending, rarely strigose, prostrate or ascending, ½-2½ in. long, scarcely as long as the lvs., 1-fl., rarely 2-3-fl.; lfts. pilose, eglandular: basal lvs. short-petioled, ternate; lfts. small, 4-5 lines long, broad, the outer strongly oblique, the terminal slightly petioled, all with 2-3 pairs of ovate, acute, or obtuse teeth, light green and glabrous above, stiprose on the veins beneath: fls. small, 3-6 lines broad; appendages broad, obtuse or rounded; petals broadly obovate, slightly emarginate, exceeding the sepals, yellow; carpels glabrous, smooth or rugose; style somewhat thickened below. July, Aug. Mountains of Eu. G. 36:1483.-The smallest of European potentillas.

31. Anserina, Linn. Caused emitting runners, forming a thick turf: st. numerous, decumbent or ascending, 2-6 (rarely 12) in. long, dichotomously branched and laxly corymbose, pilose, rarely glandular, usually reddish; basal lvs. long-petioled, palmately 5-foliolate, rarely 7-foliolate; lfts. sessile or nearly so, cuneate-obovate, ½-1½ in. long, toward the apex crenate-serrate to deeply incised-serrate, sparsely pilose and green above, green and pilose beneath; fls. long-slimper-pedicelled; appendages oblong, obtuse; petals obovate to broadly obovate, emarginate, longer than the sepals, golden yellow, rarely paler; carpels glabrous, rugose; style subterminal, clavate. March-May, often also Aug., Sept. Eu.-Very variable. Dry or stony soil. For banks and rockeries.

29. cinerea, Chaix. Forming mats: st. slender, ascending, 2-4 in. high, scarcely exceeding the basal lvs., few-fl.; basal lvs. palmately 5-foliolate, rarely 3-4-foliolate; lfts. narrowly cuneate-oblong-obovate or nearly oblong, rounded at apex, short-crenate-dentate, thick, rugose, sparingly stellate-tomentose above, densely so beneath, long-hirsute on both faces; appendages dilated and often bifid, scarcely shorter than the ovate, obtuse sepals; petals obovate-oblong, pale yellow, much exceeding the sepals; carpels glabrous, rugose; style subterminal, clavate. April-June. Alps.

3158. Potentilla Anserina, showing a plant in early summer before the runners start. Later the flowers are borne on the runners.
P. nepalensis, P. splendens.

- Po purpurea,
- P. amama, P. caucasicum, P. concolor, P. lanulosa, P. minima,
- O'Briana, Wolf).-Mars, Mac Nabana
- P. hybrida,
- Eldorado, cardwale
- Hopwood, ana

5-6: petals at base deep rose, at center pale rose, margins whitish.

status of which has not been worked out and which have not been

Vesuve, brilliant

potentilla.

pine W. U. S.-Forms dense mats in dry soil. This spe­

receptacle.

is, however, known in the trade as a

Following are some of the hybrid potentillas, the exact botanical

name applied to various hybrids. B.R. 1890, p. 335.

Gordonii, Baill. (Ivesia Gordonii, Torr. & Gray.

H. Gordonii, Hook.). Caudex stout, woody, and compo­

ste. erect, 4-12 in. high, and, like the lvs., glandular-pubescent or glabrous: lvs. pinate, mostly

basal, numerous; lfts. 10-20, divided into 3-6 oblong or linear segms.; cauline lvs. very small: fis. small and

inconspicuous, in a crowded cyme; petals yellow, spatulate, shorter than the sepals; stamens 5-20,

inserted on the edge of the cup-shaped receptacle at a distance from the carpels; style filiform, basal. Subal­

spatulate, shorter than the sepals; stamens 5-20, inserted on the edge of the cup-shaped receptacle at a distance from the carpels; style filiform, basal. Subal­

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Horkelia Gordonii,

Torr.

Sanguisorba.

POTHOS

L. H. B.

POTHOS (Potha is said to be a Ceylonese name).

Aroids. Tall-climbing branching shrubs (more or less herbaceous as known in cultivation) of the oriental
tropics.

Leaves thick and often shining, entire or lobed, sometimes blotched or variegated: fis. small and per­

fect, crowded on a spadix, with 6 perianth-segms. and 6 stamens, the ovary 3-loculed and with a rounded or

mushroom-like sessile stigma: fr. a 1-3-seeded berry:

spathe usually persistent and wide-spreading or deflexed

at maturity. Rhaphidophora has an oblong or linear

spike staminate, the upper pistillate, the stamens

many and hanging, the styles 2, the fr. somewhat

fleshy, colored, and inclosed in the calyx, the lvs.

POTERIUM (Greek for drinking cup; because the foliage of one species was used in the preparation of a medicinal drink).

Rosaceae. Linnaeus placed certain

rosaceous plants in the genera Poterium and San­
guisorba, the latter having precedence of publication. Many subsequent authors have united these genera.

Focke, however (Engler & Prantl, Die Natürlichen

Pflanzenfamilien), re-defines the genus Poterium to

include one species, the P. spinosum of S. Eu., allowing

the other species to remain in Sanguisorba. As thus

understood, Poterium is monoeious, the lower fis. in

the spike staminate, the upper pistillate, the stamens

many and hanging, the styles 2, the fr. somewhat

fleshy, colored, and inclosed in the calyx, the lvs.

These plants are known as burnet, although

the name applies more correctly to Sanguisorba alone.

P. spinosum, Linn., is a small spiny shrub with nearly

glabrous serrate lfts., somewhat downy branches, small greenish fis. in oblong spikes and reddish berry-like fr.

It is offered in S. Calif. Grows 3 ft., the branchlets ending in spines. Said to be a very interesting orna­
mamental undershrub. Recently P. obtusum, Franch. & Sav. (P. obtusum, Hort. Sanguisorba obtusa, Maxim.),

has been offered abroad: it is from Japan, said to be the

beautifulllest of the burnets yet introduced: 3 ft., lvs. long, pinate, lfts. about 6 pairs, oblong, rounded at end, ser­

rate, petioluled: frs. much branched, the crimson

pinnate. Several species are offered in S. Amer. lvs.

about 3 in. long and 1 in. diam. Summer. G.C. III.

50:2.-For P. canadensis and P. Sanguisorba see

Sanguisorba.

K. M. Wiegand.

Following are some of the hybrid potentillas, the exact botanical

status of which has not been worked out and which have not been

standardized as to nomenclature: P. bicolor (P. argyrophylla x P. atrata; according to Wolf), brilliant carmine.

(P. argyrophylla x P. atrosanguinea, according to

Potsos aureus of the horticulturists. A. Piton, a very gray, with a deep green margin and a deep green

band along the midrib; needs further definition. Borneo.

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50:2.-For P. canadensis and P. Sanguisorba see

Sanguisorba.

L. H. B.
more an experienced practical potter, to perfect and
pot machine.

Different forms of this wheel, but it had always been
of three to one, it was thought that perfection had been
reached. Much time, though very little money, had
been spent previous to the fifties in attempts to make a
wheel, propelled by the foot, or hand- or foot-power. When, in the early
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fifties, a wheel was made to be propelled by hand- or foot-power. When, in the early
fifties, a wheel was made to be propagated by machine. These discs, or jigger-heads, are
made of different sizes and fitted with various rings. Plaster molds are made in very large numbers for each
size of pot, and the larger standard pots (6- to 12-inch)
are all made at the present time in these molds. The
old methods have now passed.

The making of the pot is not its only cost; previous
to that comes the preparation of the clay. The hundred
years from 1785 to 1885 saw no improvement in the pro­
cess of preparing it for use. It was ground in a wooden
tank or tub, propelled by an ox. The various other
processes remained as crude in 1885 as they had been
the century previous: the drying, firing, and all con­
nected with the manufacture. The capacity of our
flower-pot drying-rooms of today far exceeds the
entire product of any one year prior to 1885. At that
time the custom of using wood for drying and firing pots
still continued. It required three cords of white pine and
from thirty to forty hours' labor thoroughly to fire a
small furnace. Today three tons of bituminous coal will
fire five times as much pottery in fifteen hours.

Grades of clay used in the manufacture of flower-pots
are almost as numerous as the banks in which they
are found, and require many different methods of treat­
ment. To separate the stones from the clay has always
been a very perplexing as well as expensive problem.
The clay is first plowed by means of a horse and cap­
stan, whereby one horse will do the work of twenty
men with picks. This clay is then loaded in dump­
carts and carried to the mill, where it is shoveled
through a disintegrator, which expels the larger stones
and crushes the smaller ones. It then falls on an end­
less belt and is carried to a revolving drier. This is a
western device, with which, by the use of crude petro­
leum for heat, from 20 to 25 per cent of moisture is
evaporated from the clay, and while it passes through
a direct blaze of white heat there is sufficient moisture
all the time to prevent it from burning. (Burning of the
The operation of potting as practised in commercial florists’ establishments is as follows: The soil having been prepared, the workman places the empty pots at his left hand, the cuttings in front of him, and an empty "flat" to receive the potted plants at his right. With a simultaneous movement he takes an empty pot in his left hand and a handful of soil in his right. He "sets" the pot in front of him, fills it with soil, and while doing so reaches for the cutting, retaining a small portion of soil in his hand. With the index finger of the right hand he makes a hole in the pot large enough to receive the cutting. As he puts the cutting into the pot, he plucks to the cutting the portion of soil which he retained in his right hand into the hole, takes a hold of the index and middle fingers of both hands to steady it and obtain leverage, places the thumb of each side of the cutting, and while doing so, repeats the movements. It is marvelous how rapidly these motions are made by expert workmen, and the work can be done as well by a single hand as by two. When the cuttings are in the proper condition as to root-development already described. There was a time when 5,000 a day of ten hours was considered the maximum, and it is still good work for the average worker. James Markey, an employee of the late Peter Henckel, succeeded in potting 7,500 in ten hours. Upon one occasion he potted 11,500 verbena cuttings in a day of fourteen hours, which is the highest number ever reached. At a potting contest held in Madison Square Garden in New York city in 1892, George Martin potted 1,373 cuttings in one hour, the material used being arborvitae cuttings without roots. The "standard" pots (Fig. 3160) cannot be handled so rapidly as those without rims, for the reason that the lower edges of the rim are sharp and rough and make the fingers of the workmen sore. Consequently the pots without rims are to be preferred.

The essentials in good potting are to put the cutting in the center of the pot and at the proper depth, to firm the soil thoroughly and evenly, and to leave ½ inch, or a little less, between the top of the pot and the upper edge of the pot to receive water.

Included in potting is the care of the plants immediately after being potted and until they have taken root in the pots. First in importance is the "setting" of the plants on the bench; care should be taken that they are "set" perfectly level so that they will hold water. They should be watered thoroughly and shaded as soon as they are set. The best method of shading when large quantities are potted is by the use of lath shutters. These are made by nailing common laths on three parallel pieces of furring strip, allowing 1 inch space between the laths. They may be made any length, 3 feet being a very convenient size. Inverted pots of a sufficient height to clear the top, young plants make very handy supports for these shutters. During late spring and summer it will be necessary to supplement this method of shading by covering the shutters with paper or muslin, the muslin being preferred. Sew the muslin in 10-yard lengths, giving pieces 2 yards wide. Sprinkle the muslin copiously at intervals as it becomes dry. These must be kept up for three or six days according to conditions; the shutters should be put over the plants early in the morning, first watering the plants; an hour or so later.
the muslin should be put on, provided the sun is shining brightly. After the second day the period for covering the plants should be shortened by putting shutters and muslin on later and taking them off earlier until the plants are sufficiently established to get along without them. An important detail is to have about \( \frac{2}{3} \) inch of sand on the bench to retain moisture and allow for the proper “setting” of the plants. Another very important detail, in case new pots are used, is thoroughly to saturate them with water before filling; allowing sufficient time for the water to evaporate from the surface before using. It is bad practice to work with wet pots, and worse still with wet soil. A good test of the proper amount of moisture in soil for potting is when it molds in the hand only under strong pressure. Another essential, in case old pots are used, is to see that they are clean inside at all events; they should be clean outside as well, but if any old soil is found adhering to the inside of the pot it should be cleaned out and thrown away.

Potting large plants from the open ground, such as carnations, roses, geraniums, and shrubs, is an entirely different operation from the foregoing. These all require pots 5 inches in diameter and over, and sufficient pressure cannot be given with the thumbs properly to firm the soil. It is necessary, therefore, to use a stick about an inch wide and flattened on the end for herein lies the great essential in successfUl plant-growing. Potting orchids in baskets, which sounds paradoxical, is identical with potting them in pots as far as the essential details of manipulation are concerned. The potting of bulbs is discussed under Bulb.

“Shifting” is the technical term used in the florist’s trade when plants are transferred to larger pots. (See Fig. 3165.) When the plant exhausts the soil in the small pot it must be put in a larger one to maintain growth. The trained eye detects at a glance by the white color of healthy “work­ing” roots, then the plant must be at once shifted, or it will soon reach that stage which is the bane of the careless plant-grower, viz., “pot-bound.”

“Knocking out” is the technical term used by florists to describe the turning of a plant out of a pot. The best way to do this is to take the pot in the right hand, invert it in passing it to the left, as the plant should be placed between the index and middle fingers of the left hand, give the pot a smart tap on its rim on the edge of the bench and the ball of soil is separated from the roots; place the plant in a flint ready for the purpose, and repeat. One tap is all that is necessary in ninety-nine cases out of a hundred. It is bad practice to get into the habit of giving a series of taps, as it makes slow work. We are considering now the first shift, i.e., from a 2-inch to a 3-inch pot.

The plants having been knocked out, the next opera­tion is to “shoulder” them. This consists of removing
the shoulder or edge of the ball of soil with the thumb and forefinger down to where the roots begin. (Fig. 3107.)

The object of this is obvious, to remove leached-out soil and supply a fresh, nutritious portion in its place, so as to get the greatest possible advantage from shifting.

Everything being made ready, the operator proceeds by putting a portion of soil in the bottom of the pot, sufficiently to raise the ball of soil flush with the edge of the pot. As this is being done, reach for the plant with the left hand and put it in the center of the pot; simultaneously take a handful of soil in the right hand and fill the pot, then grasp the pot between the index and middle fingers of each hand, place the thumbs on each side of the plant at right angles with the body, lift the pot about \( \frac{3}{4} \) inch and set it back on the bench with a smart rap, pressing with the thumbs at the same time; change the thumbs to right angles with their former positions, then press again, then change so as to press where they have not touched already; three pressures of the thumbs and the rap on the bench, and the operation is done. A smart operator with two boys will shift 5,000 plants in ten hours.

The amount of work is made possible only by eliminating all unnecessary motions and making them synchronous with each hand in reaching for soil, pot, and plant as described. One hand should not be idle while the other is employed. See Figs. 3108-3172 for good and bad examples of potting.

Be careful in shifting not to set the plants too deep. The tendency of roots is downward, and only enough of the stem to steady the plant in the pot should be in the soil. Plants set too deeply in the pots are easily overwatered, because so much soil is not within the influence of root-action. A few plants which root from the crown, like lilies, should be set deeper than such plants as roses, geraniums, fuchsias, palms, and all plants whose root-action is mainly downward. Do not give too great a shift at one time; that is, do not attempt to shift from a 2-inch pot to a 5- or 6-inch pot, 2 inches or so for all sizes above.

Drainage is necessary in all pots over 4 inches and for hard-wooded plants even that size is better drained. This is technically called "crocking," i.e., placing sherd in the bottom of the pot to allow the quick passage of water and admit air to the roots. Place a large piece over the hole in the bottom of the pot and the remainder in smaller pieces. There are usually enough broken pots around a place to supply the needs. Charcoal is an excellent material for supplying pot-drainage, none better. An inch or so of drainage is sufficient in a 5- or 6-inch pot, 2 inches or so for all sizes above.

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center for such plants will not be too much if stocky plants well set with good flowers are wanted; and in these days such plants will bring enough in the best markets to pay for the space and trouble. For 2- and 3-inch pots use sifted soil, but for 4-inch and over, soil well broken, but having plenty of fiber from sod in it, should be used. Always water plants thoroughly after shifting so as to soak the soil to the bottom, and do not water again until they show dryness half way down the pot on the outside. PATRICK O’MARA.

POTTING

POURETÉA: Photinia.

POUTERIA (native name). Sapódácœ. Trees or shrubs, often pubescent, flowers in clusters: corolla with 4 rounded lobes and a tube about twice as long; staminodes free, petal-like, borne at the edge of the tube; stamens borne at the base or middle of the tube, becoming free; ovary swollen at the base, hairy, 2-4-celled, gradually produced into the long style: fr. a 1-4-seeded berry, hairy or glabrous, occasionally pointed.—About 30 species in Trop. Amer. P. suavis, Hemsl. Tree with rather slender flowering branches: lvs. crowded at the ends of the branches, narrow-oblong to lanceolate, about 4 in. long, coriaceous: fls. very small in flosculous borne in the axis of the fallen lvs.: fr. pear-shaped with a thin edible pericarp possessing a delicate perfume. Uruguay. Intro. into gardens abroad.

PR À T Ì A (named after Prat Bermon, with Freycinet's voyage). Campanulácœ. Slender prostrate or creeping herbs, rarely ascending or erect, sometimes grown for ornament.

Leaves alternate, toothed: inf. axillary, in 1-fld. peduncles: fls. rather small, often unisexual; calyx-tube adnate to the ovary, 5-parted; corolla oblique, split to the base at the back, 2-4-celled: ovary 2-5 lobed or subequally 4-10 lobed; stamens 4, didynamous; corolla tubular, throat hairy, limb 2-4-celled, gradually produced into the long style: fr. a 1-4-seeded berry, hairy or glabrous, occasionally pointed.—About 30 species, mostly from Austral. and New Zeal., but also in S. É. Asia and S. Amer. Several species seem to be more or less extensively cult. abroad. The genus is very closely related to Lobelia and similar cult., differing from it in the indehiscent more or less succulent fr. They are used both as greenhouse and hardy herbaceous rockwork plants, depending on the species.

angulata, Hook. (Lobâta littorâlis, Cunn.). Fig. 317b. Perennial herb, very variable, slender, creeping or prostrate, glabrous or sometimes slightly pubescent: sts. 2-12 in. long: lvs. short-petiolate, orbicular or ovate-oblong to obovate: fls. white with purple streaks: berry globose or broadly ovoid, purplish red. New Zeal. G. 54:767, G.M. 63:597, G.C. III. 47-98. J.H. Ill. 71:57.—Hardy in England and used as a creeper for rockwork. Var. arenaria, Hook.f. (P. arenariârum, Hook.f.). Lvs. larger, obscurely toothed: peduncles very short. Auckland Isls.—Well adapted for shady localities; a quick-growing creeper with many white, star-like fls.


P. ñiçófóia, Hort., listed abroad as a charming little creeping plant with evergreen foliage studded through all the summer months with large pure white fls. followed by large lilac-colored berries, and loving a damp spot, is unknown botanically.

F. TRACY HUBBARD.

PREMÁTHÉS (Greek, duming meaning drooping blossoms). Compositâ. RATTLESNÁKE ROOT. Tall perennial herb, a few species of which are offered by collectors for use in wild-gardens. Leafy-stemmed, with dull-colored heads borne in spike-like terminal panicles: lvs. alternate, lower ones petiolate, sagittate, cordate, often much divided; upper ones auriculate and much narrower and smaller: heads 5-30-fld.: achenes terete, 4-5-angled, usually striate.—About 15 species, of which 10 are native of N. Amer. (The N. American forms are by some botanists separated as Nabalus.) The species are extremely variable. They are of easy cult. in any good soil, but very weedy and of little importance horticulturally.
Young plants should be raised every season, as older plants become unsightly. The plant was formerly considerably grown, being trained to a balloon-shaped wire trellis. Needs warmth to bring out the markings.—From Lowe’s “Beautiful Leaved Plants.”


**PRICKLY ASH:** *Xantoxylum.* F. COAFREY: *Symphytum asperinum.* F. Pear: *Opatia.* F. Poppy: *Argemone.*

**Pride of India:** *Melia azedarach.*

**Primula:** *Ligustrum.*


**Primula (Primula veris,** the “first in spring,” was an old appellation of one or more of the species).

**Primulaceae.** Low plants, for the most part herbaceous, mostly spring-blooming, but a few kinds used for winter flowering, producing usually clusters of attractive flowers mostly in white, pink, and rose, but sometimes in red, blue, and yellow.

**Perennial (plant sometimes monocarpic or blooming but once),** with monopetalous salverform fls. in clusters on scapes that arise from a radical cluster of simple entire or lobed lvs.: corolla-tube usually surpassing the 5-toothed or 5-cleft calyx; corolla with 5 spreading lobes, which are commonly notched or retuse at the end and more or less narrowed at the base; stamens 5, affixed to the corolla-tube: ovary 1-loculed, with many ovules on an axile placent, and 1 undivided biform style and a capitate stigma, dehiscent by 5-10 valves: bracts of the floral involucre sometimes lf-like.: the fls. of some species are strongly dimorphic or trimorphic,—the stamens and pistils of different lengths in different fls. of the same species (Fig. 3174). See Darwin’s work, “The Different Forms of Flowers on Plants of the Same Species;” this polymorphism is in conjunction with cross-pollination. Often the herbage is covered with a loose meal or farina or powder.—Primulas are natives to the N. Temp. zone, only one being known in the cold parts of Sc. Amer., one in Java, and sparingly in Afr. They are mostly boreal or alpine plants. About a score are native to the colder parts of N. Amer. Twenty-five years ago, Pax (Monographische Übersicht über die Arten der Gattung Primula, Leipzig, 1888, and in Engler’s Bot. Jahrbücher, vol. 10,) admitted 145 species. Pax & Knuth, in Engler’s Das Pflanzenreich, hft. 22 (iv. 257), 1905, describe 208 species and many marked hybrids, and others have been recognized since that time. The number of species now known is upward of 300, with the greatest extension in China (about one-half the species), about 70-75 in the Himalayan region, and the remainder in Japan, Patagonia, but it appears not in cult. The latest horticultural treatment is by S. Mottet, Monographie du genre prêrophile, Paris, 1915; this work follows the systematic analysis of Pax & Knuth, which also is adopted herewith. The fancier of primulas must

**PRENANTHES**

**PRESTÓNIA** (named after H. Prestoe, of the Botanic Gardens at Trinidad). *Palmócea.* Slender dwarf palms with a reed-like, annulate caudex, occasionally grown in the warmhouse: lvs. long and slender-petioled, pinnatisect at the base, upper segms. narrow: fis. small, monopetalous; male fls. petaloid, with a few dark crimson veins on its foliage. The plant blooms rarely, on to Fla. and Ky. B.B. 3:289.-Little known in cult. and usually only a weed as a wild plant.

**Leaves opposite, with a few well-separated pinnate veins; cymes often densely-corymbose or almost umbel-like.**—About 30 species, natives of Trop. Amer., one in Java, and sparingly in Afr. They are mostly boreal or alpine plants. About a score are native to the colder parts of N. Amer. Twenty-five years ago, Pax (Monographische Übersicht über die Arten der Gattung Primula, Leipzig, 1888, and in Engler’s Bot. Jahrbücher, vol. 10,) admitted 145 species. Pax & Knuth, in Engler’s Das Pflanzenreich, hft. 22 (iv. 257), 1905, describe 208 species and many marked hybrids, and others have been recognized since that time. The number of species now known is upward of 300, with the greatest extension in China (about one-half the species), about 70-75 in the Himalayan region, and the remainder in Japan, N. Amer., Eu., and Eurasia. P. magellanica occurs in Patagonia, but it appears not in cult. The latest horticultural treatment is by S. Mottet, Monographie du genre prêrophile, Paris, 1915; this work follows the systematic analysis of Pax & Knuth, which also is adopted herewith. The fancier of primulas must

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also have the proceedings of the Primula Conference held in London in 1913, comprising botanical and horticultural discussions (Journ. Roy. Hort. Soc. 39). The discussion contains a full synonymy of the Chinese and other Asiatic species by Balfour and of European species by MacWilliam. For cult. and horticultural conditions for England, the reader should consult H. M. Paul, "Handbook of the Hardy Primula," 1911. For evening primrose and Mexican primrose, see *Bealsia*.

Regarding the volume of the recent literature, a comprehensive monograph is still lacking, due to the great extension of the genus by contemporary explorers. Further collecting in the Himalaya-Thibet-China region will undoubtedly discover many more forms. The numbers of new species have made it necessary to extend and to recast the sections as defined by Pax & Knuth; but these have not yet been redefined and keyed at once in a connected treatment for the entire genus, and in a compillation like the present it is necessary to spread the Paxian groups as a tentative expedient, even if species of not very close relationship are brought together; in this compilation, the purpose is not so much to show botanical affinities as to make an easy guide to the consultant to identify given species. Even so, much change is likely to take place in the definition or recognition of species in the genus, as the many forms are more closely studied. In the present account, the characteristics of the species have been drawn so far as possible from the recent working authorities. The popular names bore in the different publications, and the author cannot vouch for the authenticity of all of them. The reference R. H. S., in the citation of portraits, is to the Journal of the Royal Horticultural Society.

The data of introduction, given for some of the recent species, is the year in which they were brought into cultivation in Great Britain. The informal notes on culture, under the different species, apply mostly to Great Britain.

Primulas are cool-climate or cool-season plants, mostly spring-bloomers. Many of them grow at very high altitudes, and depend on very special conditions for their perfect development. Several cultural groups of primulas may be recognized: (1) The alpine and subalpine section affords some of the most useful plants for rock and alpine gardens. The relatively little attention given to alpine gardens in this country is the reason for the neglect of these charming spring-flowering plants. In recent years, many species have been added to these outdoor primulas and great interest has arisen in them abroad. (2) The polyanthus class, comprising fully hardy spring-flowering plants, suitable for culture under ordinary garden conditions, and always popular in this country. To the same class belong the true cowslip (*P. veris*) and the oxlip (*P. elatior*), but these are rarely seen in our gardens in their pure form. All are easily propagated by division. (3) Yellow-flowered or purple-flowered verticillate-clustered outdoor species, of the *P. imperialis* and *P. japonica* type, some of which are hardy even in the northern states with some winter protection. (4) The true greenhouse species, represented by the old *P. streptocarpa* (the true primrose), the more recent *P. ochroleuca* and the still more recent *P. malacodes*. These are Chinese species. The colors are of the cymic series. (5) The auriculas of gardens, developed from *P. Auricula*.

In Great Britain, much interest is now taken in new primulas, and very many species are more or less in cultivation, the larger part of them as fancier's subjects. Not many of them have been tried to any extent in this country, and it is commonly assumed that the American hot summers are against them. Many of them are easily grown from seed and can be carried over in pots in a frame, if they are not hardy or will not withstand the changeable conditions of the open winter. Some of the species do well in open light, but the larger number of the new kinds probably require protection from sun; the species demand an equal supply of moisture. Some of the species mentioned in this country for outdoor growing are *P. Auricula*, *P. Beesiana*, *P. Bulleyana*, *P. capitata*, *P. cortuades*, *P. denticulata*, *P. farinosa*, *P. frondosa*, *P. marginata*, *P. minima*, *P. pulvenerida*, *P. rosaa*, *P. Sieboldii*, *P. stokimenensis*, *P. Veitchii*, aside from the English primulas, oxlips, and cowslips (*P. acutiss*, *P. elatior*, and *P. veris*), and the auriculas. For the cultivation of the auricula, see Vol. I, page 430.

Cultivation of hardy primulas. (E. J. Canning)

The hardy primulas are not so well known in American gardens as they deserve to be, although their culture is gradually on the increase, and new species are occasionally introduced. Perhaps the best known and most commonly cultivated are those which are native to the meadow lands of Great Britain, central and northern Europe. These are the English primroses (*P. farinosa*, *P. Bulleyana*, *P. capitata*, *P. cortuades*, *P. denticulata*, *P. farinosa*, *P. frondosa*, *P. marginata*, *P. minima*, *P. pulvenerida*, *P. rosaa*, *P. Sieboldii*, *P. stokimenensis*, *P. Veitchii*), and the Chinese primroses, oxlips, and cowslips (*P. acutiss*, *P. elatior*, and *P. veris*). They are all simple in their requirements, growing and flowering freely in any good garden soil, and are quite hardy as far north as Massachusetts at least, provided they are not planted in a too exposed or wind-swept position. They are all very attractive when in flower, and they can also be grown in pots and easily forced for flowering in the greenhouse in February and March.

These primulas may be propagated by seeds or division. Seeds may be sown in February in pans or small shallow flats in a mixture of loam, leaf-mold, and sand of about equal proportions, making the surface very fine. Pressing the seeds evenly into the soil and covering with about 1/4 inch of the finely sifted mixture. Place the flats or pans in a warm greenhouse or a temperature of 55° to 60° at night with a rise of 15° by day. In two or three weeks the seedlings should begin to appear. As soon as large enough to handle, they may be pricked out into other flats in a similar soil, and about 2 inches apart each way. By the middle of May they may be planted out in lines in some sheltered part of the garden till September, when they may be lifted and planted where they are wanted to flower in spring. Also those intended for flowering in the greenhouse should be potted at this time. Seeds may also be sown in a coldframe in April or May, scattering them very thinly in shallow drills, watering and keeping free from weeds in the summer, and transferring them in September to the position in the garden where they are to flower in the spring.

Propagating by division is practiced when the plants become rather large or to perpetuate some very fine variety. It consists simply in dividing the plant or clump into two or more parts and replanting again. September is the best month to do this.

The cowslip, oxlip, and English primrose are excellent subjects for massing or naturalizing in open woods, on sheltered banks, or any position where they are not too shaded, and where they can be left undisturbed for several years. They are also hardy primroses in gardens where a spring display of flowers is wanted. A light mulching with stable-manure, or in very cold gardens, a few branches of hemlock or pine, is all the winter protection they need.

Other hardy primulas not so well known as the above, but even more beautiful and showy and some of them of larger growth, are species from China and Japan, some of them from high altitudes in the Himalaya...
PRIMULA PRIMULA

mountains, and others from boreal and mountainous regions of Europe and North America. From Japan, *P. japonica* and *P. Sieboldii* are the best. From China, *P. petalocephala* and *P. Bulleyana* are large and showy, producing their bright flowers in whorls, *P. Beecnana* having from five to eight whorls with an average of sixteen flowers in a whorl. From experience and observation, the writer finds that they must have a deep rich manure soil in a sheltered place, with an eastern aspect, or where they are shaded during the warmest part of the day. A low mow look in a properly constructed rock-garden is an ideal place for them.

The high mountain and northern species, *P. cortusoides*, *P. denticulata* and the variety *cachemiriana*, *P. rosea*, *P. farinosa*, *P. muttassimnica*, and *P. Auricula*, require a rich moist soil with an eastern aspect in a rock-garden for their successful culture. It is not so much the cold of the winters as it is the heat and drought of our summers that makes their cultivation difficult.

Most of them flower through the months of May and June. They are all propagated by seeds which may be sown in flats in a cool shaded frame as soon as ripe or about the end of July, wintering the seedlings in a cool greenhouse or frame the first winter, and planting out in the rock-garden in spring; or seeds may be sown in February in a warm green-house plant-room. The English primrose, last keeping the seedlings in flats in a shaded frame till September before planting in the rock-garden. A light dressing of decayed stable-manure carefully placed between the plants as water comes on and a few hemlock or pine branches to protect them from the sun in winter are beneficial.

While the last group of primulas may never become so popular in this country as they are in the cool and most climate of England, yet, for anyone who can provide the conditions, they are well worth growing.

Commercial culture of florists' primulas. (E. A. White)

Primulas have long been regarded as important by commercial plant-growers. Their compact dwarf habit of growth and their freedom of flower production make them especially desirable. They have never been used extensively as cut-flowers, yet the flower-clusters of *E. auricula* and *P. obconica* lend themselves well to artistic arrangement and are sold in limited numbers in the larger cities, usually in bunches of twenty-five sprays. *P. Poiantha* also produces sprays of blooms which are particularly attractive when cut and placed in a formal similar to bunches of trailing arbutus.

The species most generally grown under glass for potted plants are *P. obconica*, *P. sinensis*, *P. keveniensis*, and *P. malacoides* (fairly primrose); *P. Forbesii* (the baby primrose) is still sometimes grown.

While *P. sinensiss* in its varying varieties is still grown as a potted plant to a considerable extent, it is of less importance commercially than are *P. obconica*, *P. keveniensis*, *P. malacoides*, and *P. floribunda*. *P. sinensis var. stellata* seems more in demand than the type. When taken from the greenhouses to a dwelling-house or a flower-store, the individual flowers of *P. sinensis* soon fade and the plants become unsightly. Retail dealers speak of them as “poor keepers.” The most desirable varieties of *P. sinensis* are Crimson King, Pink Beauty, Reading Blue, Orange King, The Czar, The Duchess, Coral-Pink, Princess May, and Royal White. In the stellata group, White Star, Pink Star, Light Blue Star, and Dark Blue Star, and Giant Red Star are most frequently grown. *P. malacoides* and *P. obconica*, the latter in its several varieties, Kermesina, Fire King, and Giant Red are probably the most important present-day primulas.

Primulas are usually propagated yearly from seed. When very large plants for exhibition purposes are desired, the plants may be carried over a second year. Young plants are usually more productive of blooms, hence are more desirable. Seeds must be fresh. Primulas may also be propagated from cuttings.

When large plants are desired for Christmas, the seed is sown in January. Later sowings may be made in February and March. Seed-pans should have a layer of broken crock or sand, and a little coarse material is placed above this. The seed-pan is then filled evenly full with a mixture of equal parts of leaf-mold and sand. This is compacted slightly, being careful to have the surface even. The top of the soil should not be over ¼ inch below the top of the pan. If lower than this, the confined atmosphere about the seedlings may cause an attack of the “damping-off” fungus. The seeds are then sown evenly and thinly over the surface and a thin covering of one-half finely sifted leaf-mold and sand, thoroughly mixed, is sprinkled evenly over the top. The seed-pans are then sprinkled with a fine spray, covered with glass, and placed in a partially shaded spot. As soon as the seedlings germinate, the glass should be removed. The germination period in the life of primulas is a critical one, and temperature, light, and moisture require particular attention.

When the seedlings have developed about three leaves, they should be transplanted to flats or small pots. Care should be taken in this first potting and in subsequent repottings not to set the plants too deep in the soil, as it causes the lower leaves to decay. The crown should be even with the soil. If it is above the soil, the plants will be weak and spindly; if below, they reach maturity and it may be necessary to stake them. At no time should the young plants be allowed to become pot-bound. Any check in their development during the rapid-growing period prevents the perfection of the plants. They should be repotted several times and the soil made a little richer each time by the addition of well-rotted cow-manure and bone-meal.

About the tenth of June primulas may be put into a frame out-of-doors. Watering should be carefully attended to in the summer months.

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I. HYBRIDS AND REPUTED HYBRIDS.

Several hybrid primulas have attained more or less prominence in cult. aside from those in the Vernalae group (P. elatior-veris-acaulis set), and they are briefly described here; P. kewensis is apparently the best known of them in cult.

In a genus so vast and abounding in beautiful forms, many good cultural hybrids are to be expected, although the number of artificial ones is surprisingly small considering the number of species and the length of time some of them have been in cult. For an account of Primula hybrids in nature, see Farrer, Journ. Roy. Hort. Soc. 39:112-25; also the monograph by Pax & Knuth.

a. Fls. yellow.

1. kewensis, W. Wats. (P. floribunda × P. verticillata), Fig. 3175. A hybrid that appeared in one of the houses at Royal Botanic Gardens, Kew, in 1897, blooming in 1899: it has some of the mealiness of P. verticillata and the general appearance of a robust form of P. floribunda; lvs. in rosette, 6-8 in. long and 1½ in. wide, obovate-elliptical, tapering to a petiole-like base, margins wavy and dentate: scapes many, 1 ft. high, slender but erect, glabrous, bearing 2-4 whorls of 6-10 bright yellow fragrant fls. on slender pedicels: bracts large, dentate: calyx campanulate, the lobes regular and acute; corolla-tube 1 in. long, the limb ¾ in. across, the lobes nearly circular and notched. G.C. III. 27:195. R.H. 1906:400. Gn. 59, p. 196; 64:10. G.M. 43:232; 51:320. G. 26:99. Gn.M. 15:18. Gn.W. 20:249; 21:214.—A var. farinosa, Hort., is listed, the stgs. and foliage covered with silvery white powder. P. kewensis is a good winter bloomer of long season, and a desirable companion for P. sinensis and P. obconica; requires the general treatment of P. obconica.

b. Fls. not yellow, in shades of red or purple, sometimes white.

2. admontensis, Gusm. Said to be a hybrid between P. auricula and P. Clusiana, but probably a P. Clusiana form or P. Clusiana × P. minima: described by Paul as a very dwarf-growing plant, hardly 3 in. high: fls. large, purplish lilac, in June: lvs. fleshy, round-oval, evergreen. Admont, in Steiermark, Austria.—Said to thrive in full sun in limestone soil.

3. Arctotis, Kerner. One of the numerous hybrid progeny of P. auricula and P. hirsuta (see P. pubeacena, No. 20); as a garden plant, said to have acquired some of the characteristics of both parents: fls. lilac-purple or white, in May and June, on scapes 4-5 in. high.—Succeeds in partly shady places in sandy loam; natural hybrid.

4. Berninae, Kerner (P. hirsuta × P. viscosa). Three to 4 in.: fls. large, rosy purple, on short stgs.; April, May.—A natural hybrid.

5. beitdr, Huter. Natural hybrid of P. glutinosa and P. minima: fls. in 2’s, deep rose-colored, rising scarcely more than 1 in. above the foliage, early.—Requires partial shade and a well-drained position.


7. Bwlesii, Farr. (P. pedemontana × P. viscosa). A natural hybrid, usually larger than P. pedemontana; the upper face of lvs. densely glandulose, scale longer, pedicels longer and densely glandular, the umbel few-fl., and 1-sided; smaller than P. viscosa, the fls. wider, the lvs. and pedicels with more or less rufous glands: intermediate between the parents, with which it was found. Intro. 1911.

8. discolor, Leyb. (P. Porte, Huter). Natural hybrid of P. auricula × P. enensis: said by Paul to be "a charming plant for sunny places on the rockery," 3-4 in.: fls. lilac-purple with silvery white eye; Apr.-June.

9. Faschinii, Schott. Natural hybrid of P. minima × P. spectabilis: said to inherit the strength and vigor of P. spectabilis and the free-flowering qualities of P. minima: 3 in.: fls. rosy purple, usually 2 or 3 to each

14. Huteri, Kerner. Natural offspring of P. glutinosa x P. minima; very dwarf, but sturdiest: fls. pale rose-colored, in trusses; May, June. Tyrol.—Of good constitution; prefers slightly shaded places.

15. intermedia, Hort. Several applications are covered by the name P. intermedia: described and illustrated in G.S. 2:59 as "one of the most beautiful of the members of a very large family, and closely resembles the alpine auriculas, its fls. being purplish crimson, with a conspicuous yellow eye, and produced on stout sts, in crowded clusters that overtop the foliage." Fragrant. April.—The garden plant under the name P. intermedia is probably one of the natural hybrids of P. Ciusiana and P. minima.


17. Kerner, Goebi & Stein. P. Auricula x P. hirsuta, a natural hybrid (see P. pubescens, No. 20): 4-5 in., hairy: fls. rose-lilac, with yellowish white eye; April, May—Seem well suited for dry position in rockery.

18. Muretiina, Moritz. (P. Mureti, Charp.), Natural hybrid of P. integrifolia and P. visosa; a similar cross is P. Dinyana, Lagger, which may be the preferable name for the group: lvs. pale green, in rosettes, stiff and hairy: fls. 4-5 in., producing many crimson-purple fls. in large clusters; March-May.—Strongly recommended for partly shaded places in well-drained soil in the rock-garden.

20. pubescens, Jacq. Several natural forms of P. Auricula x P. hirsuta are included under the name P. pubescens; here may be referred the variants represented by the names P. helvetica, Don, P. rhaetica, Gaud., P. Arctotis, Kerner, P. Goebi, Kerner, P. Kerner, Goebi. & Stein, P. Peirischii, Stein, all pinkish-flowered in minor characters and garden value. P. pubescens is a hardy plant, according to Paul, and easy to grow in both sun and shade, if it has a well-drained place: 3-4 in.: fls. rosy crimson with white eye; May, June. P. pubescens alba—P. hirsuta var. nivea (No. 41) is a very free-flowering plant, with large snow-white fls. which make an excellent display against the rosettes of stiffish lvs. G.S. 75, p. 88. G.L. 16:95.

21. rhaetica, Gaud. One of the P. pubescens forms (No. 20), hybrid of P. Auricula and P. hirsuta; lvs. white-mealy: scape 3 in. above foliage, mealy: fls. large, clustered, brilliant violet-purple; May—July, flowering continuously in a sunny place in the rockery.

22. salisburgensis, Floereker. Natural form of P. glutinosa x P. minima, perhaps not in cult.: lvs. cuneate, strongly 7-9-toothed toward the top, serrate at summit: scape not glutinous: fls. rose-colored.

23. Stäubli, Schott. Natural hybrid of P. minima and P. pubescens; dwarf and tufted but vigorous and free-flowering: fls. large, bright rose-purple, borne singly; April-June.—For shaded places in the rock-garden.

24. venusta, Host (P. Jelének, Gausm.). Natural hybrid of P. Auricula and P. cerniolica: habit of P. cerniolica, but the lvs. and calices sometimes more or less white-mealy: vigorous and hardy; 3-4 in., forming large spreading rosettes: fls. fragrant, red to brownish rose or purple; April-June.—For half-shady places in the rock-garden.

25. Venzsh, Huter (P. adulterina, P. cridaiensis, P. micrantha, and P. valmenona, Gausm.). Natural hybrid of P. tyrolensis and P. Wulfeniana: large or small, mostly a strong and free grower with lvs. in rosettes 3-4 in. above foliage: fls. in loose heads or clusters, large, lilac-purple.—For half-shady places in the rock-garden.

26. voinichenia, Gausm. One of the natural forms of P. minima x P. Wulfeniana: robust, 4-6 in., or much less in the wild: lvs. oblong, usually few-toothed but rarely entire: fls. in trusses, bright red, spring to late summer.—Named by Paul to be serviceable for chalky soils in dry sunny places.

In Plants of various sections, probably not of the Auricula group or kind.

27. Aréndse, Hort. Arends. Said to be a hybrid between P. obconica and P. megasepalia, "in general appearance similar to a glorified P. obconica:" fls. rich lilac-pink in color, in many-fl. umbels: lvs. more narrowly resembling those of P. megasepalia, the petals exceedingly hairy.

28. Briscoeii, Hort. Veitch. (P. Bulleyana x P. japonica, garden origin). Habit of P. japonica, but with paler lvs. and more crimsoned midrib, the infl. inheriting to some extent the powdery character of P. Bulleyana; the scapes and fls. are said also to resemble P. pulvulenta; purple-fld. (?).


30. Lindsays, Hort. Hybrid, parentage not recorded, with deep crimson fls. with purplish yellow eye: "a pretty plant with neat foliage and fls. of a kind of deep crimson and a purplish yellow eye." Named for R. Lindsay, Edinburgh.

31. Silva-Taroucana, Fedde (P. pulverulenta x P. Cockburniana, a garden hybrid). Known also as Unique: foliage much like that of the common primrose, but the lvs. and calices sometimes more or less white-mealy: the blade decurrent on the petiole: fis. turkey red, in tiers, the calyx and pedicel white-farinose. A fine garden plant. G.C. III. 41:391.

32. Suteptiti, Gausm. (P. rosea var. grandiflora x P. ophseriana, a garden hybrid). Fls. light blue, in April, on strong sts., and strong plants: sometimes blooming early in the year. For the alpine house, and the blooms last fresh for a considerable period. Intro. by P. Sztitz, Bad Lauterberg, Germany.

33. Tewfikiana, Hort. Vilm. Garden hybrid of which one of the parents is supposed to be P. Bulleyana: a vigorous grower, producing infl. 2 ft. high: fls. in several tiers, salmon-rose with yellow eye: fertile.

II. Auricula.

Fleshy-lvd. or coriaceous-lvd. species from the Alps, Pyrenees, and other high mountains of Eu.: fls. in umbels (rarely varying to nearly or quite single): bracts not foliaceous or leafy.

a. Fls. yellow (much modified in color in cult. forms, particularly in No. 54).

34. Auricula, Linn. (Auricula fistula, Opiz). Auricula. See p. 340 and Fig. 440, Vol. I, and also for
cult. Low, with a radicle rosette of thick obovate-dentate leaves or pubescent nearly lvs. 2 or 3 in. long, which are often crenate on the upper part: scape 1-8 in. high (sometimes nearly or quite wanting), usually exceeding the lvs.: fls. in an umbel, sometimes as many as 20, bright yellow and fragrant or inodorous, short-stalked, subtended by minute oval or nearly circular, the segments, obovate-cuneate and emarginate; stamens dimorphous.—This description represents the wild form as understood by J. G. Baker in B.M. 6887. "It is one of the most widely spread of all the species," Baker writes, "as it extends in a wild state from Dauphine and the Jura on the west through Switzerland to Lombardy, the Tyrol, Hungary, and Transylvania." In cult., the plant has run into fls. of many colors. It is possible that some of these forms are hybrid progeny of the related species. Baker writes: "What the relation is of this widely spread wild type to the multiform races of the garden Auricula is a subject that still remains to be fully worked out." The cult. forms are of two groups,—those having farina on the lvs. and those without it. Var. albocincta, Hort. Lvs. densely farinaceous, white-margined. The wild form of the species is little known in cult. MacWatt writes that "by nature it flourishes best where it is most at home, on the limestone rocks of the Alps, the Apennines, and the Carpathians. In the wild state the flowers are comparatively small, but under cultivation the scape often carries a big head of large-sized flowers." Var. ciliata, Koch (P. ciliata, Moretti. P. Bollati, Lehm. P. bellusuenus, Venezi). lvs. not farinose, cartilaginous-margined, more or less glandular-pilose; the edges densely long-ciliate: fls. scentless. Var. Obristii, Beck (P. Obristii, Stein. P. similis, Stein. P. Bollati, Beck). Lvs. silvery green, not mealy, more or less glandular-hairy, the margin narrowly cartilaginous: scape sometimes elongated: scape surpassing the lvs., about 6 in. high, somewhat exceeding the foliage, bearing 1-3 fls.: bracts linear-oblong and elliptic, not viscid, shining, dark green, marginated and minutely glandular: scape about 2 in. high, equaling or surpassing the foliage, bearing 1-3 fls.: bracts linear, usually reddish: fls. rose-colored; calyx tubular, glabrous, more or less purplish, with ovate-obtuse lobes; corolla included in white throat, the limb funnel-form and about 1 in. across, the obovate lobes deeply emarginate: caps. included in calyx. Alp. chiefly Austrian. G.W. 61, p. 429. —Very early blooming in cult. and not difficult to grow. 38. Wulfenniana, Schott. Spreading tufts: lvs. 1-2 in. long, stiff, lanceolate to obovate and elliptic, not viscid, shining, dark green, marginated and minutely glandular: scape about 2 in. high, equaling or surpassing the foliage, bearing 1-3 fls.: bracts linear, usually reddish: fls. rose-colored; calyx tubular, glandular, more or less purplish, with ovate-obtuse lobes; corolla included in white throat, the limb funnel-form and about 1 in. across, the obovate lobes deeply emarginate: caps. included in calyx. Alp. chiefly Austrian. G.W. 15, p. 271. G. 36:273. Var. longobarda, MacWatt (subsp. longobarda, Pax & Knuth. P. longobarda, Duby). Stouter: lvs. and calyx large, the latter cut beyond middle with acute lobes: corolla-limb about ½ in. across. G.W. 15, 1922 (as P. bulbifera var. longobarica, Pax). Lvs. ovate or oblong-oblong, the margin narrowly cartilaginous: scape sometimes as long as 4 in. or more high (usually 6-7 in. under cult.), glandular, 1-6-fid.: bracts lanceolate or linear, more or less purplish: fls. rose-colored or lilac: corolla-lobes bifid rather than emarginate: caps. included to about half their length. A striking species with a cowslip odor, blooming in N. Italy in the Appennine region. B.M. 3414. G.C. III. 41:18. G.M. II. 10:219. Var. ciliata, Koch (P. ciliata, Moretti). Spreading tufts: lvs. and those without it. Var. albocincta, Hort. Lvs. entire, coriaceous, cartilaginous-margined: bracts narrow and long; fls. rose-colored. 39. pedemontana, Thomas. Lvs. ovate or oblong-lanceolate, acute or obtuse, dentate or sometimes practically entire, shining, the margin densely glandular, the throat white, limb about 1 in. across, the lobes obcordate. Graian and Cottan Alps. B.M. 5794. G.W. 61, p. 397; 72, p. 166. —Of easy cult. in a slightly shaded place. AA. Fls. rose, violet, purple, or bluish. B. Lvs. entire, coriaceous, cartilaginous-margined: bracts narrow and long; fls. rose-colored. C. Foliage not farinose but reddish glandular-hairy, at least on margin (with a reddish exudate). D. Glandular-hairy on margins of lvs. only. E. Fls. long-pedicelled (pedicels usually ½-4½ in. long): scape mostly shorter than the lvs. 40. hirsuta, All. Lvs. broadly obovate or rhomboid, varying rarely to somewhat cuneate, obtuse, very viscid, with yellow, orange, or reddish gland, toothed toward the apex or throughout: scape glandular, often shorter than lvs., to about 3 in. high, bearing 1 to many fls. on filiform pedicels: bracts broadly ovate and obtuse, scarious; fls. lilac, rose, or white; calyx broad-campanulate, glandular; corolla minutely reflexed, glandular, with orange or white exudate; caps. included to about half their length. An Alp. G.R.S. 39:105—A showy species, requiring a shabby place in light soil in the rock-garden; worthy of attention.
The species is said to be grown sometimes as *P. viscosa*. Runs into var. angustiita, Widm., with oblong lvs. gradually narrowed into a petiole, and rose-colored fls.; var. excapa, Pax, scape very short or none, and lvs. nearly sessile; var. nivea, Sims, fls. white. B.M. 1161. Gn. 78, p. 314. G.M. 57:191. The white-fid. plant cult. as *P. nivalis* and as *P. pubescens alba* is this form (see No. 20). In gardens are forms known as var. ciliata, coccinea, and Balfouriana.

**EE.** Fls. short-pedicelled (pedicels usually \( \frac{1}{2} \) in. or shorter): scape equal in or exceeding the lvs.

42. *cenensis*, Thomas (*P. daonensis*, Leyb. *P. cadinensis*, Porta). Lvs. very viscid and bearing large red glands, oblong-cuneate to lanceolate-cuneate, gradually narrowed to a petiole, obtuse or truncate at apex, upper margin serrate or dentate: scape mostly exceeding the lvs., about 3 in. high, with 1-7 fls.: bracts broadly ovate, scarious: fls. rose-colored; calyx densely glandulose, tubular-campanulate, with ovate obtuse lobes; corolla white in throat, the limb \( \frac{1}{2}-\frac{3}{4} \) in. across, with emarginate obcordate lobes; caps. about equaling the calyx. Rhätian Alps. R.H.S. 39:105. Said to be easily raised in partial shade in a variety of soils.

**FF.** Shape of lvs. oblong to broad-ovate.

43. *apennina*, Widm. Lvs. bearing large, short, yellow at length brown glands, ovate, oblong or lanceolate-cuneate, gradually or suddenly narrowed to the petiole, obtuse, entire or toward the apex slightly denticulate or dentate: scape slightly exceeding the lvs., bearing 1-8 fls.: bracts scarious, obtuse: fls. rose; calyx glandular, campanulate with triangular obtuse lobes; corolla-tube scarcely broadened toward the glandular white throat, the limb \( \frac{1}{2}-\frac{3}{4} \) in. across, with emarginate obcordate lobes; caps. about equaling or slightly shorter than the calyx. Cottian Alps, 3,200-8,000 ft. altitude. R.H.S. 39:105.

**cc.** Foliage farinose or not, sometimes glutinous but not red-glandular.

**b.** Bracts elongated: lvs. coriaceous, truncate at apex.

44. *villosa*, Jacq. Lvs. strongly viscid and densely covered with red glands, broad-ovate or oblong or oblong-lanceolate, gradually rarely suddenly narrowed to the petiole, obtuse, often dentate from the middle or only at the apex or even more or less subentire: scape red-glandular, about 6 in. high, exceeding the lvs., 1-12-fls.: bracts green or scarious, broadly ovate, obtuse: fls. rose or lilac; calyx glandular, not split to the middle with short triangular acute or obtuse lobes; corolla-tube slightly broadened toward the white throat, the limb \( \frac{1}{2}-1 \) in. across with emarginate obcordate lobes. E. Alps. Gn. 61, p. 429. G.W. 6, p. 112. R.H.S. 39:105. Var. *commutata*, Chitto (*P. commutata*, Schott. *P. villosa*, subsp. *commutata*, Widm.), from Steiermark, has larger and thinner often oblong and coarsely toothed lvs. Gn. 61, p. 328.
of commerce, according to MacWatt, is chiefly varieties of P. hirsuta.

ddd. Bracts broad and leafy: fls. bluish violet

54. glutinosa, Wulf. Deciduous: 3-4 in.: lvs. glandular-viscid, rather stiff, somewhat shining, punctate above, the margin toward the apex subcartilaginous, lanceolate-cuneate or oblong-lanceolate, gradually narrowed to the short-petiole, obtuse, dentate-serrate: scape exceeding the lvs., bearing 1-2 fls.: bracts broad-ovate, obtuse: fls. rose or violet, rarely white; calyx glandular, with the lobes triangular; corolla-tube many times exceeding the calyx, gradually broadened upward, the limb broad-tunnel-form, rarely flat, 1 in. across, with emarginate lobes: caps. equaling or exceeding the calyx. Norwegian and British Alps. Primula. 56: 104.—Should not be grown vertically. Natively it hangs from crevices in the rocks; it is recommended to grow it in an elevated place in the rock-garden where it may droop.

55. viscosa, All. (P. latifolia, Lapeyr.). Not farinose: lvs. finely densely clothed with short discolored glands, intensely rank-smelling, yellowish green, rather soft, often more or less curved, the margin not at all cartilaginous, oval or oblong-cuneate or lanceolate-cuneate, obtuse or acute, gradually narrowed or contracted to a petiole more or less equaling the blade, dentate, wavy-dentate or entire: scape glabrous or only the margin sparsely cartilaginous, with sessile glands, not split to the middle, the lobes triangular; corolla-tube gradually broadened to a farinose throat, the limb 1/2-1 in. across, broad-tunnel-form with emarginate lobes: caps. equaling or exceeding the calyx. Mountains of S. Eu., in several forms. Primula. 56: 104.—The plant is recommended to “be grown in turf which has been added a little leaf-mold, in positions where it does not get full sun.”
PRIMULA

Said to be difficult to flower under cult., but blooms freely in marshy places where it grows wild; it has the color of a blue gentian.

55. d e b r u m, Velen. Plant 8-10 in. high; lvs. provided with sessile glands, subcoriaceous, stiff, margin cartilaginous, punctate above, oblong or lanceolate, very entire, acute, gradually or scarcely narrowed toward the base; scape viscid, obscurely colored upward, exceeding the lvs., bearing a somewhat nodding, 1-sided umbel of 5-10 fls.: bracts oblong-linear: fls. intense purple-violet; calyx viscid, dark green, split to the middle, with narrowly triangular acute lobes; corolla gradually broadened toward the glandular throat, the limb funnel-shaped, about 1½ in. across, with slightly emarginate lobes; caps. included. Bulgaria. B.M. 8124. C.C. III. 37:98. R.H.S. 39:113. F.S.R. 2, p. 239.—Said to be difficult to grow, but thrives in a rock-garden if well drained.

III. FLORIBUNDA

Thin-bracted verticillate species, with leafy involucral bracts, from S. W. Asia and Afr.

A. Plant not farinose; calyx very deeply cut.
56. floribunda, Wall. BUTTERCUP PIMROSE. Plant glandular-pubescent, 5-8 in.: lvs. elliptic or ovate, acute or obtuse, membraneaceous, narrowed to a broad petiole which is shorter than the blade, irregularly dentate: scape bearing 3-5 many-fl., superimposed umbels: bracts (at least the lower) 2-3-nerved; the limb more or less farinose, elongate-cylindric, the limb more or less than ⅖ in. across with broad-ovate scarcely emarginate lobes: caps. globose, included. Bulgaria. B.M. 6712. C.C. II. 19:113; III. 27:195. Gn. 45:1424; 47, p. 221. Gn.W. 5:453. Var. grandiflora, Hort., is offered. Var. Isabellina, Hort., free-flowering; corolla-tube slender, cylindrical, the limb about 1 in. across with broad-ovate, slightly emarginate lobes: caps. globose, included. Abyssinia. B.M. 6042.

59. Boveana, Decne. (P. verticillata var. Bovëna, Mast.). Not glandular, more or less farinose or glabrous: lvs. membraneaceous, rhomboid or spatulate, acute or acuminate, irregularly serrate or even somewhat incised-lobed, narrowed to a winged petiole which is shorter than the blade: scape bearing several many-fl. superimposed umbels: bracts (at least the lower) 2-3-nerved: flowers golden yellow, fragrant; calyx deeply parted, campanulate with triangular-lanceolate, entire lobes; corolla-tube slender, cylindrical; the limb about 1 in. across with broad-ovate, slightly emarginate lobes: caps. globose, included. Nepal. B.M. 2842 (as P. verticillata).

IV. SINENSES.

Plants of various habit, with lobed distinctly petioled lvs., the lobes dentate or crenate. Himalayan-Chinese region.

A. Calyx prominently inflated, truncate, or squared at the base.
60. sinensis, Lindl. (P. chinensis, Hort. P. Mandarina, Hoffmg. P. p rae tiens, Ker. P. sempervirens, Lois.). CHINESE PIMROSE. Figs. 3176, 3177. Trunk short and woody, but as known in gardens the plant is practically stemless, the ample foliage and the strong short scapes arising directly from the surface of the ground or very near it; whole plant soft-hairy; lvs. rotundate, soft, and usually linn, several-lobed and

3177. Single and semi-double flowers of Primula sinensis. (X1)

3178. Wild form of Primula sinensis, after one year's cultivation from seed collected in China.
the lobes unequally incise-dentate, long-petioled; scapes erect, exceeding the lvs., bearing 2-3 superimposed umbels: fls. now of many colors, several to many in an umbel, large and showy, salverform, the segms. obcordate; calyx inflated; corolla-limb about 1/4 in. across, spread out, the lobes broad-cordate, emarginate. caps. glabrous. China. Winter bloomer, as grown in greenhouses. B.M. 2564. L.B.C. 10:916, 20:1226. B.R. 539. F.S. 22:2334-7. I.H. 32:551; 35:42. Gn. 51:468 and p. 460. G.C. III. 25:181, 203, 205. Gng. 2:91. A.F. 8:625, 625, 671. F.R. 4:29.—The Chinese primrose is variable under cult. There are double-fld. forms of various shapes and colors and of various degrees of doubling. For pictures of various double and half-double forms, see R.H. 1867:220, 380. F.S. 20:2145. I.H. 31:512; 35:42; 38:126. J.H. III. 44:515. The normal form of this primrose has a somewhat flat-topped fl-cluster, but there are forms with pyramidal and elongated clusters. Primula sinensis was intro. into England from Chinese gardens in 1820, but it was not until 1879 that the original wild form was known to botanists. For accounts and pictures of this wild primrose as grown in English gardens, see essay by Sutton in Journ. Royal Hort. Soc. 13:99 (1891). G.C. III. 5:117; 8:504; 9:200; 31:270 (reproduced, less than half in Fig. 3179); 11:13 and 31:271 showing the plant after one year of cult. and reduced in Fig. 3178 (figure reproduced in A.G. 13:245). Gn. 49:214. B.M. 7559. G.C. III. 45:148; 55:131. Gn. 62, p. 307. R.H.S. 39:128. Dr. Augustine Henry, who has collected the wild plant at Ichang, in China, writes (Gn. 53, p. 229; 57, p. 22; 59, p. 252 (bench)). G. 62. Sieboldii, Morr. (P. cortusoides var. dammiana, Lindl., var. grandiflora, Lem., var. viridiflora, Hort. P. plexa, Turcz. P. amurensis, Hort.). Fig. 3181. Perhaps all over except the corolla: lvs. petioled, ovate-oblong, base cordate, lobed, the lobes numerous, unequally dentate; the petiole longer than the blade: scapes exceeding the lvs., bearing a simple many-fld. umbel: fls. white, rose, or purple; calyx funnel-form, with narrowly triangular-lanceolate acute lobes which are H-like and glabrous; corolla-lobes broad and emarginate. Japan. B.M. 5238. I.H. 16:559. Gn. 29, p. 392; 35, p. 395; 36:318; 72, p. 327. G.M. 51:911. G. 9:454; 19:175. C.L.I. 23, No. 5, 53. R.H.S. 39:176. Gng. 8:241, 242. R.H. 1892:300.—Looks like a large and robust form of P. cortusoides, with fls. 1 1/2 to nearly 2 in. across, the throat usually striped and the limbs in various colors. The fls. are two to three times larger than those of P. cortusoides. In some forms the fls. are fringed. Blooms in late spring. Hardy N. Several named forms are mentioned in gardening literature, as var. clarkeana (G. 37:109), var. grandiflora, and others.

63. obconica, Hance (P. pectoliflorum, Hook.). Fig. 3182, and Plate XCII. Slender, with few-hairy lvs. (the sharp hairs often irritating-poisonous): lvs. all radical, ovate-oblong or round-oblong, base more or less coriaceous, long-petioled, scutell-toothed and very finely serrate: scapes many, 4-10 in. tall, exceeding the lvs.: bracts small, linear, and unequal: fls. small, lilac or light purple, several to many in umbels, on long-spread-

A number of very recent species closely allied to P. obconica are likely to find their way into cult. and perhaps to extend the usefulness and range of this type of primula. Some of these species are: P. ambía, Balf. f., a glabrous type from a dry site, with a remarkable involucre; P. barbícalyx, C. H. Wright, hairy all over and with a bearded calyx, the lvs. somewhat elongated and with rounded lobes; P. creódáza, Franch., in which the characters of P. barbícalyx are more emphasized (the plant cult. under this name is said to be P. saxátílis); P. begóniaformis, Petit., smaller than P. obconica and less hairy; P. púrea, Balf. f., very dwarf, xeromorphous; P. Elímacum, very hairy, lvs. 2-3 times usual size, scapes short, fls. minute; P. Pétímenegmí, Bonati, a grotto plant, lvs. large, membranous, and delicate, scapes very short.

64. sinósísteri, Balf. f. A recent species of the P. obconica type that promises to be of much horticultural value, since it does not have the irritant hairs, is a free grower, forms compact masses of foliage, and produces many trusses of white sometimes lilac fls.: lvs. acutely lobed. Yunnan, China. R.H.S. 39:145.—Said to have been distributed as P. Lístéri.

cc. Lobs of calyx entire, obtuse.

65. Lístéri, King (P. obcónica vars. rotundifólia and glárésca, Franch.). Lvs. petiolate, glabrescent or glabrous, membranaceous, opaque, reflex-ovoburcullar from a cordate base, sinuate-dentate, the lobes irregularly few-toothed or subentire, acute; the petioles slender, manifestly longer than the blade, very short-pubescent, glabrescent: scape much shorter than the lvs., glabrescent, 3-5-fl.; bracts small, linear; fls. rose; calyx almost glabrous, broad-campanulate, with broad-semi-orbiculate, obtuse or scarcely mucronulate lobes; corolla-tube almost ½in. long, the lvs. obovate, bilobed, at other times entire or dentate-campanulate, with lanceolate acute lobes; corolla-tube cylindrical, the limb convex, about ¼ in. across, with shortly bilobed lobes. Tibet and China. G.C. III. 50:102.

cc. Lobs of calyx denticulate.

66. malvácceo, Franch. (P. langkongénia, Forr.). Whole plant fairly densely short-pubescent: lvs. glabrescent, bright green, open-cordate at the base, rotundate or very broadly ovate, coarsely crenate, the crenatures denticulate; the petioles longer than the blades: scape thick, exceeding the lvs., bearing 2-3 superposed umbels which are slightly separated from each other: bracts, those below the lowest umbel. Il- like, large, ovate-lanceolate: fls. reddish; calyx pubescent, at the same time clothed with meifherous glands intermixed, cup-shaped, with the lobes frequently denticulate; corolla-limb about 3½in. across, distinctly annulate at the throat, with obovate, 2-lobed lobes: caps. small, globose, not exceeding the calyx-tube. China. Intro. 1895. R.H.S. 39:149.

67. blattariíformis, Franch. Whole plant covered with short papilliform hairs: lvs. ovate or obovate, from a roteund or shortly attenuate base, coarsely crenate, the crenatures denticulate; the petioles shorter than the blades: scape erect, much exceeding the lvs., bearing a raceme 8-12 in. long: the pedicels short: bracts equaling the calyx: fls. lilac; calyx broad-campanulate, with acute dentate lobes; corolla-tube puberulent outside, the limb ½-3½in. across, broadly obovate, acute: caps. subglobose, small, included in the calyx. China. Intro. 1895. R.H.S. 39:149.

"A first glance at the plant suggests Verbacum."—Balfour.

ms. Shape of calyx more or less tubular, little if any enlarging after flowering (perhaps exception in No. 80).

c. Stamens affixed in base of corolla-tube.

68. heuchérifólia, Franch. (P. Gagnépéou, Petit., Lvs. petiolate, deeply and narrowly cordate, rotondate, 7-9-lobed to a depth of scarcely one-fourth the diam., sparsely pilose, the lobes ovate-deltoid, unequally dentate; the petiole villous with red hairs: scape much exceeding the lvs., when mature short-pulverulent as well as short-pilose, bearing 3-4 fls.: bracts short, linear-lanceolate, pulverulent: fls. purplish; calyx narrowly

3180. Primula stellata of florists, a form of P. sinensis, prized for its small well-formed slender-stalked flowers that stand well above the foliage. (× ½)

c. Stamens affixed in the tube or at the throat of corolla.

d. Lvs. paper-like, suborbiculate, glaucous beneath.

69. chartácceo, Franch. Lvs. long-petiolate, chartaceous glabrous, ovate-suborbiculate, base slightly cordate, obscurely crenate-dentate, glaucous above, pin-

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prominently somewhat 7-nerved, both surfaces densely finely rusty-punctate: scapes frequently several, 2-3-fl.; the pedicels very slender-puberulent: fls. rose-lilac; calyx urn-shaped, 5-cleft to the middle, the lobes oblong, obtuse, striate especially at the margin with resinos red dots; corolla salver-shaped, the lobes ovate, 2-cleft: caps. spherical, not exceeding the calyxtube. Cent. China.

DD. Less membranaceous or thin, oblong in general outline, doubly crenate and often somewhat lobed.

70. cortusoides, Linn. Lvs. in a rosette on the ground, rather large and soft, loose-hairy (at least on the midrib and petioles), ovate-oblong or cordate-oblong, irregularly many-notched: scapes few to several, 6-12 in. tall, much exceeding the lvs., very straight, hairy: bracts linear: fls. rose-colored, about 1 in. across, short-pedicelled, in a loose many-fld. umbel, the segms. obovate and deeply notched or even lobed. W. Siberia. B.M. 399. Gn. 29, p. 382; 62, p. 217. G.M. 43: 247.—A handsome hardy species, blooming in May in the northern states, and represented by garden forms; according to Balfour, by the short pedicels of the fls.

71. saxatilis, Komar. Fig. 3183. Plant pubescent: lvs. oblong or broadly oblong-ovate from a cordate or subcordate base, incised-lobed, the lobes sometimes subentire, sometimes crisped or dentate; the petioles frequently exceeding the blades: scape exceeding the lvs., pubescent below, subglabrous above, bearing 1-10 fls.: bracts linear: fls. rose-purple; calyx ovate-cylindrical or narrowly campanulate, prominently nerved, with deltoid acute very shortly puberulent lobes; corolla tubular, the limb up to 3/4 in. across, with emarginate lobes: caps. oblong, included, very glabrous. E. Siberia. R.H.S. 39: 173.— Said to be cult. under the name of P. oreodoxa. Pedicels much exceeding the bracteate.

72. violodora, Dunn. Plant pubescent: lvs. reniform or orbicular, frequently bullate, base cordate, lobed, the lobes bicrenate; the petiole longer than the blade, covered with violet hairs: scape 8-12 in. high, bearing 2-3 superposed umbels, rarely only 1; bracts small: fls. with the odor of violets, rose-lilac; calyx subglabrous, green, narrowed at the base, with very acute strongly nerved lobes; corolla-tube cylindrical, the mouth yellow, the limb up to 3/4 in. across, with obturate lobes. Cent. China.

E. Foliage bullate or blistered.

73. mollis, Nutt. Plant softly hirsute-pubescent, 1 ft.: lvs. deeply cordate at the base, the sinus closed, cordate in general outline, sinuate-lobed, crenulate-denticulate, softly pubescent; the petiole densely pubescent, equaling or exceeding the blade: scape pubescent, 8-10 in., after flowering growing to as much as 16 in. high, much exceeding the lvs., bearing 3-5 many-fl. superposed umbels: bracts lanceolate, the upper narrower: fls. bright rose; calyx intense red, soft-hirsute, tube turbinate, with spreading acute lobes; corolla-limb more or less oblique, 1/4-3/4 in. across, with obovate emarginate lobes. E. Himalayas. B.M. 4798. F.S. 12: 1230. Gn. 76, p. 424. G.W. 13, p. 125. R.H.S. 39: 184.—May and June to July, requiring a moist or boggy place.

74. sinomollis, Balf. f. Lvs. gray-hairy, rounded, petiolate, very shallowly rounded-lobed or scalloped: scapes long, bearing superposed whorls of red fls.: calyx cup-shaped to campanulate, ribbed, with straight erect lobes. Yunnan, China. Introd. 1913. R.H.S. 39: 148.

- 75. septamloba, Franch. Whole plant scattered with soft white hairs: lvs. up to 31/2 in. diam., in outline orbicular, deeply cordate, sparingly pilose, 7-lobed, the lobes one-third the depth of the lf.-diam., broadly ovate or triangular, obtuse but sometimes with more or less acute large teeth, denticulate; the petioles somewhat hairy, much exceeding the blade: scape up to 12 in. high, slender, clothed with spreading hairs, bearing a small cluster of fls.: bracts linear-lanceolate, obtuse: fls. reddish purple, semi-pendulous and somewhat fragrant; calyx glabrous, tubular-campanulate with lanceolate acute lobes; corolla-limb about 3/4 in. across, concave, with obovate emarginate lobes. Cent. China. Introd. 1908. G.C. III. 58: 297. R.H.S. 39: 145.

76. ocularis, Duthie. Allied to P. septamloba, with geranium-like lvs. and red-purple drooping fls which are darker in color than those of the related Chinese species. 'W. China. Introd. 1904.

FF. Lobes of lvs. acute.

77. Kaufmanniana, Regel. Lvs. pubescent, becoming glabrescent, petiolate, about 2 in. long and broad,
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orbicular in outline, cordate or subtruncate at base, the many lobes oval and few-toothed, the petiole exceeding the blade: scape 6-8 in. tall, over-topping the lvs., softly-pubescent below and glabrescent above, carrying a many-fld. umbel: bracts lanceolate, acute, exceeding the pedicels: fls. rose-purple; calyx glabrous or nearly so, the lobes erect and acute; corolla exceeding calyx, the limb more than ½ in. across, the obovate lobes emarginate. Cent. Asia.

78. polyezura, Franch. Lvs. petiolate, 1-2½ in. long, broadly deltoid or suborbicular, about 11-lobed, the lobes broadly ovate and dentate or crenate, the petiole very long: scape 4-16 in. tall, much overtopping the lvs., pubescent, the umbel solitary or 2 or 3-superposed: bracts lanceolate, shorter than the villose pedicels: fls. purplish or violet (?); calyx ribbed, long-tubular, pilose, the lobes lanceolate-acute; corolla-tube cylindrical, twice exceeding the calyx, the limb about ½ in. across, lobes bifid. Cent. China.—P. Veitchii and P. lichenanenata may be minor forms of this.

79. Veitchii, Duthie. Lvs. petiolated, when young subrugose, about as broad as long, lobed, the lobes dentate, green and pubescent above, dense-white floccose-tomentose beneath: the petiole equaling the blade: scape exceeding the lvs., 10-12 in. high, bearing a rather densely many-fld. umbel or several umbels superposed: bracts shorter than the pedicels, clinate, pubescent: fls. rose-purple or violet, the anthers yellow; calyx subtruncate at the base, pubescent, with lanceolate-acute often unequal lobes; corolla pubescent, the limb yellow-tinted at the mouth with broad-obovate emarginate lobes: caps. twice as long as the calyx. Cent. China. Intro. 1906. B.M. 8051. G.C. III. 37:544. G.M. 48:314. R.B. 36, p. 270. R.H.S. 39:144.—Veitchiana, Petitm., is a different species, apparently not in cult.


81. geraniifolia, Hook. f. Very short-pubescent: lvs. about 2 in. long and broad, orbicular in outline, cordate at base, 11-15-lobed, the lobes triangular and many-toothed and acute, the slender petiole much exceeding the blade: scape 8-10 in. high, bearing 1 or 2 umbels: bracts small (about ½ in. long), linear: fls. rose-colored, on slender pedicels about ½ in. long; calyx campanulate, glabrous, the lobes acute; corolla exceeding calyx, the limb about ½ in. across, the lobes lightly emarginate. Thibet. R.H.S. 39:184.

82. Paxiana, Gilg. Plant tall and very showy: lvs. very thin-membranaceous, reform from an open cordate base, acute, many-lobed, at first sparse-pilose on the nerves, somewhat ciliate, primary nerves 3, prominent, dividing ternately, the lobes broadly and mostly triangular, denticulate; the petiole much exceeding the blade: scape tall, 16-20 in. high, sparingly puberulent, bearing 3-4 superposed umbels which are 4-6-fld., and 1-2 in. apart: bracts small, almost subulate: fls. bluish lilac; calyx campanulate, somewhat strigose-puberulent with acute lobes; corolla cylindrical, the limb up to 1 in. across, with obovate, deeply bilobed lobes. China. The foregoing species may be difficult to separate from printed descriptions. In P. Kaufmanniana and P. polyneura, the ⅛-lobes are oval and few-toothed; the former has a glabrous and the latter a pilose calyx. In P. geraniifolia and P. Paxiana the lobes are triangular and many-serrate; in the former the corolla-tube is twice and in the latter thrice or more longer than the calyx.

V. MONOCARPICE.

Lvs. little if at all lobed; calyx leafy, often much enlarging after flowering: Chinese.

83. malacoides, Franch. FAIRY PRIMROSE. Fig. 3184. A slender and open grower, 8-20 in. high, larger and more branched than P. Forbesii, somewhat hairy below with white hairs, glabrous above: lvs. thin-papery, glabrescent, broad-ovate, under surface sometimes sparsely white-farinose, upper pale green, the base open-cordate, broadly 6-8-lobed, the lobes acutely incise-dentate; the petiole exceeding the blade: scape more or less exceeding the lvs., bearing 2-6 many-fld. superposed umbels which are distant from each other: bracts short, linear-lanceolate, acute, white-farinose below: fls. rose and lilac; calyx densely white-farinose, campanulate from a spherical base, with the lobes short, acute, and spreading; corolla-tube cylindrical, slender, the limb a little concave, ½-¾ in. across, with obovate lobes: caps. globose, included. China. Intro. 1908. G.C. III. 44:396, 397; 52:308. R.H. 1912:156. G. 31:53. G.M. 51:914; 56:917, G.W. 13, p. 42. Var. Alba, Hort., has white fls. Var. plena, Hort., has double fls. G.C. III. 54:428.—An excellent greenhouse species, blooming well in winter. Although perennial, it is usually treated as an annual; seed sown in spring should produce flowering plants in autumn. It blooms several months, bearing fls. in successive whorls on very slender stems, which sometimes reach a height of 18 in. It is now common in cult., and self-sows about the greenhouse. Several shades of color are represented, and also large-fld. forms which are possibly hybrids (see G.C. III. 58:180). The plant grows well out-of-doors in the

3183. Primula saxatilis. Often cultivated under the name of P. cortusoides. (Separate fls. × ½)
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rock-garden in mild climates, with some protection. Often confused with baby primrose (P. Forrsei), but the oblong long-petioled lvs. at once distinguish it, as well as the tall and open inf.

84. pseudomalacoides, Stewart. Much like P. malacoides, but more delicate in every way and said not to seed readily unless cross-pollinated; lvs. more prostrate, oblong. Yunnan, China. Intro. 1906.

85. Förbesii, Franch. Baby Primrose. Figs. 3185, 3186. Handsome slender species, monopodial in the form first intro., but a perennial as now known: loosely white-hairy, at least on the lvs. and lower part of the scape; lvs. small, 1-2 in. long, oval-oblong to cordate-oblong, shallowly sinuate-toothed, minutely serrulate: scapes very slender, 6-14 in. high, much exceeding the lvs., often bent above the whorls; fls. small (about ½ in. across), light lilac, slender-pedicelled, appearing in successive umbels or whorls, the segms. obovate, calyx sharply-toothed, small, somewhat loose. China; Burma, 3,000 ft. B.M. 7246. R.H. 1892, p. 259. G.C. III. 14:685; 35:20; 40:192. J.H. III. 49:257. R. H's. 39-149. A.F. 14:757. G.C. III. 1:140. F. E. 11:125.—Although first described so recently as 1886, and first exhibited in London in 1891, this plant was once a common conservatory plant in America. It is a most profuse bloomer, beginning to flower when not more than 2 or 3 in. high and continuing until the scapes reach a height of 10-12 in. It is easily grown from seeds, and blooms well all winter. Unless given plenty of light and room, the scapes become weak and crooked. In recent years it has dropped from favor with florists, its place being taken in part by

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III. MINUTISSIMA.

Plant very small or minute, producing stolons; lvs. toothed or crenate: Himalaya, Thibt. 86. minutissima, Jacq. Plant very small, stoloniferous, the stolons short and leafy: lvs. small, less than ½ in. long, sessile, spatulate-obovate or lanceolate, acuminate, dentate or crenate, more or less farinose below: scape very short, almost hidden among the lvs., 1-3-fld.: bracts 1-2, small; fls. strictly sessile, large in relation to the plant's size, purple, calyx glabrous, tubular-campanulate, split to the middle with acute lobes; corolla-tube slender, the limb ½ in. or less across, with obovate, deeply emarginate lobes. Himalayas.

VII. OMPHALOGRAMMA.

Lvs. little if any lobed; fls. solitary on a bractless scape, the calyx little or not at all enlarging after flowering: China, Himalaya.

A. Fls. appearing with or after the lvs.

87. vinciflora, Franch. Plant with a short perennial rhizome: lvs. thin, paper, oblong or oval, densely overlapping and forming a narrow erect crown, all erect or nearly so, the upper ones larger, all entire but ciliate, covered with reddish glands: scape short (6-9 in.): fls. solitary, purple-violet or blue, 1½ in. across, the tube cylindrical or long-obconic, yellowish at the base and covered with black glandular hairs outside; the segms. well separated and broadly obovate, the 3 upper reflexed on the tube; calyx small, not inflated. China. B.M. 9554; G.C. III. 1:574; 40:239; 54:186. G.N. 77, p. 497; 79, p. 242.—A most odd species, with vinca-like fls., of simple cultural requirements.

88. Ewesiana, King. Rhizome scale: lvs. about 4 in. long, including the petiole, ovate-lanceolate, very remotely and scarcely denticulate, almost subentire, leathery, acume, glabrous, gradually narrowed to a winged, puberulent petiole: scape stout, 4-6 in. high, without bracts, red-hairy, 1-fld.: fls. violet; calyx pubescent, parted almost to the base, with lanceolate-linear, subobtuse lobes; corolla-tube pilose, broadened toward the throat, the limb funnelform, with almost quadrato lobes which are slightly narrowed forward and are almost truncate and denticulate at their apex: caps. cylin­dric, equalling the calyx. Sikkim, Himal­aya.

AA. Fls. appearing before the lvs.

89. Delavayi, Franch. Plant slightly soft white-hairy pubescent: lvs. long-petiole, thin-papery, about 3 in. long and almost as broad, broadly ovate or suborbicular, the base more or less cordate, wavy-dentate or crenate; scape produced before the lvs., without bracts, 1-fld., densely pubescent, laxly enveloped up to the middle with fuscous, membranaceous, very broad scales; fls. bright purple; calyx broadly campanulate, deeply parted, with linear-lanceolate lobes about ½ in. long which are entire or denticulate and acute or obtuse; corolla outside pilose, the funnel form tube broad, slightly constricted above the base, then gradually broadened, the throat sprinkled with hairs, with oblong-ovate incised lobes: caps. ovate-oblong, ¾-1 in. long, ½ in. thick. S.W. China.

VIII. BULLATA.

Lvs. strongly rugose or bullate, hairy or glandular, more or less coriaceous, little if any lobed, small (2-4 in. long): fls. pedicelled: China, Thibet.

90. ovalifolia, Franch. Lvs. membranaceous, finally subcoriaceous, ovate, obtuse, crenulate or subentire, ciliate, contracted abruptly to the petiole which equals or is shorter than the blade and is more or less covered with red hairs: scape 6-9 in. high, equaling or shorter than the lvs., somewhat red-hairy: bracts lanceolate, acuminate: fls. purple; calyx open-campanulate, with lanceolate acuminate, hairy lobes; corolla-tube broadened to the concave limb, which is up to 1 in. across, with obovate slightly emarginate lobes. Cent. China. Intro. 1906. G.C. III. 38:70.

91. Förrestii, Balf. f. Beautiful undershrub of very recent intro., not farinose, with glandular fragrant foliage, and in its native places producing rootstocks 2-3 ft. long and probably in some cases 50-100 years old.: lvs. petiolate, ovate-elliptic, attenuate or sub-

92. rédeless, Balf. f. Allied to P. Forresteri and in foliage much resembling it but softer and more hairy: scapes 6–9 in. tall, bearing umbels of 12–20 fls. that vary in color from white to pale pink and splashed purple, with a small yellow eye. W. China; a very recent intro., and probably not yet tasted in this country.

93. carlels, Forr. Rhizome not woody: lvs. petiolate, 2–4 in. long, ovate or ovate-elliptic, densely pubescent beneath and mostly bulbil (puckered) above, at the base more or less attenuate, at the apex rounded, sinuate-crenate; scape 1–3 in. high, more or less woolly, 1– or 2-fld.: calyx broadly bell-shaped, lightly pubescent, the lobes triangular and acute; corolla purplish blue, the tube funnelform and throat shaped, lightly pubescent, the lobes ovate, crenate: scape 1–3 in. high, more or less pilose or canescent toward the top, bearing a simple 2–4-fld. umbel or 2 suppressed umbels: bracts short, subulate: fls. pale purple; calyx tubular, split nearly to the middle with narrowly triangular lobes; corolla-tube slightly dilated toward the top, the limb about 1½ in. across, with a small yellow eye. W. China; a very recent intro., and probably not yet tasted in this country.

94. gilbertae, Forr. Limb of corolla concave; calyx open-campanulate.

Lvs. membranaceous, rugose, gradually attenuate at base (rarely cordate): fls. pedicilled: handsome species: Eus. Asia. This is a group of spring-flowering plants to which the polyanthus and the true cowslip belong. They are much varied and hybridized, and the botany of them is therefore much confused.

X. CAROLINELLA.

Much like Bullatia, but lvs. larger: Asia Minor, China.

X. FALCACE.

Lvs. membranaceous, rugose, hairy, cordate at base, distinctly petiolate: infl. bracteate, about 2–3-fld. Japan.
Var. rufescens, Reichenb. ('P. rufescens', Duby. P. canescens, Opiz. P. officinalis var. canescens, Beck. P. panurica, Kerner). Calyx equaling or surpassing corolla-tube, more or less open-campanulate, about % in. long; corolla %—% in. across: lvs. contracted or narrowed into petiole, cano-tomentose or glabrescent below. Var. suaveolens, Reichenb. (P. Colonnae, Ten. P. officinalis var. Colonnae, Pax). Calyx campanulate; corolla-limb little concave or almost plane, about % in. across: lvs. ovate to oblong-ovate, cordate, densely white-tomentose beneath.

AA. Limb of corolla plane. b. Scapes evident. c. Fls. yellow.

98. elatior, Hill. Oxtrip. Lvs. rugose, membranaceous, ovate or oblong, the apex, obtuse, more or less contracted or narrowed to the petiole, crenulate or denticate, more or less pilose or canescent-tomentose below; the petiole more or less winged, shorter than or equaling the blade: scape more or less pubescent, 4—8 in. high, bearing a many-fld. umbel: bracts linear, acute, small: fls. pale yellow, turning green in drying, scentless; calyx more or less pubescent, 5-ribbed, tubular, with narrowly lanceolate acute lobes that are shorter than the tube; corolla-tube cylindrical, the limb flat, more or less than % in. across, with obcordate, emarginate lobes: caps. cylindrical or oblong, equaling or exceeding the calyx. Eu, especially in the mountains and the northern part, southeast to Caucasus and Persia. Gn. 62, p. 217. G.W. 15, p. 269.—Var. gigantea, Hort., is offered, with fls. more than 1 in. across, yellow predominating. For cowslip x oxlip, see New Phytologist, vi:162 (1907).

From the cowslip the oxlip differs in having the fls. more or less upright, the corolla-limb is plane and the throat is open without folds. The species is widely variable. Var. carpatica, Griseb. Lvs. ovate or oblong; the petiole more or less winged and the blade strongly rugose and crenulate: calyx usually ventricose-tubular before flowering: caps. cylindrical. Carpathians. Var. intricata, Pax. Lvs. ovate-elliptic, gradually narrowed into petiole, nearly glabrous, scarcely pubescent, reniform, or subentire, sometimes distinctly coarse-crenate, ashy tomentose or glabrescent; the petiole more or less winged: scape none; pedicels 2/—4 in. long, more or less equaling the lvs., soft-pubescent, as is the calyx: fls. pale yellow, or rarely purple or blue, becoming greenish in drying; calyx ovate-tubular, 5-ribbed with narrow-lanceolate, acuminate lobes; corolla-tube cylindrical, the limb flat, %—% in. across, with obcordate, emarginate lobes: caps. cylindrical, equaling or exceeding the calyx. Caucasus region to Asia Minor, in several varieties. B.M. 3252.

bb. Scapes none or nearly none, the umbels therefore borne in the foliage and the fls. standing singly on the long rays. c. Lvs. not white-tomentose beneath.

101. amena, Bieb. Lvs. submembranaceous, somewhat roughened or thin, narrowed to the petiole or abruptly and longer petioled, in which case the base is cordate or subcordate, sometimes minutely denticate or subentire, sometimes decidedly coarse-crenate, ashy tomentose or glabrescent; the petiole equaling the blade: scape 1—5 in. high, exceeding the lvs., bearing a many-fld. umbel: bracts short-lanceolate, acuminate; fls. purple or lilac, rarely white; calyx narrowly tubulate, with lanceolate acuminate lobes; corolla-tube cylindrical, the limb flat, %—% in. across, with obcordate, emarginate lobes: caps. cylindrical, equaling or exceeding the calyx. Carpathians.

cc. Fls. violet, rarely white.

102. acalis, Hill (P. vulgaris, Huds. P. veris var. acalis, Linn.). Primrose. Lvs. many, tufted, somewhat wrinkled, membranaceous, oblong or obovate-elliptic, apex obtuse, gradually rarely evenly narrowed to the petiole which is shorter than the blade, sometimes sessile, more or less pilose or glabrescent, crenulate; the petiole more or less winged: scape none; pedicels 2/—4 in. long, more or less equaling the lvs., soft-pubescent, as is the calyx: fls. pale yellow, or rarely purple or blue, becoming greenish in drying; calyx ovate-tubular, 5-ribbed with narrow-lanceolate, acuminate lobes; corolla-tube cylindrical, the limb flat, %—% in. across, with obcordate, emarginate lobes: caps. cylindrical, equaling or exceeding the calyx. Caucasus region to Asia Minor, is a hybrid of P. acalis and P. elatior. P. crobsselii, Hort., is probably a garden form of P. acalis or one of the hybrid derivatives. For pictures of various forms of P. acalis or vulgaris, see Gn. 7, pp. 319, 345; 11, p. 127; 12:496; 29, p. 355; 54:142. and pp. 142, 143. A.F. 13:1102. Gog. 6:245. R.H. 1880: 90; 1888:12. In cult., the primrose runs into many forms and colors, some of them double-fl. More or less caulescent forms (var. aculeata, HORT.) are probably hybrids.

103. polyanthla, Hort. Fig. 3188. A garden group supposed to be hybrids of P. veris or P. elatior and P. acalis, although some botanists refer it to P.
elatior direct, and some consider it to be a direct development of *P. acutus*, with elongated scapes. Whatever its origin, the group is distinct for garden purposes, and it is the commonest form of hardy primula known in American gardens. The fls. are several to many in an erect umbel that usually stands well above the long lvs.; the colors are mostly yellow and red-and-yellow, running into orange, bronze, and maroon, and sometimes pure white. Gn.M. 2:59.—There is a form with one corolla inside the other, known as duplex or hose-in-hose. The polyanthus is perfectly hardy, blooming in earliest spring. Prop. easily by seeds sown as soon as fully ripe; also by division. *P. variabilis*, as used in horticultural literature, usually refers to this Polyanthus group or to plants of similar origin.

cc. *Lea. white-omentumosae beneath.*

104. *Jülii*, Kusn. Lvs. thin, glabrous, reniform-ortubinate or ovate-ortubinate, base cordate, coarsely crenate, abruptly passing into the somewhat winged petiole which is 2–3 times as long as the blade: scape none; pedicels numerous, 2–3 times longer than the lvs.; fls. rose or red; calyx glabrous, narrowly tubular, andered, with narrow-lanceolate very acuminate lobes; corolla-limb flat, ¼– ½ in. across, with narrow deeply obcordate lobes. Transcaucasus. Intro. 1910. B.M. 8488. G.C. III. 51:293. B.H. 1914, p. 251. Gn. 78, p. 194. G. 35:327.—Said to be a free grower, liking moisture, and producing its red fls. in profusion.

XII. SOLDANELLODEE.

Lvs. more or less hairy or pubescent: fls. sessile or very nearly so: involucral bracts short and broad: Himalaya, China.

a. Infl. spicate.

105. *spicata*, Franch. Lvs. membranaceous, short-pubescent on both surfaces, petiolate, with the petiole 1½–3 in. long, ovate or oblong-ovate, obtuse, short-attenuate at base, double-serrate; the petiole narrowly winged and shorter or longer than the blade: scape slender, 2–3 times longer than the lvs., glabrous, short-puberulent toward the top: infl. elongated, 1-sided, spicate: bracts lanceolate: fls. sessile, horizontal or somewhat pendulous, violet; calyx campanulate, sparsely white-farinaceous, triangular, acute; corolla-tube short, abruptly dilated into a broad flattened cup-shaped limb, ovate, emarginate, the apex denticulate to entire: caps. globose, about equaling the calyx. China. Intro. 1908. R.H.S. 39:157.

aa. Infl. capitate or umbellate (fls. sometimes solitary).

b. Fls. several or many.

106. *Wättii*, King (P. Gillii, Hort.). Lvs. covered with flexuous white hairs especially on the nerves and margin, glabrescent, membranaceous, oblong-lanceolate, gradually narrowed to the petiole which equals the blade, coarsely crenate-dentate, the teeth entire or crenulate: scape 4½–6 in. high, many-fl., glabrous: bracts membranaceous: fls. sessile, nodding, violet; calyx open cup-shaped, membranaceous, with lobes which are quadrate or semi-ortubinate in outline and dentate; corolla glabrous, the limb broad-funneliform, broad-ortubinate, emarginate as well as crenulate. Sikkim-Himalaya. B.M. 8456 G.C. III. 51:286. Gn. 76, p. 191. R.H.S. 39:192.

107. *florida*, Balf. f. & Smith. Lvs. long-stalked, the blade ovate, covered beneath with white meal (farina): scape very much overtopping the lvs., which spread on the ground: fls. in umbel, short-stalked, with many calices, the corolla purple-blue, and rapidly fading to paler tint. Yunnan, China. G.C. III. 57:207.—A humus-loving species.

108. *dryadifolia*, Franch. Glabrous: lvs. small, ovate crenulate, contracted to a petiole about ¼ in. long or subcordate, white-farinaceous below or devoid of farina: scape 2–3 times longer than the lvs., puberulent, bearing 3–5 fls. which are clustered: bracts broad-ovate, sometimes tridentate, green or becoming purple, sparsely farinose: fls. subsessile, violet; calyx broadly campanulate, split scarcely to the middle with ovate, obtuse, entire or minutely crenulate lobes; corolla-limb flat, ½–¾ in. across, with noticeable 4-lobulate lobes: caps. ovate-oblong, about equaling the calyx. China. Intro. 1911.

109. *pinnatifida*, Franch. Lvs. clothed with soft, white hairs especially so on the nerves and margin, petiolate, 1½ in. or less long, ovate or oblong, base cuneate, entire, or else incised-lobed, the lobes quadrate or ovate, the lower and upper smaller, entire, the intermediate variously lobed; the petioles narrowly winged, equalling the blades: scape 2–3 times longer than the lvs., glabrous, somewhat farinate toward the top: bracts lanceolate, acuminate, frequently colored: fls. capitate, reflexed, violet; calyx becoming violet, sparsely golden-farinose, campanulate, with ovate, obtuse lobes frequently denticulate or crenate at the apex: corolla-tubes cylindrical, the limb cup-shaped, less than ½ in. across, with ovate, entire or scarcely emarginate lobes. China. Intro. 1908. R.H.S. 39:156.

110. *céruma*, Franch. Closely allied to *P. pinnatifida*, whose fls. have similar capitate infl., differs however in having the lvs. broadly ovate, short, indistinctly petiolate, margins scarcely conspicuously crenulate; bracts of the involucres ovate not lanceolate: calyx-lobes ovate, mucronate not rounded or crenulate at the apex: fls. blue. China.

bb. Fls. few or only 1.

c. Blossoms large for the plant.

112. unißósá, Klatt. Devoid of farina, small; lvs. small, membranaceous, sparsely white-villous, broad-ovate or orbicular-ovate, acute, base truncate or acute, incis-dentate or crenate; the petiole slender, equaling or exceeding the blade; scape slender, long, exceeding the lvs., 1-2-fld.: bracts minute, oblong; fls. large in relation to the plant, sessile, nodding, pale violet; calyx campanulate, membranaceous, deeply 5-lobed, the lobes quadrate, truncate, acute, frequently undulate-crenulate; corolla funnelform, the limb almost 1½ in. across with broad, coarsely dentate lobes; caps. globose. Sikkim-Himalaya. R.H.S. 39: 136.

113. pússiľa, Wall. Plant minute, cespitose, small-lvd., small-fl., and the habit of an androscæ: lvs. less than ¼ in. long, spreading-recurrent, spatulate or oblancculate, obtuse, pinnatifid, somewhat striose-pilose above, more or less puberulous below, the midrib stout, toward the base narrowed to a petiole which can scarcely be distinguished from the blade; scape slender, about 2 in. high, bearing 1-4 fls. in a head: bracts ovate-lanceolate: fls. purple or violet; calyx farinose, campanulate, with triangular acute lobes; corolla-tube densely villous at the throat, the limb with 3 in. across, with spreading, obcordate, emarginate lobes; ovary depressed-globose. Himalaya. B.M. 7079. R.H.S. 39: 205.

cc. Blossoms small for the genus; plant minute.

114. saffírina, Hook. f. Very small and densely cespitose, small-lvd. and small-fl., glabrous or nearly so; lvs. ¼-½ in. long, cuneo-spatulate or ovate, narrowed into petiole, pinnatifid: scape slender, 1-2 in. high, 1-4-fl.: bracts minute, lanceolate: fls. very short-peduncled, nodding, capitate or essentially so, violet; calyx, cup-like with triangular lobes; corolla funnelform, with short tube, scarcely surpassing the calyx, the limb about ½ in. diam., lobes ovate and emarginate. Sikkim, 12,000 to 15,000 ft. altitude. B.M. 6901.

XIII. CAPITATE.

Much like the Soldanelloidens, but bracts subulate or lanceolate: fls. sessile or pedicelled: W. Himalaya to China.

a. Fls. erect; calyx tubular-campanulate.

115. erósa, Wall. (P. capitáta var. críspá, Hort. P. denticuláta var. erósa, Duby). Glabrous or puberulous, 5-7 ft. high; lvs. appearing with the fls., not farinose, somewhat pubescent, slender reticulate-veined, obtusely-spatulate or oblancculate, obtuse, gradually narrowed to the petiole, which are commonly distinguished from the blade, sharply erose-denticate: scape slender, 8-10 in. high, much exceeding the lvs., bearing a many-fld. umbel: bracts small, triangular, farinose: fls. purple or violet; calyx open tubular-campanulate, the tube short, with lanceolate acute lobes; corolla-limb about ½ in. across, with obcordate emarginate lobes; caps. included in the calyx. Temp. Himalaya. B.M. 6010 A. G.C. 3, p. 130. Gn. 62, p. 131. G.L. 16:95. R.H.S. 39: 187.—Said to require a moist place or a bog

b. Fls. or the outer ones, reflexed, nodding or pointing downward; calyx mostly globose-campanulate. (Some of the plants of this group have been associated by Balfour as a section Muscarioides, with a muscari-like flower habit. "The characteristic feature of the group is the aggregation of small fls., which have tubular corollas with a short erect limb, in a close spike or capitulum, in which they are all inserted with the mouths of the corollas downwards."

n. Calyx-teeth acuminate.

116. denticuláta, Smith. Scapes 4-18 in. tall, bearing a dense umbel or head of pale purple fls.: lvs. in a rosette on the crown, usually not full grown until the fls. are past, and surrounded beneath by short, broad, thick, filifl.-like bracts; if-blades oblong-obovate or spatulate, usually narrowed into a winged stalk, sharply denticulate, more or less acuminate: corolla-tube about twice as long as the calyx-teeth, the corolla-lubes obcordate, Himalaya region, 7,000-13,000 ft., and said by Hooker to be "the commonest Himalayan primula, and very variable." The fls. are said to be eaten in salad and the powder of the roots to be used in killing leeches. Intro. 1842. B.M. 3895. B.R. 28: 47. Gn. 11, p. 127; 29. p. 382; 35, p. 529; 41, p. 588; 62, p. 215; 70, p. 161.


117. pseudodenticuláta, Pax. Glabrous; lvs. chartaceous, appearing with the fls., linear-oblong, obtuse or acute, scarcely noticeably denticulate, almost entire, not farinose, generally narrow, the tube of the calyx-stipe stiff, exceeding the lvs., 1½-4 in. high, sparsely farinose below the top, bearing a head of many fls.; bracts lanceolate, acuminate from a broad base: fls. lilac, the outer ones of the head opening long before the inner ones; calyx tubular-campanulate, white-farinose, with narrowly triangular, obtuse pllose lobes which do not turn black; corolla-limb annulate at the throat, about ¼ in. across, with broad-obcordate, deeply emarginate lobes. S. W. China. Intro. 1908. G.C. III. 53:264.—Another recent species of this group is P. nessésis, Forr., with bright pink fls., "of considerable merit" for both indoors and outdoors; scape slender and much overtopping the oblong-rugose or bullate lvs. R.H.S. 39: 160. It is said that this is the name for the plant that has been distributed as P. farinosa var. Deesi, and also for some of the P. pseudodenticuléata.

118. glábra, Klatt. Lvs. not farinose, membranaceous, small for the size of the plant (about ½ in. long, ovate-spatulate, obtuse, erose-dentate, attenuate into a narrow petiole-like base: scape slender, 2-3 in. high, bearing a close head-like umbel: bracts small, acute: fls. purple-violet, very short-peduncled; calyx tubular-campanulate, inesed or cut scarcely one-third the length, the lobes obovate and very obtuse; corolla-tube scarcely exceeding the calyx, the lobes narrowly obcordate and bifid. Sikkim-Himalaya, 12,000-15,000 ft., and more alpine. R.H.S. 39: 192.—Apparently still only very recently.

a. Fls., or the outer ones, reflexed, nodding or pointing downward; calyx mostly globose-campanulate. (Some of the plants of this group have been associated by Balfour as a section Muscarioides, with a muscari-like flower habit. "The characteristic feature of the group is the aggregation of small fls., which have tubular corollas with a short erect limb, in a close spike or capitulum, in which they are all inserted with the mouths of the corollas downwards."
XCII. A plant of Primula obconica.

1.20. pseudocapitata, Ward. A Chinese (Yunnan) representative of P. capitata, with smaller trusses of purple fls.; bracts cut. Intro. 1911.

1.21. spherocéphala, Balf. f. & Forr. Much like P. capitata, with small globular heads, the fls.; purplish inside, not annulate, bracts filibrate; delicately perfumed, S. W. China.—This and No. 120 are distinguished from No. 119 by the much smaller corolla-limb and more globular heads.

1.22. Giraldiana, Pax (P. muscaroïdes, Hemsel.) Not farinose, 8–12 in.: lvs. flaccid, very thin-membranaceous, glabrescent, the younger ones cobwebby-pilose below, especially on the nerves, narrowly oblong, acute or obtuse, lobulate-crenate-dentate, long-narrowed to a winged petiole which is shorter than the blade: scape 8–12 in. high, glabrous, bearing a many-fl.d., globose-cylindrical head: fls. strictly sessile, reflexed, blue; calyx open-campanulate, split below the middle, with ovate, acute, denticulate, ciliolate lobes; corolla-tube slender, the limb rather concave, about ½ in. across, with broad-ovate, entire, very obtuse not emarginate lobes: caps. globose, little exceeding the calyx. Shensi, in Central China. Intro. 1908. B.M. 6168. R.H.S. 39:153.—Said to require a moist and somewhat shaded place.

bb. Calyx-teeth obtuse.

c. Corolla-lobes less than half the exerted part of the tube.

1.23. deflexa, Duthie. Rootstock short and rather stout: lvs. rosulate, rather thin, 5–11 in. long, narrowly ob lanceolate, obtuse or subacute at apex, tapering to a long winged petiole, minutely white-hairy, irregularly crenate-dentate, the teeth with reddish gland-like tips: scape often 2 ft. high, much exceeding the lvs., bearing nearly globose heads about 1 in. diam. of crowded sessile deflexed dark blue or rose-purple fls. with a delicate blue center and which often turn whitish after expansion; calyx about ¼ in. long, yellow-farinose, unequal in lobed; corolla about ¼ in. long, glabrous, funnel-shaped, the lobes cuneate-oblong and broadly emarginate: caps. depressed-globose in form. W. China, 10,000–13,000 ft. altitude. Intro. 1906. R.H.S. 39:153.

1.24. bellidifolia, King. Puberulous: lvs. thin-flaccid, not farinose, oblongate or spatulate, irregularly sublobately dentate, obtuse, narrowed to a petiole more or less equaling the blade: scape 4–8 in. high, glabrous, exceeding the lvs., bearing a dense many-fl.d. head: bracts small, fls. reflexed, purplish blue; calyx open-campanulate, puberulent, split below the middle, with ovate obtuse farinose lobes; corolla-tube slender, the throat constricted, annulate, the limb about ⅙ in. across, concave, with obcordate lobes: caps. globose. Sikkim.

1.25. Watsonii, Dunn. Lvs. sessile and rosulate, 3–6 in. long, ob lanceolate, obtuse, long-attenuate at base, more or less ob lanceolate-erect, hirsute on veins and not farinose: scape strict, very much exceeding the lvs. (to 1 ft. high), glabrous, farinose at apex, bearing a small globose or ovate spike or head of many sessile deep purple fls. which are ¼–½ in. long: calyx broad-campanulate, the 5 broad-ovate ciliate teeth equaling the tube; corolla glabrous, dark purple, the tube cylindrical, the limb 13–16 in. long, the lobes truncate or obtuse: caps. ovoid. W. Szechuan, China.—Scapes powder yellow. Intro. 1911. R.H.S. 39:157.
an often obscure petiole, obtuse or rather acute, obliquely and sparingly denticulate or subentire, rarely sharply denticulate: scape exceeding the lvs. or (in alpine forms) more or less equaling them, 1½—10 in. high, bearing a densely fld. subumbellate head: bracts oblong-ovate: ob lanceolate, obtuse base produced below the place of insertion: fls. rose; calyx split one-third to one-half its length, with ovate, obtuse lobes which become black; corolla-limb less than ½in. across, with short obcordate lobes: caps. globose, about as long as the calyx. Persia and Afghanistan. G. 31:49.

131. involucrata, Wall. (P. Murali, Lindl. P. Traillii, Wilson). Fig. 3189. Not farinose: lvs. leathery, becoming somewhat glaucous or ovate-oblong, or deltoid-ovari-cular, obtuse, very entire or obliquely and minutely denticulate, subacute or rarely acuminate, not contracted to a petiole which exceeds the blade: scape much exceeding the lvs., 4—12 in. high, slender, bearing in 6—8 to many-flid. umbel: bracts linear, their base spurred with appendages: fls. white; calyx glabrous, tubular, 3-lobed, with narrowly triangular subacute lobes; corolla-throat annulate, yellowish, the limb about ¼in. across, lobes obcordate. Himalaya. F.S. 10:1023. G. C. III. 22:255. (replaced in Fig. 3189). G.W. 79, p. 107. R.H.S. 39:209.—Needs a moist position.

132. sibirica, Jacq. Plant wholly green: lvs. pale green, membranaceous, glabrous, elliptic-ovari-cular or ovate, rarely oval, with a tendency to be denticulate, suddenly contracted to a petiole which almost equals the blade: scape exceeding the lvs., 2—7 in. high, slender, bearing a lax, few-flid. umbel: bracts oblong, obtuse, their base appended-saccate: fls. lilac or pink; calyx glabrous, tubular, 5-ribbed, with short, rather obtuse lobes; corolla-throat noded, the limb about ¼in. across or less, with obcordate deeply emarginate lobes: caps. cylindric, exserted from the calyx.

Var. integrifolia, Pax (P. integrifolia, Eder. P. sibirica var. kashmiriana, Hook. f.). has fls. mostly smaller, the corolla-tube scarcely exceeding the calyx, and the corolla-lobes narrower. B.M. 6493. Var. brevicalyx, Trautv., has corolla-tube twice or more longer than calyx, Arctic and alpine regions of the northern hemisphere. B.M. 3167 (as P. sibirica); 3415 (as var. integrinna). G.C. III. 41:350 ("the small variety"). G. N. 78, p. 412. G. 37:247. G.M. 56:903.

133. conspersa, Hort. Veitch. Allied to P. sibirica: lvs. fine, but rarely serrate, about 1½ in. long and ½in. broad, erect, firm in texture, not farinose, fls. rather more rosy: scape about 9 in. high, farinose, bearing an umbel about 12-flid.: fls. about ¼in. across, pale lilac: later than P. farinosa and with taller scapes and larger fls. W. Kansu, China.

134. tibetica, Watt (P. pumilio, Pax). Not farinose; dwarf: lvs. leathery, glabrous, elliptic, acute or obtuse, very entire, contracted to a petiole which almost equals the blade: scape very short, ¼in. (frequently less) high, bearing 1—5 fls.: bracts linear-oblong, their base hardly gibbous; fls. rose or blue: calyx tubular, 5-angled, with short-triangular obtuse lobes; corolla-throat annulate, the limb hardly ½in. across, with deeply obcordate lobes: caps. long-exserted, exserted. High mountains of Tibet.

cc. Lj.-margin more or less denticulate.

135. Knuthiana, Pax. Farinose, not hairy: lvs. membranaceous, oblong-ovate or lanceolate, acute or obtuse, narrowed to a winged oblong-obovate to linear-acute or when obovate, obtuse, gradually narrowed to a petiole which equals or exceeds the blade, sharply denticulate or when mature wavy-crenulate, a little undulate: scape exceeding the lvs., 4—5½ in. high, bearing a many-flid. lax umbel: bracts broad subulate-annulate from the base which is scarcely gibbous: fls. violet; calyx open-campanulate, split to the middle with triangular acute lobes; corolla-throat constricted, the limb about ½in. across, with obcordate deeply emarginate lobes: caps. cylindrical, equaling to a winged depressed oblong-calyx, glabrous; lvs. membranaceous, 1½—2½ in. long, soft, obovate-lanceolate, oblong or spatulate, obtuse, sharply denticulate, narrowed into a winged petiole which equals or is shorter than the blade: scape exceeding the lvs., 5—7 in. high, bearing a lax, many-flid. umbel: bracts acuminate from a saccate base: fls. violet: calyx tubular-campanulate, not split to the middle, with slightly triangular, suboblong: corolla-tube not constricted at the throat, the limb about ½in. across, with narrowly obovate, deeply emarginate-bifid lobes: caps. glabrous, included in the calyx. Cent. China.

136. efarinosa, Pax. Not farinose, very glabrous: lvs. membranaceous, 1½ in. (more or less) long, oblong-ovate, obtuse, sharply denticulate, narrowed into a winged petiole which equals or is shorter than the blade: scape exceeding the lvs., 5—7 in. high, bearing a lax, many-flid. umbel: bracts subulate from a saccate base: fls. violet: calyx tubular-campanulate, not split to the middle with slightly triangular, suboblong: corolla-tube not constricted at the throat, the limb about ½in. across, with narrowly obovate, deeply emarginate-bifid lobes: caps. glabrous, included in the calyx. Cent. China.

137. dariilica, Rupr. Plant farinose or not so, glabrous: lvs. ¾—2¼ in. long, soft, obtuate-lanceolate, oblong or spatulate, obtuse, sharply denticulate, narrowed into a winged petiole which equals or is shorter than the blade: scape exceeding the lvs., 3—4½ in. high, bearing a lax, many-flid. umbel: bracts linear, their base somewhat saccate: fls. rose; calyx subglobose, split to the middle, with obturate, subacute, greenish lobes; corolla-limb less than ½in. across, with obcordate, bifid-lobed caps. calyx exceeding the calyx. Caucasus region. R.H.S. 39:160.

138. elliptica, Royle. Plant farinose or not so, glabrous: lvs. ½—2¼ in. long, soft, obtuate-lanceolate, oblong or spatulate, obtuse, sharply denticulate, narrowed into a winged petiole which equals or is shorter than the blade: scape exceeding the lvs., 3—4½ in. high, bearing a lax, many-flid. umbel: bracts linear, their base somewhat saccate: fls. rose; calyx subglobose, split to the middle, with obturate, subacute, greenish lobes; corolla-limb less than ½in. across, with obcordate, bifid-lobed caps. calyx exceeding the calyx. Caucasus region. R.H.S. 39:160.
fld. nodding umbel: bracts linear and obtuse, dilated and saccate at base, exceeding the short pedicles: fls. rose, ovate-lanceolate, obtuse, denticulate, gradually narrowed to a petiole which is very frequently scarcely distinguishable from the blade: scape exceeding the lvs., 4-6 in. in height, bearing a densely many-flanged umbel: bracts lanceolate acute, their base saccate-produced; fls. pale sulfur-yellow: calyx campanulate, split two-thirds its length, with lanceolate acute lobes; corolla-limb about ⅓ in. across, with obovate lobes. E. Caucasus regions. G.M. 58:264.

cc. Fls. rose, lilac, or purplish.

d. Corolla-tube little if at all exceeding the calyx, or only twice or less as long.

140. luteola, Rupr. Not farinose, glabrous: lvs. membranaceous, long lanceolate-elliptic, obtuse, denticulate, gradually narrowed to a petiole which is very frequently scarcely distinguishable from the blade: scape exceeding the lvs., 4-6 in. high bearing a densely many-flanged umbel: bracts lanceolate acute, their base saccate-produced; fls. pale sulfur-yellow: calyx campanulate, split two-thirds its length, with lanceolate acute lobes; corolla-limb about ⅓ in. across, with obovate lobes. E. Caucasus regions. G.M. 58:264.

PRIMULA

3190. Primula rosea. (X ½) in P. farinosa or keep many of them separate as species. The above description of P. farinosa is the inclusive one. More narrowly defined, it may be characterized as follows: lvs. obovate-lanceolate, farinose beneath: fls. variable in color and breadth of lobes, but usually pale lilac with yellow center, umbellate; calyx oblong-ovate, with linear teeth; corolla-limb flat; corolla-lobes obovate and rounded below, distant, as long as the tube: caps. twice as long as calyx.

144. scótica, Hook. The form in the extreme north of Scotland, on sandy heaths: half as large as P. farinosa: lvs. obovate-lanceolate: fls. bluish purple with yellow center: calyx swollen, the teeth short-ovate and blunt; corolla-limb flat, the lobes broadly obovate and about half the length of the tube: caps. scarcely exceeding the calyx.

145. modéstá, Bis. & Moore (P. farinósa subsp. modestá, Pax.). Treated as a subspecies of P. farinosa by Pax & Knuth; lvs. farinose, about ⅔ in. long and one-sixth as broad, spatulate, dentate-serrate: scape about 5 in. tall, 10-flanged: bracts setaceous: pedicels about 1 in. long: calyx campanulate. Japan. R.H.S. 39:189.

146. davúrica, Spreng. (P. farinósa subsp. davúrica, Pax.) Small or tall, 2-12 in. or more: lvs. 1-3 in. or more long, less than ⅔ in. wide, lanceolate or narrow-oblong-lanceolate, obtuse, nearly or quite devoid of farina, wing-petioled, very nearly or quite entire: fls. rose or lilac-rose, on filiform pedicels. Siberia, Mongolia, subarctic N. Amer.

147. mistassínica, Michx. (P. farinósa subsp. mistassínica, Pax. P. pusilla, Hook.). Plant small and slender, with only mere traces of meallness if any: lvs. only ⅔ in. long, stalked or not, spatulate or obovate, toothed or repand: scape about 6 in. tall, with few fls., the latter flesh-colored (rarely white) and shorter than...
149. **concinna**, Watt. Very small but very handsome species, the whole plant in the wild not more than 1 in. high and growing in cushion-like clumps: lvs. about 3/4 in. long, oblanceolate, acute or obtuse, entire or crenulate, yellowish farinose beneath: scape very short, not exceeding the lvs., with a 2-5-fld. umbel: bracts short, linear-oblong: fls. rose-purple varying to white, with notched yellow corona, the corolla-tube equaling the calyx, the lobes obcordate. High Himalayas; a charming alpine. R.H.S. 39:208.

150. **cognata**, Duthie. Lvs. rosulate, 1 1/2-3 in. long, obovate or spatulate, obuse, narrowed into a winged petiole, crenate-dentate and ciliate, farinose beneath and minutely puberulent above: scape about 9 in. high, farinose, bearing 6-12 pale violet-purple white-throated sweet-scented long-pedicelled erect or spreading fls.: bracts linear-lanceolate, ciliate: calyx 3/4 in. long, the tube prismatically angular, the lobes linear, obtuse, yellow-farinose; corolla-tube about twice exceeding calyx, the limb divided nearly to base, the lobes

151. **longifolia**, All. Farinose: lvs. oblong-obovate, rarely ovate, acute or obtuse, denticulate or subentire, gradually narrowed to a short, broad petiole which is scarcely distinguishable from the blade: scape stout, 4-12 in. high, rarely lower, bearing a many-fld. umbel: bracts acuminately from a broad base, frequently denticulate, base subsaccate: fls. violet, throat yellow; calyx often colored, angular, subtubular, the lobes 'saccate, acute or obtuse, very much shorter than the corolla-tube; corolla-limb about 3/4 in. across; stamens always inserted on the corolla-throat: caps. cylindrical, more or less exceeding the calyx. S. W. China. Intra. 1908. R.H.S. 39:165.

152. **Gambeliana**, Watt. The buds farinose: lvs. long-petioled, almost orbicular, about 3/4 in. diam., membranaceous, base cordate, dentate; the petiole longer than the blade: scape 4 1/2 in. high, exceeding the lvs., glabrous, bearing 2-7 fls.: bracts lanceolate, acute; fls. purple; calyx minutely puberulous, campanulate, split below the middle, with lanceolate acute lobes; corolla-tube broadened toward the ringless throat, the limb 3/4-1 in. across, with obcordate emarginate lobes. Sikkim-Himalaya. R.H.S. 39:122.

153. **grändis**, Trautv. Plant short, tall, large-fld., not farinose: lvs. about 6 in. long, 5 in. broad, chartaceous, wrinkled, ovate or oblong, base cuneate or subcordate, irregularly twice-crenate, very lightly powdery-puberulent below; the petiole narrowly winged, exceeding the blade: scape stout, exceeding the lvs., bearing a many-fld. umbel: bracts short, lanceolate-linear, acuminate: fls. borne on filiform pendulous pedicels, pale yellow; calyx campanulate, 5-ribbed, cut one-third of length with triangular acute lobes; corolla-tube cylindrical, with erect oblong-linear, obtuse subulate lobes which have a broad sinus between them; style long-exserted: caps. cylindrical, exceeding the calyx. Caucasian. Gt. 1879:968.

154. **muscoides**, Illegh. f. Plant minute, densely capitate, very glabrous, not farinose: lvs. spatulate or ovate-oblong, convex, sessile, apex subtruncate, narrowed toward the base, coarsely toothed toward the top, the broad midrib produced beyond the petals: bracts small, ovate; fls. sessile, subaxillary, 2-bracted; calyx split below the middle, cup-shaped, with triangular acute lobes; corolla-tube slender, cylindrical, the limb about 3/4 in. across, with narrowly obcordate, emarginate lobes, Sikkim-Himalaya.

155. **bella**, Franch. Plant slender, capitate, glabrous: lvs. from 1/2 to about 1 in. long, including the petiole, which equals or exceeds the blade, white-farinose below, ovate or suborbicular, incise-lobed, the lobes narrow, linear, acute or mucronate, narrowed to a very narrowly winged petiole: scape exceeding the lvs., 1-2-3-fld.: bracts lanceolate, acute, entire or tridentate at the apex: fls. violet-purple; calyx open-campanulate, split to the middle, with deltoid-ovate, acute lobes sometimes tridentate at the apex; corolla-tube cylindrical, the limb densely white-hairy at the throat, 3/4 in. across, with obovate-cuneate lobes which are bilobulate below the middle: caps. oblong, small, included in the calyx. S. W. China. Intra. 1908. R.H.S. 39:165.

156. **yunnnanensis**, Franch. Plant rather small, glabrous: lvs. 1/2 in. or less long, including the petiole, which is shorter than the blade, obovate-oblong, narrowed to the winged petiole, frequently farinose below, crenulate: scape 3-4 times longer than the lvs., bearing 1-2 fls. on pedicels about 1/4 in. long ("in pairs on long slender stalks"); bracts lanceolate, acute; fls. violet-purple; calyx open-campanulate, split to the middle, with deltoid-lanceolate lobes, spreading after flowering and displaying a mealy upper surface; corolla-tube slender; the limb 3/4-1 in. across, not very concave, with deeply bilobulate lobes: caps. ovoid, small, included in the calyx. Yunnan, China. Two recent species allied to this are P. bischanenensis, and P. umbrilldr. Intra. 1908. R.H.S. 39:165.

158. umbellata, Forr. Farinose, with short scape: lvs. oblong-pointed and irregularly dentate: fls. 5 or 6, lilac-purple, deflexed; calyx, lobes long and pointed. W. China, Intro. 1908. R.H.S. 39:168. "...The bracts radiate from the top of the scape, each one forming a channel in which a pedicel, twice the length of the bract, lies."

XVIII. Petiolares.

Lvs. in rosettes, glabrous, or nearly so and mostly narrowed to their insertion, dentate, the midrib wide: fls. large, pedicelled, umbellate, the scape mostly short, sometimes long: caps. globose: Himalaya, China.

159. petiolaris, Wall. Glabrous, with or without farina or meal: lvs. membranaceous, rugose, polymorphous, the petiole long or short, the blade oblong or roundish in outline and more or less irregularly erose-denticulate: scape short or even none, sometimes equaling or exceeding the lvs., bearing long-pedicelled white, rose or pale purple fls.: calyx tubular or narrowly tubular-campanulate, somewhat enlarging after flowering, the lobes narrow and acute; corolla, limb about 1 in. across, the lobes obcordate and emarginate, crenate or dentate: caps. globose, included in the dilated calyx-tube. Himalaya.—Perhaps not in cult., although P. Winteri, by some regarded as a form of it, is in gardens.


XIX. CANKRIENIA.

Lvs. nearly or quite glabrous, membranaceous or paper-like, serrulate or denticulate, narrowed to the petiole: fls. in superposed umbels: caps. globose: China; also Japan, Himalaya, Java, N. Amer.

a. Fls. yellow.

161. imperialis, Jungh. Tall, stout, not farinose, the inf. excepted, glabrous: lvs. 4–16 x 2 1/2–4 1/2 in., elongate-ovate or spatulate, obtuse, long-narrowed to a winged petiole which is shorter than or rarely equal to the blade, wrinkled, finely denticulate, the very broad midnervc produced beyond the blade: scape stout, much exceeding the lvs., 16–30 in. or more high, bearing several many-fl. superposed umbels which are 2–3 in. apart, more remote in fr.: bracts lanceolate from a broad base, acuminate; fls. golden yellow; calyx open-campanulate, farinose or not so, with short, broadly triangular acute lobes; corolla-tube slightly dilated toward the ringed throat, the limb crowded about 3/4 in. across, rarely less, with obcordate or emarginate lobes: caps. globose, included in the calyx. Mountains of Java. B.M. 7217. Gn. 40:206; 61, p. 272. G.M. 34:738, 759. —Not hardy N. The noblest of all our species, the scape rising 8 1/2 ft., and bearing 5 or 6 whorls of deep yellow fls. of firm substance. Once confounded with P. prolifera, from which it differs, according to Hooker, in "the more robust habit, the thicker texture, broader midrib, close reticulate nervation, and bullate surface of the foliage and its deeper colored flowers."

162. serratifolia, Franch. Lvs. long-elliptic or oblong, sharply irregularly serrate, rugose above, broad at the end or only short-acute; scape slender, much exceeding the lvs., bearing a few few short but slender drooping pedicels; corolla pale yellow with lemon-tinted blotch in center. S. W. China. —Apparently confused in the descriptions, the P. serratifolia of Pax’s monograph, is a chimera including P. Beesianu, P. pulverulenta, and P. serratifolia." Intro. 1908. R.H.S. 39:173.

163. Bullöynia, Forr. Plant 1 1/2–2 1/2 ft. tall: lvs. paper-like, ovate-lanceolate, rounded or acute at apex, narrowed into a short winged petiole, sharply irregularly toothed, glabrous and lightly hispid above: scape tall and strong, farinose at apex, bearing 5–7 superposed umbels each 15–17-fl.: bracts linear, farinose when young; fls. faintly fragrant, deep reddish orange, in bud deep brownish crimson, on spreading or drooping pedicels that are erect after anthesis; calyx campanulate or in fr. cup-like, the lobes triangular to subulate; corolla-tube cylindrical to funnelform, the limb nearly 1 in. across, the lobes obovate to roundish: caps. ovoid, scarcely exceeding calyx. Yunnan, China, 10,000–11,000 ft.—Named for A. K. Bailey, England, for whom Forrest collected in China. Intro. 1908. G.C. III. 46:16, 17. J.H. III. 68:103. R.H. 1911, p. 467. G.M. 52:403. G.35:325. R.H.S. 39:172. Produces heavy rosettes and fl.-sts. 2–2 1/2 ft. tall; a moisture-loving species, and apparently adapted to cultivation in this country.

164. helodöxa, Balf. f. A very recent addition to this group, collected in 1912 in China and intro. into Great Britain in 1915. It is described as a magnificent plant of strong growth, producing many whorls of dark yellow fls. Intro. 1913.

165. Cockburniäna, Hemsl. Glabrous: lvs. membranaceous, 2–4 in. long, obovate-oblong, obtuse, the young ones more or less puberulent, soon becoming bare, obscurely lobed and at the same time minutely or obsolescently dentate, narrowed toward the base but scarcely petiolate: scape slender, 4–18 in. high, bearing 2 superposed 3–6-fl. umbels: bracts minute: fls. yellow; calyx farinose, narrowly campanulate with deltoid acute lobes; corolla-cylindrical limb, the limb scarcely 1 in. across, with obcordate spreading retuse lobes. W. China. Intro. 1906. B.M. 8973. G.C. III. 37:331; 40, 231, 249. R.H.S. 39:172. Useful for pots and also planted out. P. "Unique," offered by Bees, in England, is a hybrid between P. Cockburniana and P. pulverulenta. fls. cinnamon-red, in tall graceful spikes (see No. 31).

AA. Fls. white, rose, or purple.

b. Scape pilose.

166. sonchifolia, Franch. (P. gratissima, Forr.). Lvs. papery, 6–8 in. long, glabrous, sprinkled with raised dots, oblong or obovate-oblong, obtuse, double-sinuate, the mature ones subruncinate, the teeth or somewhat reflexed, sharply denticulate: scape about equaling the lvs., thick, the top as well as the pedicels and the calyx very shortly seahrobs, bearing a simple umbel: bracts very short, ovate-triangular: fls. violet: calyx tube narrowly campanulate, the limb about one-third its length, with ovate, obtuse lobes; corolla-tube broadened toward the throat, the limb 1/4–1 in. or more across, slightly concave with obturate shortly emarginate lobes: caps. globose, included in the calyx. S. W. China. G.C. III. 47:98.

BB. Scape pulverulent or farinose.

167. pulverulenta, Duthie. Resembles P. japonica in general habit, but distinguished by its silvery-farinoso scape and inf. and by the deep rose-purple or violet-colored fls., also by the long and gradually

360. Scapo glabrous, or at most only puberulent.

 correlated anuulate.

168. japonica, Gray. Plant glabrous, tall, not nearly except the calyx: lvs. 4-6 by about 2 in., ob ovate-oblong or spatulate, obtuse, membranaceous, sharply and irregularly dentate, gradually narrowed to a winged petiole, shorter than the blade, and with a sheathing base: scape tall, much exceeding the lvs., 8-24 in. high, bearing several-many-fl. superposed umbels: bracts linear-subulate: fls. purple, rarely rose or white; corolla-tube slender, nearly isodiametral, the limb somewhat concave, almost 1/2 in. long; corolla-limb more than 3/4 long, the obcordate lobes nearly 3/4 in. across, with odorate emarginate lobes: caps. globose, shorter than the calyx: B.M. 1872:257; var. lilacina, Hort., lilac: var. splendens, 174, Parryi, Gray. Plant glabrous or minutely puberulent, tall, stout, many times longer than the lvs. on pedicels which are soon nodding; calyx tubular-campanulate, with obcordate emarginate lobes: bracts linear-subulate: fls. rose· borne from the blade: scape tall, stout, 8-16 or 20 m. tall, more or less cleft about the middle or below, tubular-campanulate, with ovate lanceolate, acute at apex, narrowed to petiole which more or less in the purplish fruiting calyx. Formosa. 13.M.8606.

171. Wilsonii, Dunn (P. angustidens, Pax, in part). Plant aromatic: lvs. green (not glaucescent), tending to recurve rather than to incurve, rarely 8 in. long or more than 1/2 in. broad: fl-stalks and calyx usually glaucous and red-striate; season of bloom early. Intro. 1890. A very promising species.

172. ob lanceolata, Balf. f. (P. angustidens, Pax, in part). Plant like P. Wilsonii: not aromatic: lvs. glaucous, ob lanceolate or strap-shaped, always narrow (about 1 in. wide) and often more than 1 ft. long, flat, curving outward from the base, the margins with sharp and rigid small teeth: calyx not shining; corolla-limb longer than that of P. Wilsonii, flat on expansion, tube whitish inside and outside, the lobes acute: fl. ovoid with conical summit, partially inclosed in calyx, the fr-stalks not rigidly appressed.

173. Miyabeana, Ito & Kawak. (P. japonica var. Miyabeana, Ito). Lvs. oblong-ovate to wide-ob lanceolate, acute when young but later obtuse or rounded, to 8 in. long, somewhat narrowed at base, glabrous on both surfaces, fleshy beneath at first but becoming nearly or quite destitute of meal, the margin irregularly dentate: scape 1-2 ft. high, and much exceeding the lvs., bearing several superimposed, 6-10-fl. whorls, with pedicels to 1/4 in. long: bracts 1/2-3/4 in. long, narrow and acute: calyx mealy within, the lobes defold and shorter than the tube; corolla purple, the tube more than 3/4 in. long, the oborate lobes nearly 3/4 in. long; caps. oblong or globose-oblong, inclosed in the purplish fruiting calyx. Formosa. B.M. 8606.

Closely allied to P. Poissonii.

174. Párryi, Gray. Plant glabrous or minutely puberulent, tall, robust, not farinose: lvs. more or less than 8 in. long, 1-2 in. broad, fleshy, narrowly ovate-oblong, obtuse or subacute and then mucronulate, entire or minutely denticate, almost sessile, narrowed to a winged petiole which is scarcely distinguishable from the blade: scape tall, stout, 8-16 or 20 in. tall, bearing a simple 1-sided, many-fl. umbel: bracts oblong-lanceolate, acute: fls. fragrant, purplish: calyx glabrous, split to the middle, the tube ovoid, with triangular acute often purplish lobes: corolla-tube broadened toward the ringless throat, the limb with a golden mouth, 1 in. across, with oburate, emarginate lobes: caps. oblong, included in the calyx. Rocky Mts., Idaho and Colo. to Ariz. B.M. 6185. G. 1877, p. 65.—According to Nelson, "a handsome plant but very rank smelling; along subalpine brooks." Often 1 ft. and more high.

175. Rúbbyi, Greene. Not farinose (except the infl.), slender and small for the section: lvs. 2-3 in. long, ob lanceolate, subobtuse, membranaceous, denticate, narrowed to the narrow winged petiole which more or less equals the blade: scape slender, 1/2-6 in. high, slightly exceeding the lvs., bearing a simple 6-10-fl. umbel: bracts ovate-lanceolate: fls. bright; rose borne on pedicels which are soon nodding: calyx tubular-campanulate, split almost to the middle, fleshy, with narrowly lanceolate, acute lobes; corolla-tube slender-cylindrical, the limb somewhat concealing, almost 3/4 in. across, with oburate emarginate lobes. Mountains in Now Mexico, Ariz. B.M. 7032. G.C. III. 51:190. J.H. III. 51:89. Gn. 78, p. 388.
Lvs. glabrous or nearly so, nearly coriaceous, bluntly toothed: fis. in umbels, very nearly sessile or short-pedicellate; caps. globose: Turkestan to China.

a. Calyx cut scarcely to the middle.

b. Calyx cut to the middle or beyond.

c. Lobes of calyx acute.

d. Lobes of calyx obtuse.

Lvs. membranaceous, not farinose, narrowly oblong, obtuse or subobtuse, finely dentate, narrowed to a short winged petiole which is scarcely distinguishable from the blade or even sub sessile; seape 6-10 in. high, much exceeding the lvs., white-farinose at the top, bearing a simple umbel or 2 supereosed and a short distance apart: bracts lanceolate, acute, white-farinose margined: fis. somewhat nodding, purple; calyx campanulate, not split to the middle, purplish green, the lobes triangular, subacute and glabrous; corolla-tube obconical-dilated above the calyx, the limb concave about 1/2 in. across, with broadly ovate, subtruncate, slightly emarginate and at the same time frequently undulate-suberectulate lvs. Cent. China. Intro. 1905. B.M. 8585. G.C. III. 37:390; 40:209. R.H.S. 39:161.—The calyx is banded or etiulate with white farina.

b. Brevisepala, Forr. Glabrous and not farinose: lvs. papery-like, very broadly ovate-elliptic, serrate, attenate into short winged petiole: seape slender, 4-8 in. high and much exceeding the lvs., bearing a 4-12-fid. inflorescence somewhat drooping umbel: bracts small, broad-lanceolate, acute; fis. faintly fragrant, pedicellate, deep blue; calyx purplish green, with broad-lanceolate acute lobes; corolla-broad-tunneliform, the tube equaling or exceeding the calyx, the limb 2/3 to nearly 3/4 in. across, long and obtuse and equaling the tube; cGrolia scarcely cut to the middle, purplish green, the lobes triangular, acute: fis. golden yellow; calyx farinose. tubular, split to the middle, with lanceolate acute lobes. W. China. Intro. 1906. B.M. 8135.

Crevices and ledges of limestone cliffs, Lichiang Range, Yunnan, 11,000-12,000 ft. altitude. Intro. 1908. R.H.S. 39:161.

m. Microdena, P. sikkimensis, Hook. Very like P. sik­kimensis, but distinguished by the suborbicular-ovate glabrescent lvs. with a petiole as long as the blade, irregularly toothed; corolla at least twice as large as calyx, deep yellow and attractively veined. W. China. Intro. 1912.


b. Orbiicularis, Hemsl. Similar in foliage to P. Cockburniana and P. sanguina, but very different in fis.; most nearly allied to P. sikkimensis and P. Stur­artii, from which it differs in having nearly entire lvs., tube of corolla, which scarcely exceeds calyx, con­stricted near the top and below the middle at the inser­tion of the very short stamens, and in the limb of the corolla which is flat and with entire lvs. Lvs. somewhat coriaceous, oblong-lanceolate, 2-6 in. long, obtuse, longitudinally recurved, minutely dentate; seape about 1 ft. high, yellowish or whitish farinose, bearing an umbel of 5-7 yellow fragrant pedicellate fis.: calyx thick, campanulate, scarcely 3/4 in. long, the lobes ovate and oblong and equaling the tube; corolla scarcely exceeding calyx-tube, the limb orbicular and about 1 in. diam., the lobes orbicular. W. China. Intro. 1906. B.M. 8135. G.C. III. 39:403.

185. Sturartii, Wall. An exceedingly variable Himalayan species with drooping yellow fis. in a terminal umbel: radical lvs. 5-10, narrowly oblanceolate, acute, sharp-serrate or sometimes entire. J.H. III. 37:445. G. 4:589. G.M. 52:869. J.F.2:69. R.H.S. 39:161.—P. sik­kimensis is a fine alpine species from altitudes of 11,000 to 15,000 ft. and more, covering large areas with fragrant light yellow bloom; considered to be extremely easy to grow along water-courses or in other moist places, but requiring shade.

Lvs. membranaceous, oblong-oblanceolate, 2-6 in. long, obtuse, long -itudinally recurved, minutely dentate; seape about 1 ft. high, yellowish or whitish farinose, bearing an umbel of 5-7 yellow fragrant pedicellate fis.: calyx thick, campanulate, scarcely 3/4 in. long, the lobes ovate and oblong and equaling the tube; corolla scarcely exceeding calyx-tube, the limb orbicular and about 1 in. diam., the lobes orbicular or nearly so. Asia Minor to China and far north; N. Amer.

a. Fis. yellow.

b. Fis. crimson.

c. Fis. crimson and white.

186. Etohoga, Watt. Glabrous; lvs. about 4 in. long, membranaceous, ovate, oblong, crenulate, sometimes entire and not so below, gradually narrowed to a short, winged petiole; seape slender, the seape reaching 2 ft.; fis. 4-5 x 1-1/2 in. narrowly obovate-spatulate, obtuse, wrinkled, sharply double-serrate, subequally narrowed to the petiole; seape elongated, 8-14 in. high, bearing a many-fid. umbel: bracts narrow, subulate-acuminate from a broad base: fis. slightly drooping, yellow; calyx farinose, 5-ribbed, tubular-campanulate, not split to the middle, with triangular acute frequently recurved lobes; corolla-tube funneliform-broadened, the limb concave, flattened up to 1 in. across, with roundish emarginate lobes; caps. subglobose, extending the calyx. Himalayas; reported also from China, but the oriental forms may be distinct. Two of them, also in cult., are Nos. 182 and 183. B.M. 4597. Gt. 1876, p. 321. G.C. II. 19:824; 25:528. G. 4:589. G.M. 52:869. J.F. 2:169. R.H.S. 39:161. 

—P. sikkimensis is a fine alpine species from altitudes of 11,000 to 15,000 ft. and more, covering large areas with fragrant light yellow bloom; considered to be easy to grow along water-courses or in other moist places, but requiring shade.
ened, the limb concave, 1 in. across, with ovate, truncate, emarginate and crenulate lobes. Sikkim-Himalaya.

187. *szechuanica*, Pax. Glabrous and not farinose: lvs. 2-3 in. long, thin-membranaceous, oblong or oval-oblong, suberosse-denticate, acute, narrowly to winged pediole: scape to 8 in. or more high, stout, bearing an umbel of 6-10 yellow fls.: bracts triangular, acuminate: fls. nodding; calyx green, 5-ribbed, about 13/10 in. long, tubular, inseed about one-third of the way, the lobes acute and subacute; corolla-cylindrical, the limb nearly 21/3 in. across, the ovate lobes reflexed. Szechuan, China.

AA. Fls. purple or violet, rarely white.

b. Corolla-lobes reflexed.

188. *Maximowiczii*, Regel. Glabrous, not farinose: lvs. distinctly petioloed or almost subessee, narrowly elliptical or elliptico-oblong, acute, densely denticulate or subentire, base entire, petiole winged, equaling the blade, sheathing, spreading at the base, white, rarely almost none: scape many times longer than the lvs., 8-16 in. high, glabrous, not farinose, stout, bearing a simple numerous-fid. umbel or superposed umbels: bracts long-acuminate from a broad base: fls. dark purple; calyx campanulate, green, 5-ribbed, cut one-third the length, with tubular, very acute, somewhat recurved lobes; calyx-sheath slender, nodding, the limb acute, crenate-dentate or subentire, 21/3 in. across, with reflexed oblong lobes, neither retuse nor emarginate: caps. frequently much exceeding the calyx. N. Cent. China. Intro. 1911. B.M. 8363. G.C. III. 47:221; 53:267. Gn. 77, p. 208. R.H.S. 39:153.

189. *tanghica*, Pax. Glabrous, not farinose: lvs. almost sessile, 2-3 in. long, oblong or oval-oblong, acute, narrowly towarded the base, very entire or slightly denticulate, the very broad, white midriever produced beyond the blade: scape stout, 14-16 in. high, glabrous, bearing superposed umbels: bracts long-acuminate from a broad base: fls. 4-6 to an umbel, soon drooping, purple; calyx glaucen, tubular-campanulate, cut one-third its length with triangular acute ciliate lobes; corolla-limb 31/3 in. across, with narrowly linear lobes. N. China. Intro. 1906. B.M. 8043. G.C. III. 38:42.

aa. Corolla-lobes not reflexed.

190. *nivialis*, Pall. Glabrous, farinose or not so: lvs. 3-5 in. long, ovate-oblong or lanceolate, obtuse or subacute, margin often recurved, crenate-dentate or subentire, gradually narrowed to a winged petiole which is shorter than and very often scarcely distinguishable from the blade: scape robust, 9-16 in. high, exscaig the lvs., bearing a many-fid. umbel, rarely 2 superposed: bracts subulate-acuminate from a broad base: fls. erect, purple or white; calyx frequently farinose, cup-shaped, split below the middle, with lanceolate, acute or rather obtuse lobes; corolla-limb 1/3 in. across, with obtuse, retuse lobes: caps. frequently twice the length of the calyx. Caucasus to the Himalayas and China, northward to the Baikal and Dahuria.—A variable species, with well-marked geographical forms. The white-flowered plant in cult. as *P. nivalis* is a form of *P. hilaria* (No. 16).

191. *purpurea*, Royle (P. nivialis var. purpurea, Regel. *P. Sibirica var. purpurea*, Watk.). Lvs. obovate-spatulate, nearly entire: fls. purple, in compact umbels: caps. often twice length of calyx. Thibet, etc., 10,000-14,000 ft., on exposed hillsides, but seeking the shade of overhanging banks. Gn. 31:442; 62, p. 131.—Correvon describes it as a stout, strong-looking plant, with stiff upright slightly toothed lvs., dark green above and bright white generally yellowish beneath, long and narrow: fls. very dark purple, numerous, drooping because of the length of the pediole, which, with the st., is covered with white powder; corolla deeply cut above 8-12 in. high.

192. *turkestanae*, Regel (*P. nivialis var. farinose*, Schrenk). Smaller: lvs. 2-3 in. long, and about 1 in. wide, elliptico-oblong, crenate-dentate or dentate or rarely nearly entire, densely farinose beneath and on the lvs. margins: fls. sometimes in superposed umbels; pedicels short; calyx and corolla purplish. Turkistan.

193. *sinopurpurea*, Balf. (*P. nivialis var. sinensis*, Pax). Said to be a "splendid species, enveloped in golden meal!": robust: lvs. entire: fls. purple, on short pedicels, often in superposed umbels; calyx densely farinose inside and out; corolla-cylindrical; the limb nearly 23 in. across, the ovate lobes reflexed. Szechuan, China.

AA. Fls. purple or violet, rarely white.

b. Corolla-lobes reflexed.


195. *pulchella*, Franch. Glabrous: lvs. 2-4 in. long, yellow-farinose beneath, linear, ovate or oblong, obtuse, revolute, minutely denticulate, long-narrowed toward the base: scape 8-12 in. high, stiff, bearing a many-fid. umbel: bracts lanceolate or linear: fls. erect, violet; calyx golden farinose, finally bare, split below the middle, with lanceolate acute narrow-oblong; calyx-lobes which are white striate between. Early spring. E. Ore.—Offered by dealers in native plants.


197. *Cusickiana*, Gray. Scapes 6 in. or less tall, each bearing 2-4 violet or white fls.; lvs. oblong-spatulate or narrow-oblong, about 2 in. long, entire or very rarely toothed: involucr-branches 2 or 3, conspicuous, unequal: corolla-lobes 21/3 in. across, with shortly oblong or oval, sometimes entire lobes: caps. ovate, obtuse, more or less equaling the calyx. S. W. China. Intro. 1908. G.M. 50:962. R.H.S. 39:161.

198. *pulchella*, Franch. Glabrous: lvs. 2-4 in. long, papery, golden farinose below when young, finally becoming bare, oblong or ovate-oblong, finely and evenly serrulate, acute, narrowed to a winged petiole which is scarcely distinguishable from and equaling or shorter than the blade: scape exceeding the lvs., 8 in. or more high, stout, bearing a 1-sided, 6-10-fid. umbel: bracts triangular, acuminate: pedicels soon nodding, secund: fls. bright violet; calyx dark purple, marked with 5 white lines, ovate-campanulate, split to the middle, with deltoid, lanceolate, acute lobes; corolla-tube cylindrical, the limb funnelform, 31/3 in. across, with broadly ovate scarcely emarginate lobes. S. W. China. Intro. 1908. G.C. III. 55:357. Gn. 78, p. 284. R.H.S. 39:160.

XXII. MACROCARPÆS.

Lvs. glabrous or nearly so, contracted into a pediole and cuneate or rounded at base, toward the apex usually toothed: caps. cylindrical or ovoid; China, Japan, N. Amer.

199. *Fairiei*, Franch. Lvs. distinctly petioled, sulfur-farinose below, 3/4-2 in. long, membranaceous, ovate or oblong-ovate, obtuse, crenulate-dentate or almost subentire, gradually narrowed to a wingless or narrowly winged petiole: scape more or less exceeding the lvs., 2-4 in. high, bearing a several- to many-fid.
umbel: bracts linear-subulate; fls. rose; calyx narrowly campanulate, split nearly to the middle, with lanceolate acute, and corolla-tube cylindrical, the limb flat and about 3½ in. across, with triangular-obcordate, deeply emarginate lobes, the lobules divaricate: caps. cylin-derial, much exceeding the calyx. Japan.

200. *sufruticosens*, Gray. Rhizomatous, parts above ground branched and woody; plant not farinose, glabrous: lvs. about 1 in. long including the petiole, cuneate-spatulate, obtuse, leathery, top 5-7-toothed, long-narrowed toward the base to a winged petiole which is scarcely distinguishable from the blade: scape 4-5 in. high, bearing a many-fld. umbel: bracts lanceolate, acuminate: fls. reddish purple; calyx campanulate, split almost to the middle, glandular-puberulent, with lanceolate, acute lobes; corolla-tube pale, gradually broadened toward the throat, the limb ½-3½ in. across, with obcordate, emarginate lobes. Calif.: alpine.


**L. H. B.**


**PRINOS:** *Ilex.*

**PRINSEPIA** (after Macaire-Prinsep, botanist at Geneva, Switzerland). Including *Plagiospermum.* *Rosaceae,* subfamily *Prinseo.* Woody plants, chiefly grown for their early-appearing flowers and bright green dense foliage.

Deciduous shrubs: branches with axillary spines: pith lamellate: lvs. alternate, petioled, entire or serrulate: stipules small, lanceolate: fls. 1-4 in the axils of last year's branches or in axillary racemes; calyx with cup-shaped tube and broad and short lobes imbricate in bud; petals 5, spreading, suborbicular, clawed; stamens 10 or many, with short filaments; ovary superior, 1-celled, the style inserted near the base, with capitate stigma; ovules 1: fr. a drupe with a smooth or cinnabrate pith lamellate: Ivs. alternate, petioled, entire or serrulate, in a large cluster of spreading plicate-flabelliform lvs.: fls. 1-3, on pedicels about ¾ in. long, bright yellow, ½-3½ in. across; sepal triangular ovate; stamens 10; fr. subglobose or ovoid, ½-3½ in. across, purple, juicy; stone ovoid, compressed, rugose.

April, May. N. E. Asia. M. D. 1903: 1. I.T. 5:182. H.I. 16:1526. R.H. 1907, pp. 418, 419.—Besides being an ornamental shrub this species may be worth while growing for its cherry-like edible frs. which have a pleasant acid taste.

**PRITCHARDIA** *(W. T. Pritchard, British consul at Fiji in 1860).* Including *Colpothrinax.* *Palmaceae,* chiefly characterized by fleshy spines, which have serrate edges. *Juncaceae.* Tender aquatics growing in great masses in running water.

*P. utilis.* Royle. Shrubs, to 5 ft.: spires 1-1½ in. long, usually leafy: lvs. elliptic to oblong-lanceolate, acuminate, entire or serrulate, ½-4 in. long: fls. pedicelled in axillary racemes, white, about ½ in. across: fr. purple, ½-1½ in. across, edible. Himalayas.—Apparently not in cult. in this country and probably not hardy north of Washington, D. C.

**ALFRED REIDDER.**

**PRIONOS** (Greek πριόνιον, referring to the leaves, which have serrate edges). *Juncaceae.* Tender aquatics growing in great masses in running water.

*P. utilis.* Royle. Fr. to 6 ft. : spines 1-1½ in. long, usually leafy: lvs. elliptic to oblong-lanceolate, acuminate, entire or serrulate, ½-4 in. long: fls. pedicelled in axillary racemes, white, about ½ in. across: fr. purple, ½-1½ in. across, edible. Himalayas.—Apparently not in cult. in this country and probably not hardy north of Washington, D. C.

**ALFRED REIDDER.**

**PRITCHARDIA** (W. T. Pritchard, British consul at Fiji in 1860). *Palmaceae,* tribe *Corysphae.* Spineless fan palms from islands of the South Pacific; also in Cuba if Colpothrinax is included.

Trunk usually ringed, crowned at the summit by a large cluster of spreading plicate-flabelliform lvs.: spadix at first erect, ultimately drooping at the fruiting stage: fls. hermaproditic, small, green; ovary 3-4-5-celled, when mature, 3-lobed, narrowed beneath the ovules: corolla with persistent tube and deciduous segms.; embryo sub-basilar.—About 14 or 15 species; by some, Washing-
Pritchardia pacifica

(P. macrocarpa, Lind.). Trunk 20 ft. high, 1 ft. thick, usually much lower in cult.: lvs. roundish, 3-4 ft. long, covered beneath with pale brown matted wool, slit for about 1 ft. into about 60 segms.; petioles 2-3 ft. long, without spines; calyx glabrous and of a fine rich green; segms. about 90; petiole 3 3/4 ft. long. Saman, Fiji Isls. I.H. 26: 352.

BB. Fr. yellow or red, 3-5 lines thick.

Gaudichaudii, Wendl. Trunk generally not exceeding 5-6 ft., but recorded to 12 ft., as thick as in G. robusta: lvs. 4-5 ft. long, 3-5 ft. wide, densely covered when young with whitish brown tomentum, finally glabrous and of a fine rich green; segms. about 60; petioles 2-3 ft. long, 3-7 in. thick, covered by young with whitish brown tomentum, finally glabrous and of a fine rich green; segms. about 60; petiole 3 3/4 ft. long. San Salvador, El Salvador. I.H. 26: 352.

A. Ovary 1, 3-angled or 3-lobed, alternate into style.

b. Fr. black-purple, globose, 6 lines thick.

Pachypodium, Seein. & Wendl. Fig. 3193 (adapted from Martius). Trunk attaining 30 ft. high, 10-12 in. thick, straight, smooth; lvs. 4 1/2 ft. long, 3 1/4 ft. wide, densely covered when young with whitish brown tomentum, finally glabrous and of a fine rich green; segms. about 90; petiole 3 3/4 ft. long. Saman, Fiji Isls. I.H. 21: 181. F.S. 22: 2202.

BB. Fr. greenish, globose, 15-20 lines thick.

PRITCHARDIA

Pritchardia pacifica

(Wrightii, Becc.) (Colpothrinax Wrightii, Wendl.). Barrel or Bottle Palm. Palm Barbagona. Fig. 3194; also Fig. 2735. p. 2437. Formerly retained in Colpothrinax as the only species, but recently (1907) transferred to Pritchardia by Beccari: st. single, rising for 3-6 ft. or more, at first cylindrical but gradually increasing in thickness in a bottle-like or flask-like form, the trunk slender and ascending beyond this part till the whole reaches 30-40 ft.: lvs. circular in outline, more than 5 ft. across, suborbicular, flabellate, radiate, regularly divided into about 90 segms. about 1/2 ft. long; segms. rigid, slightly leathery, pale green, very glabrous and shining: spadix simply a few-branched; spathes 2, slightly leathery, red-brown; fls. sessile: fr. globose, 1-celled. Sandily savannas in Pinar del Rio, Cuba. — A very striking palm is indicated in Fig. 3194, which is drawn from photo-illustration in Pomona College Journ. Ec. Bot., vol. 3.

P. curvata, Hort., was intro. in 1891 by Linden, but unknown to botanists. — P. filifera, Hort., is presumably a catalogue error for P. biflora. — P. filifera, Lind., is Washingtonia filifera. — P. goudichaudii, Bull. is Licania grandis. — P. pacifica, Wats., is usually planted on trunk.

PROCHYNANTHES (Greek, kneading and flower; referring to the sudden bend in the flower which is likened to a knee). An interesting tuber-bearing plants, probably suitable for cult. in pots and also planted out: closely related to Pohnanthus and Bravou, differing chiefly in the shape of the flowers.

Sts. slender, from oblong tubers which crown short thick rootstock: lvs. mostly basal: infl. a lax spike or raceme: fls. always in pairs, tubular below, abruptly bent at the middle, bell-shaped above; stamens 6, included; fr. 3-celled, many-seeded. — A genus, discovered by E. Palmer in 1886, of which two species have been described. Native of W. Mex. .

Prochnanthus, Wats. Sts. 4-6 ft. high: lvs. mostly basall, numerous, 1-2 ft. long, 2-3 in. broad, erect: fls. 5-30 pairs, brownish; pedicels nearly wanting to 1 3/4 in. long. At first supposed to be a very rare species, known only from near Guadalajara, Mex., but found by the writer to be very common in the mountains of the states of Jalisco, Durango, and Zacatecas. Not yet in the trade, but it is a plant that deserves to be intro.

P. Bulliana, Baker. Hardly differs from the above but described as having larger fls., which are sessile instead of having a long pedicel: fls. brownish green. The fls. are not pouted at the pedicel as Baker says. B.M. 7427. — P. trinitatoria, mentioned under B.M. 7427, is a mere slip of the pen for P. viridescens.

J. N. ROSE.

PROMENÆA (named presumably after the prophetess of Dodona). Orchidaceæ. A group of small herbs with the habit of odontoglossum but having leaves of paler green.

Leaves conduplicate in the bud: pseudobulbs evidently: infl. originating above the annual leafy axis, 1-2-fld.; sepals and petals subequal, spreading, the lateral sepals forming a mentum with base of the column; labellum movably joined to the base of the column. — About 10 species in Brazil. It is one of the many genera formerly united with Zygopetalum. For cult., see Zygopetalum. 

Zygopetalum Zygopetalum xanthium, Reichb. P. citrina, Donn.) A little orchid with small ovate pseudobulbs and lanceolate lvs. 2-3 in. long: fls. pale lemon-yellow; labellum
S. Calif.

**SCREW BEAN. TORNILLO.** Shrub or small tree, merely spines cent on petioles: lfts. 5-8 pairs, oblong, \( \frac{3}{4} \)-2 in. long; spikes globose to cylindrical, \( \frac{1}{2} \)-2 in. long; pod twisted, nearly sessile, 1-2 in. long. Texas, Calif., Mex.

—The pods are used as food by Mexicans and Indians.

**P. strombulifera.** Benth. (Acacia strombulifera, Willd.), is a shrub 5-8 ft. high, with ash-gray bark, very short spines, lvs. of the pinn 4-6-paired, linear, and the pod yellowish, about 2 in. long, and spirally twisted. Fern.

**F. TRACY HUBBARD.**

**PROSTANTHERA** (Greek, to add to, and anther; referring to the connexions of the anthers being spurred or created beneath). *Labiatae.* Shrubs or subshrubs with resinous glands, and commonly strong-scented.

False whorls 2-fl., axillary or borne in a terminal raceme; fls. often white or red; calyx campanulate, limb 2-lipped; corolla-tube short, dilated into a broad campanulate throat; limb 2-lipped; stamens 4, in pairs; anthers 2-celled, connective dorsally slightly prominent, often spurred or appended: nutlets obvoid and netted wrinkly.—About 40 species from Austral. Prop. by cuttings of young shoots.

**nivea.** A. Cunn. A beautiful shrub, 3-6 ft. high, glabrous except the corolla or with a few compressed hairs: st. and branches slender, twiggy, upper ones 4-angled: lvs. \( \frac{3}{4} \)-1\( \frac{1}{2} \) in. long, oblong-lanceolate or linear, entire, pale green; margins involute, especially on older lvs.

**PROSOPIS.** Several forms have been confused under this name. *P. julifiora,* DC., and allies. *Mesquite,* or *Mesquita.* These are thorny shrubs which make trees 60 feet high. They are also called *Prosartes:* Disporum.

**P. julifiora,** Benth., is the common species which ordinarily grow only a few feet high in the desert, but under favorable circumstances may trees 60 feet high. They are also called algarbos and cashaw. The sweetish pods are eaten chiefly by cattle. Seeds and plants are offered in southern California.

**a.** Plant spiny: pod straight or sicle-shaped.

**juliföra,** DC., and allies. *Mesquita,* or *Mesquite.* Several forms have been confused under this name. *P. juliföra,* DC., is a strictly W. Indian species, with many pairs of lfts. very close together, \( \frac{3}{4} \)-\( \frac{3}{4} \) in. long, and a few pairs of linear-lanceolate or linear, or more distant pairs, only the younger shoots, lvs., \( \frac{3}{4} \)-2 in. long, and spirally twisted. Rocky hills, New S. Wales and Victoria. B.M. 5659.—*P. pulchella,* Benth. Shrub: lvs sessile or nearly so, broadly lanceolate to narrow-linear, with rigid bristles on the margin: fls. in distant pairs forming interrupted terminal racemes, lilac to purple. B.M. 7934.—*P. pseudobulbis,* Benth. Shrub: lvs. with resinous glands, and commonly strong-scented.

**PROSOPIS (Greek, but the meaning is obscure). Lesoginödæ.** Tender trees and shrubs, including the mesquit and the screw bean, two forage plants of considerable value in the arid regions of southern California and the Southwest.

**P. puhescent,* Benth. (Strombocarpöa puhescent, Gray). Screw Bean. Tornillo. Shrub or shrublet, rarely spiny on pedicel: fls. 5-8 pairs, oblong, \( \frac{3}{4} \)-2 in. long; spikes globose to cylindrical, \( \frac{1}{2} \)-2 in. long; pod twisted, nearly sessile, 1-2 in. long. Texas, Calif., Mex.

—The pods are used as food by Mexicans and Indians.

**301.** *Protea cyanodora.* (X3/4)

fls. snow-white or tinged with blue; pedicels short; calyx about \( \frac{1}{4} \) in. long, green; corolla \( \frac{3}{4} \)-\( \frac{1}{2} \) in. across. Rocky hills, New S. Wales and Victoria. B.M. 5659.—Can be safely grown only where the lemon is hardy. It is a showy species when well grown.

**b.** Other species which have been intro. and sometimes cult. abroad are: *P. denticulata,* Benth. Robust shrub: lvs sessile or nearly so, broadly lanceolate to narrow-linear, with rigid bristles on the margin: fls. in distant pairs forming interrupted terminal racemes, lilac to purple. B.M. 7934.—*P. pulchella,* Benth. Shrub: lvs. with resinous glands, and commonly strong-scented.

**PROTEA (from Proteus, the sea-god, who changed into many forms; alluding to the baffling diversity of the species). Proteaceë.** Tender shrubs, small trees or caulescent perennial plants, which are among the most attractive and characteristic plants of the Cape of Good Hope, a region whose plant life is singular.

Leaves alternate, coriaceous, entire: fls. in many-fl., sessile or subsessile, terminal or lateral, usually solitary heads, inclosed in an involucre of numerous imbricate coriaceous to scabrous and various colored bracts; ovary covered with long hairs; ovule 1: nut
PROTEA

densely bearded.—About 100 species, mainly from S. Afr. but extending into Trop. Afr. Their fl.-heads are said to look like a "glorified artichoke." Indeed P. cyanoroides (Fig. 3195) is named from this resemblance. (Cyanoroides means cynara-like; and Cynara is the artichoke.) It has bright pink fl.-heads when last-, several months. The structure of the fl.-heads is the distinctive character of the whole family of the Proteaceae. The showy parts of the fl.-head are the bracts, which are often rigid, colored, and overlap one another like the scales of a hard cone or an artichoke. "When the heads of P. cyanoroides first open," says Watson, "they are full of honey and are known to the Beers as honey-pots." This honey is collected and made into a kind of sugar. The blooming of the "honey-pots" is a great occasion for picnics. Watson saw large bunches of P. repens, of which 23 appeared in Andrews' Bot. Rep. between 1797 and 1811.

The interest in proteaceous plants is growing in southern California. Proteas have a reputation for being difficult to cultivate away from the Cape, but Hooker's statement seems to indicate that their culture is not so much difficult as special. Under glass they are said to require a coolhouse which is airy and sunny. "The one great danger to cultivated Proteas," says Watson, "is excessive watering, and to guard against this it is found to be a good plan, in the case of delicate species, to place the pot in which the plant is growing inside a larger one, filling up the space between with silver sand. The latter is always kept moist." It is suggested by one grower that it is possible not excessive watering that injures them, but insufficient drainage. Many of the species need staking, as the shoots are quick to break off at the base if unsupported. Proteas ripen seeds freely, and seeds can be easily procured from the Cape.

cyanoroides, Linn. Fig. 3195. Bush, up to 6 ft. high or sometimes acaulescent: lvs. petiolar, varying from subulate and obtuse to elliptic and acute: head sessile; outer involucral bracts ovate to ovate-lanceolate, inner lanceolate, oblong, acuminate, tomentose, exceeding the fls.; ovary which is covered with long whitish hairs. S. Afr. G.F. 8:35. G.C. III. 17:773. G.M. 38:407.

mellifera, Thumb. A large bush, 6-8 ft. high: lvs. linear-oblancoceolate: involucral bracts very vescid, those of the stipes silky pubescent, the others glabrous, dark red to whitish green with pinkish tips and margins but usually rose pink; fls. whitish, exceeded by the involucre; ovary covered with long golden hairs. S. Afr. B.M. 346. R.H. 1903:308. —The oldest specific name for this plant is P. repens, Linn. Mant., not Thumb., but following Phillips & Stapf in Fl. Cip. 5 sect. 1:577, the name mellifera is maintained. They state that "The specific name repens is so inapplicable to this plant, while Thunberg's name is so suitable and has been in use for general use that we have retained it." Var. ribera, Hort., a form of P. mellifera which has been offered in the trade abroad.

nana, Thumb. (P. rosacea, Linn.). Smooth shrub, 2 ft. high, branched: lvs. acicular, erect-spreading, acute or acuminate: involucral scales oblong, obtuse, the outer greenish, the inner scarlet, exceeding the yellowish fls. S. Afr. B.M. 709. Good horticultural accounts of proteas are those of Wm. Watson in G.F. 8:34 and 4:412, which have been liberally quoted above.

PROTECTION.

Wilhelm Miller.

F. Tracy Hubbard.

PROTEOLYSIS, as used by the gardener, is an indefinite term. A plant may need protection from living agencies, as animals, birds, insects, or plants (including fungi and weeds), or it may need protection from the weather,—heat, cold, rain, drought. Generally, however, the gardener means winter-protection, which again covers two very distinct ideas,—freezing injury and mere mechanical injury. Most Cape bulbs, for example, are ruined if they are frozen; tulips are not. Yet Cape bulbs may sometimes be wintered outdoors if they are protected by a covering heavy enough to keep out frost. Strawberries, on the contrary, are covered after frost with a light mulch, which is designed merely to keep the plants from being heaved by alternate freezing and thawing. These are the main objects of winter-protection in the East, at least with herbs. In the prairie states the fruit-trees also need winter protection. Fruits from the hot drying winds of summer and from sunscald, which are not the important considerations with eastern fruit-growers. See Winter Protection. Allied topics are discussed under Greenhouse, Coldframes, and Hotbeds; Diseases and Insects; Weeds; Transplanting.

PROTITUM (probably the Javan name). Burseraceae. Trees, with balsam sap: lvs. toward the ends of the branches, alternate, 3-foliate or uneven pinnate, lfts. few-paired, rather large, petiolate, entire or dentate; panicles long-peduncled, fasiculate, branched: fls. small, slender-pedicelled; calyx small, cup-shaped, 4-6-cleft or -dentate; petals 4-6, linear-oblong; disk urn-shaped; stamens 8-12; ovary sessile, 2-4-celled: drupe fleshy, globose.—About 30 species, mostly natives of Trop. S. Amer., some species also in India, Malay, Mauritius, Madagascar, W. Indies, and Mex. P. sericatum, Engl. (Bursera serrata, Wall.). Sometimes planted in tropics and subtropics for ornament, and wood said to be used for furniture: evergreen: lfts. about 7 or more, opposite, narrow-ovate, base acuminate, pubescent or nearly glabrous, serrulate or entire; panicles axillary, lax, much branched, shorter than the lvs.: fls. very small, hermaphrodite, pubescent externally; calyx 5-toothed; petals 5; stamens 10: drupe globose, 1-3-celled. India.

PROTOPLASM.

The living or organic cell-content. The difference between living and non-living things, so far as it has been possible to study it, consists in the fact that the former are characterized by the possession of protoplasm, "the physical basis of life." This protoplasm is a most complex material, the seat of diverse chemical reactions and physical changes, and at the same time a material having a wonderful capacity for correlation and growth. When the cell or living organism is killed, there is no loss of substance, and the material originally constituting this protoplasm remains, but there is left relatively little to suggest living protoplasm. So far as is known, this non-living residue can never be recombined or activated with those characteristic properties of correlation and growth, and many other properties less complex, which are the potential or kinetic possessions of the living. It is in some ways unfortunate to call the dead material by the same name as the living.

In the living plant or animal, the protoplasmic unit is the cell, usually microscopic in size, and an association of cells of the same form, or with similar functions, constitutes a tissue. The spores of many fungi and of mosses and ferns are single cells. In plants the protoplasmic unit is usually surrounded by a resistant mem-

PROTEOPLASM.
bran, or cell-wall, resulting in a high degree of rigidity and strength. In some cases, as in "woody" tissues, the cells become highly modified, the walls may be much thickened, and the protoplasm may disappear, leaving only the non-living cell-walls.

Since the protoplasm is the seat of the greater part of the chemical reactions and physical changes even in the more complex living plants, with it must be associated the absorption, digestion, and assimilation of foods, respiration, and excretion, as well as growth, reproduction, and heredity capacities. In the simplest plants, such as many of the lower algae (pond-seaweeds), consisting of but a single cell, this cell must perform all the functions of the organism; but in complex plants there is a certain amount of differentiation of labor or function of the various protoplasts, or cell units. Thus the various tissues are more or less seats of different physiological processes; for example, the nectar-glands are "organs" of excretion, the green tissues are the seats of organic food-making (see photosynthesis).

The protoplasm of the cell is itself differentiated into various structures, important among which are (1) the cytoplasm, or general protoplasm, within which are (2) the nucleus, and (3) the plastids (in green plants).

Protoplasm is generally regarded as a viscid semi-fluid material, and commonly it behaves as a liquid (an emulsion colloid). When killed, protoplasm is "set," that is, it becomes a jelly-like matrix, and it is a study of such fixed material upon which have been based the earlier views regarding structure. There is strong evidence that much of what is called the finer structure of protoplasm is a result of fixation, and that there is actually little real "structure" in the living material, although certainly the gross appearance may change more or less with the diverse activities of the cell. Protoplasm cannot be expressed chemically; indeed, the view which is today most widely accepted is that there is a certain amount of differentiation of labor and function of the various protoplasts, or cell units.

Thus the various tissues are more or less seats of different physiological processes; for example, the nectar-glands are "organs" of excretion, the green tissues are the seats of organic food-making (see photosynthesis).

The protoplasm of the cell is itself differentiated into various structures, important among which are (1) the cytoplasm, or general protoplasm, within which are (2) the nucleus, and (3) the plastids (in green plants).

PRUNUS PITTS: Podocarpus.

PRUNE (from Prunus), is used in this country to designate a cured dried plum, and also the varieties that are employed for the making of this product. In literature, however, it may be used rather indefinitely for many kinds of plums, particularly those that designate a cured dried plum, and also the varieties it consists of numerous substances physically related, rather than of complex molecules of a definite "substance."

B. M. Duggar.

Prunes in California.

There are at least three important characters which distinguish the prune interest of California from that of any other state, viz.: the extent of the industry, the method of curing, and the plum variety chiefly used.

According to figures gathered by George P. Weldon, there were in California 91,470 acres of bearing prune trees in 1915, and 24,774 acres of young trees. This places the prune next to the peach, which is the leading deciduous tree-fruit of California with a total acreage of 144,888. The annual cured prune product of California, during the decade 1905 to 1914, has ranged from 57,000,000 pounds in 1908 to 205,000,000 pounds in 1913, the average annual product being 122,600,000 pounds. The Pacific Coast States produce all the prunes grown in the United States, and, according to the United States Census of 1910, "California reported, in 1909, 85.7 per cent of the total value of dried prunes produced in the United States." The development of this American product has not only reduced importation of European prunes so that they no longer receive distinctive enumeration in the customs reports, but about half the product is annually exported.

There are several reasons why the prune product of California is so overwhelmingly large and is still increasing. Beyond the general suitability of natural conditions for fruit-growing, there is, in the case of plum varieties, the total absence of the currucillo, and "black-knot;" the practical freedom from rot-fungi which attack ripening fruits, and a dry condition of soil-surface and air during the months of May, June, July, and September which favor gathering fruits from the ground and curing in the open air. Curing in evaporators by artificial heat is practically unknown.

The process of handling prunes, from the tree to the package, is outlined by an experienced handler, E. N. Richmond, of San Jose, as follows:

"Prunes should never be picked from the tree. They should be allowed thoroughly to ripen and fall to the ground. An orchard should be covered by pickers every seven to ten days—seven days preferably, so as to prevent sunburn of the fruit lying on the ground. The usual form of contract with pickers calls for four pickings, no shaking of the trees until the third picking, and then at grower's discretion.

"The green fruit is hauled to the dipper-shed in picking-boxes and there passed through a light solution of lye. A kettle or tank, holding 200 gallons of water and containing a basket container, is used for this purpose. In many instances the fruit is now passed by from this dip into a vat of clear water and then dumped onto a combination pricking-board and grader, operated by power, which grades the fruit into three grades so that the drying in the field can be uniform. The fruit is then piled on trays by 3 feet and taken to the drying-yard and dried in the sun. The purpose of passing the fruit through the lye-solution and over the pricking-board is that the skin may be slightly cut, thereby hastening evaporation, preventing fermentation and producing a fruit with a clear bright meat. From the dipper-shed to the dry-yard, the fruit is hauled on a one-horse truck especially constructed for this purpose.

"The operation of drying requires judgment. Fruit should be allowed to lie in the sun on the trays until about three-quarters dried, and then the trays are stacked in piles, one above the other, leaving air-vents on either end. About twenty trays can be stacked in one pile and the finishing process takes place in this stack. Under normal weather conditions it takes from ten days to two weeks to cure prunes. While the fruit is on the trays in the dry-yard, it should receive at least one turning by hand, shaking the trays or using brooms, so that the fruit secures an equal drying on all sides. It also materially lessens the time of drying and makes a finer grade of fruit. The fruit must not be taken from the trays until it is thoroughly cured.

"At the packing-house the fruit is carefully separated
into the different grades, varying from thirty to forty prunes to the pound, up to prunes running smaller than 120 to the pound. The grades as to weight and size are obtained by passing the fruit over a large grader which consists of a series of screens of different sizes, commencing with the smaller size and increasing to just a trifle larger size every 3 or 4 feet. There are from eight to twelve different screens, the largest fruit passing over the one with the largest screen, and the smallest coming over the proper bin. From there it is taken as required for packing to the processor or cleanser. The fruit in the field has been subjected to considerable dust and dirt as well as insect life. The processor or cleanser conveys the fruit through a long vat of boiling-hot water, thoroughly washing and cleansing it. From the processor the fruit is dumped on a long shaker which further assists in the cleansing process, so that by the time the fruit is put into the boxes it is in a most sanitary condition. Prunes are packed in packages varying from one pound to fifty-five pounds according to the requirements of the trade for which they are intended.

The third distinctive feature of California prune-growing is the predominance of the Prune d'Agen—the variety which has been chiefly used in the commercial prune industry of France from early times. This variety is discussed in the article on Plums. It has the "prune character" developed to a degree which no other plum variety has thus far attained. It has a sweetness often reaching above 50 per cent of fruit-sugars in the cured fruit, but this is not its distinctive character. The really distinctive characters are: (1) the high aromatic flavor in the cured fruit; (2) the dense fine texture of the flesh, which gives this variety unequaled tenderness and mouthy quality, both as a confection and as a slightly cooked fruit; and (3) the sweetness when grown without thinning and the tree is allowed to carry too much bearing wood, the fruit will be small. For this reason there has been a demand for the last fifty years for a prune retaining all the characters of the Prune d'Agen and adding greater size. Although continued effort has been made to find such a prune elsewhere in the world and to originate such a one in this state, this end has not yet been reached. All rivals of the predominant variety are, when dried, either flat or acid in flavor, coarse and stringy in flesh and large and rough in pit. It is quite probable that California growers are repeating the experience of the early French growers who have given us the Prune d'Agen as the result of their prolonged selection. Leonard Coates, of Morgan Hill, has emphasized the fact that there are variations toward better size among established trees of the true characters of the Prune d'Agen and propagation from such variations is being pursued. In view of long experience of disappointment in importation and origination, this seems at present the most promising avenue toward gaining size without losing other characters. The varieties which have been brought to notice as substitutes for the French prune have been planted only on a small acreage, have sold well for size and style and may continue to be profitable, although they can never attain the character of the prunes, eaters, (3)

The culture of the prune tree as pursued in California and propagation from such variations is being pursued. In view of long experience of disappointment in importation and origination, this seems at present the most promising avenue toward gaining size without losing other characters. The varieties which have been brought to notice as substitutes for the French prune have been planted only on a small acreage, have sold well for size and style and may continue to be profitable, although they can never attain the character of the prunes, eaters, (3)

There are two distinct areas in which the prunes of the Northwest are produced. In western Oregon and Washington, prunes are grown entirely for evaporation, the conditions there being strong loamy soils and abundant rainfall. East of the mountains the prunes are grown very largely in the irrigated valleys, although some of the dry-farming areas are producing a splendid fruit. The product at present, however, is largely centered in such valleys as the Boise and Payette valleys of Idaho, the Grande Ronde and Freewater districts of Oregon, and the Walla Walla and Yakima valleys of Washington. In these districts the prunes are rarely evaporated, but are shipped out in the fresh condition to eastern markets, where they are generally known as plums.

There is considerable controversy, especially in the western section, as to the better locations for prunes. Some growers prefer the bottom lands—either the sandy loams along the rivers, or the stronger clay soils. The contention is that these lower elevations produce larger prunes and a greater yield. Another set of growers, however, stoutly maintain that the rolling hills are the only places for prunes, and while their prunes are smaller, nevertheless they are heavier and sweeter, and their orchards are more reliable. East of the mountains, the prunes are generally planted in the silt loams.

Since all plum trees blossom in early spring, they are very subject to loss from frosts and cold rains. To offset the loss from frosts, the southern and eastern exposures should be avoided, as these are undesirable since the thawing out on such exposures is very rapid, supposed to lead to a breakdown of the tissues.

When planted on the lighter loams, the peach root is preferred, but when on the stronger loams, the pear root is better. As yet, not enough investigation has been conducted to determine what species of plum roots are the most desirable for the various locations. On the lighter soils, or higher elevations, the trees are planted from 18 to 20 feet apart, but when grown on the stronger loams, from 20 to 22 feet should be allowed.

E. J. WICKSON.

Prunes in the Pacific Northwest.

Prune-culture in the Pacific Northwest has had a very checkered career. The early pomologist took much interest in plums and prunes, because of the magnificence of the products secured, and the ease with which they were grown. This interest increased up to the early nineties, when the prune reached a boom period. Thousands of acres were planted in a few years. They were planted on all soils and exposures and a great many varieties were tried. Toward the latter part of the nineties, there was a tremendous production of the fruit, mostly of a questionable value. Few men knew how to evaporate prunes properly. Much of the product decayed in transit, while other portions were evaporated, and the market for prunes was made practically inedible. There was little or no market for the dried tart prune; consequently, there was but one inevitable result: namely, a collapse, and in a few years thousands of acres of trees were taken out. The United States Census shows that there were nearly a million less prune trees in the state of Oregon in 1910 than were growing in 1900. About 1905 the industry began to pick up. Those growers who had good locations and proper varieties, and who had mastered the process of evaporation, began to find a market. This market has steadily improved, until in the last seven or eight years the prune has proved to be a very profitable crop, either shipped green, or evaporated. The increase in acreage in the past four years has been very large, and the industry now seems to be thoroughly established. The United States Census for 1910, giving the number of plum and prune trees, shows the following figures:

<table>
<thead>
<tr>
<th>State</th>
<th>Acres of Plums and Prunes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>1,764,896</td>
</tr>
<tr>
<td>Washington</td>
<td>823,082</td>
</tr>
<tr>
<td>Idaho</td>
<td>302,355</td>
</tr>
</tbody>
</table>

The number of bushels produced is as follows:

<table>
<thead>
<tr>
<th>State</th>
<th>Bushels of Plums and Prunes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>1,747,587</td>
</tr>
<tr>
<td>Washington</td>
<td>1,076,382</td>
</tr>
<tr>
<td>Idaho</td>
<td>170,027</td>
</tr>
</tbody>
</table>
Some growers think that on extremely rich soils, 25 feet is a more desirable distance.

The tillage given prunes is very similar to that for other deciduous fruits grown in the Northwest. In all young orchards, the tillage should be very thorough in the early spring. With trees not in bearing, tillage should cease by the middle of July. In many of the bearing orchards, where the tillage has been very thorough in the early spring months, sufficient vigor of tree and size of fruit is often obtained so that tillage may be discontinued by the middle of July or the first of August, but in many of the orchards it will be necessary to continue the tillage up to about the time of harvest, which comes later, varying from the first of August to the first of September.

Formerly, the trees were all headed from 30 to 40 inches in height. In more recent years, however, many growers are heading from 20 to 24 inches and producing very satisfactory trees. The same general principles that apply to the pruning of apple trees, also apply to the prune. Care should be taken to have the main scaffold limbs spaced as far apart as possible. Strong heading back is necessary the first few years. With many orchards, summer pruning can be conducted advantageously, the pruning being done largely in June and consisting of a cutting back of the terminals to the point where it is desirable to force out new laterals. Occasionally a little thinning out of the laterals is practised. When the trees reach their heavy bearing, which is about the seventh year, it is desirable to give them moderate pruning annually, as it is their aim to keep the trees well supplied with strong one- and two-year-old wood, as the larger plums are found almost invariably on the vigorous wood. When orchards have been allowed to run down somewhat, it is often found desirable to thin out the spurs with hand shears, and in this way reinvigorate the remaining spurs. When trees are very much run down, the most satisfactory treatment will probably be to dehorn them, forcing out a new vigorous top which, in three to five years, will produce commercial crops of fruit. Very little hand-thinning is done with plums and prunes in the Pacific Northwest.

The Italian prunes generally thin themselves. Some varieties of plums, however, must have hand-thinning.

Very little work has been done as yet with manures or fertilizers. Commercial fertilizers, where tried, have never given striking results in the older orchards. The growers are finding that, in mature orchards, a stable compost is very desirable. When it is impossible to secure such material, vetch or rye planted the latter part of August or early September, and plowed under the latter part of August or early September, and plowed under in the early spring, is very beneficial. Care has to be taken, however, not to use excessive amounts of nitrogen, as this element tends to make the trees unproductive, and generally makes the skin of the prune so heavy that it is difficult to evaporate.

The prune industry in the Pacific Northwest is not old enough as yet to demonstrate how long an orchard will remain profitable. However, there are several orchards in Oregon forty years old, that are still very productive. On the other hand, there are orchards twenty years of age that have passed their usefulness.

If this latter class have been neglected. Where good soil is obtained, and proper care given, it is safe to say that the orchards will be productive at least fifty years.

There are a number of insects which are troublesome to the prune. The San José scale attacks the tree, but is very easily controlled with the lime-sulfur spray. The borers—both the peach-root (Sanninoidea opalescens) and the shot-hole (Xyleborus dispar)—are very bad. Young trees are often severely attacked with aphids. Other insects which are more or less troublesome at times are the leaf syneta (Syneta albida), the Indian meal moth (Plodia interpunctella), the rose-leaf hopper (Empoia rosea), and the tipulid (Ctenophora angustipennis). Of the other diseases, the mushroom root-rot (Armillaria mellea) is very serious, especially when the trees have been planted on newly cleared land. Brown-rot (Sclerotinia fructigena) is the worst pest of the fruit and is becoming more serious. Other diseases that have to be controlled with are crown-gall, rust, and bacterial canker. The latter three diseases, however, are not nearly so serious as the first two mentioned.

Of the varieties of prunes that are grown in Oregon, the Italian (Fellenberg) comprises about seven-eighths of the planting, and the percentage in favor of the Italian is constantly increasing. For evaporation, it is the only one worth consideration in the Northwest. For shipping purposes, however, numerous plantings have been made of the Tragedy, and also of the Hungarian. Other varieties that are grown to a limited extent are the French, locally called the Petite, or Prune d’Agen, the Pacific, Willamette, Clairac Mammoth, Columbia, Tennant, Silver, and Sugar. There is, of course, to be found scattered over the Northwest a miscellaneous list of soft plums that are grown largely as local fruit. Since the Italian prune is benefited by growing with other varieties, there will probably always be a scattering of other kinds planted in our orchards. Many growers report that, wherever the Italians are near other varieties, a more satisfactory set of fruit is obtained on the Italian. In the evaporated fruit districts, the Petite will be the pollinator. The greatest drawback of this prune is its small size. It, however, dries heavier than the Italian and, size for size, sells somewhat higher.

When prunes are to be shipped in their green state for eating fresh in the eastern markets, it is customary to pick the fruit while it is still very hard and green. The plums, however, will have developed to a very large extent their true color before the packing is undertaken. The fruits are graded carefully and packed in five-pound baskets, four baskets being placed in a crate. While this crate virtually holds about twenty pounds, the weight of the fruit will range from eighteen to thirty pounds, according to varieties, size, and the general condition of the fruit. These four-basket carriers are the typical ones used for plums, apricots, and peaches. The San José scale is constantly seen in the eastern markets. The fruit, when properly refrigerated, has not only the general condition of the fruit. The fruit, when properly refrigerated, has not only
and Alaska. When the fruit is to be evaporated, it is first allowed to ripen on the trees and should not be gathered until it drops naturally to the ground (Fig. 3197), or will drop with very little shaking. The fruit is picked from the ground in bushel boxes, the pickers going through the orchard every few days to gather it up. The yield varies tremendously, from 1,000 to 6,000 pounds to the acre. As soon as the fruit is gathered, it should be hauled to the evaporators and evaporated quickly in order to avoid brown-rot, which often spreads rapidly in the containers.

There are two main types of evaporators used for drying fruit—steam and hot air. The steam driers are used only where a very large output is obtained. It is customary for the orchardists to dry their own fruit. Since the orchards on the whole are rather small, an inexpensive building is used for the process, and the hot-air type of building is erected. These hot-air driers are of two distinct types, the tunnel, and the stack. There are many forms of tunnel driers. These tunnels consist of groups of long nearly horizontal pipelines, built on a fire pit. They vary in length from 25 to 50 feet. Each tunnel in itself may be complete, or they may all be connected. The tendency in the past has been to have the tunnels too long. In the newer buildings, however, are tunnels from 16 to 25 feet in length. The capacity of the drier can be increased more satisfactorily by increasing the number of tunnels rather than by increasing the length of the tunnels.

The heat is applied directly by the tunnels and, as a rule, brick arch furnaces, or iron stoves, such as are commonly known as the hop stoves, are employed. In order to distribute the heat more uniformly, it is generally conducted from the furnaces by long pipes ranging from 9 to 15 inches in diameter, decreasing the farther they get away from the source of heat. These hot-air driers are of two distinct types, the tunnel, and the stack. There are many forms of tunnel driers. These tunnels consist of groups of long nearly horizontal pipelines, built on a fire pit. They vary in length from 25 to 50 feet. Each tunnel in itself may be complete, or they may all be connected. The tendency in the past has been to have the tunnels too long. In the newer buildings, however, are tunnels from 16 to 25 feet in length. The capacity of the drier can be increased more satisfactorily by increasing the number of tunnels rather than by increasing the length of the tunnels. The heat is applied directly by the tunnels and, as a rule, brick arch furnaces, or iron stoves, such as the hop stoves, are employed. In order to distribute the heat more uniformly, it is generally transferred from the furnaces by long pipes ranging from 9 to 15 inches in diameter, decreasing the farther they get away from the source of heat.

The stack drier is arranged to contain trays which are placed one over the other, the bottom of the stack being open. A single stack consists of three or four small vertical compartments generally open to each other. The fruit is first placed in the top compartment and after slightly drying is removed and placed in a lower compartment. The stack driers turn out a very good product, but require a maximum amount of labor. The buildings should be very well ventilated; these ventilators should be of an adjustable nature so that they can be opened and closed quickly. Cold air intakes are also provided. These should be in below the vent pipes so as to furnish fresh air rather than to assist in rapidly sucking out the warm air. There is a very close relation between ventilation, air-circulation, and the humidity of the atmosphere. Such relationship, unfortunately, has not been well studied by the larger number of those operating the evaporators.

The temperature is gradually increased during the drying process, starting in the neighborhood of 125° to 135° and finishing at 160° to 180°. It requires about thirty-six hours on the average to dry prunes well, the time depending on the building, ripeness of the fruit, and atmospheric conditions. The fruit will generally produce about twenty pounds of dried fruit to a bushel of fresh. Before the prunes are placed over the heat, it is customary to wash and grade the fruit. The more modern buildings now have automatic machinery which does all of this labor in one process. The prunes, after being sorted, are dipped into boiling lye. This is generally at the strength of one pound of lye to thirty to fifty gallons of water. This use of lye is adopted solely for the purpose of checking the skin of the fruit so that the gases can escape more readily and the prune be more easily dried. In most cases, as good results could be secured by boiling water. There are probably cases, however, when the skin of the fruit is so thick that it is difficult to secure as quick and satisfactory results without the use of lye. As soon as the prunes have been dipped into the lye, they are quickly dipped into clean water. A chemical analysis of the rinsing waters has shown that they are generally acid rather than alkaline and it is very doubtful whether lye remains on the fruit any length of time or, if it does, it is not sufficient ever in any way to be injurious to the health. As soon as the prunes have been thoroughly dried, they are taken from the driers and stored in large bins and allowed to sweat. They are then ready for the processing. The processing is largely a steaming operation. This is generally done in central buildings owned or controlled chiefly by the buyer or packers. The prunes are submitted to the steam for a very short time. This steaming cleans and sterilizes the fruits and adds luster to the products. They can be so handled as to add considerable weight. When this is done, however, it is unscrupulous on the part of the packer and will sooner or later lead him into trouble. The processing of the prunes also softens them so that they can be packed more easily. Formerly some bleaching was...
The finished product is subject to considerable loss from fermentation, mold, and the attack of pests. It will be necessary for considerable scientific investigation to be made before the problems connected with these losses will be entirely understood. As soon as the prunes have been processed, they are taken in the boxes, dried, and packed for market. These boxes range in capacity from ten to fifty pounds. The bottom of the box is faced. Uniform, well-proportioned prunes are flattened with the fingers. This makes a very attractive top for the box when it is reversed. Lace paper and lithographs are used on the better packs.

In selling prunes, they are bought entirely according to weight, but based on the number of prunes to the pound: such as 30–40's, 40–50's, and so on, indicating the number of prunes to the pound. The table on page 2816 illustrates the method used in basing the prices for any given size of prune in the Pacific States. The figures below the words "bulk basis," such as 30 to 35, 70 to 75, mean the number of prunes in a pound of fruit. The figures to the right of the words, "bulk basis," such as 2, 2½, refer to the so-called base price paid for prunes. The base price, in this case, figured on the sizes running from 75 to 80 prunes to the pound. Note that the figures to the right of 75 to 80 are the same as the figures to the right of the words "bulk basis."

As an illustration of the way the table works, take the first figure to the right of the words "bulk basis," which is 2. That means that, for prunes running from 75 to 80 to the pound, the buyer will pay 2 cents a pound. Should the prunes be so large, however, as to run 30 to 35 to the pound, note that the figure to the right of 30 is 4½. Should they run, for example, 55 to 60 to the pound, note that the figure opposite is 3.

Should the base price at any time be more than 5 cents, one could easily enlarge this table by adding 2¼ cents to the base price for prunes running from 30 to 35 to the pound, and decrease the price ½ cent for each smaller size in proportion to the size of the prunes.

PRUNÉLLA: Brunella.

PRUNING is the methodical removal of parts of a plant with the object to improve it in some respect for the purpose of the cultivator. Much of the current "pruning" is really repairing, and is commonly called "surgery." See pages 354, Vol. 1.

Under this denomination are comprised a multitude of practices and ideals. It is impossible to give any advice for pruning until one has analyzed the subject and knows the objects for which one is to work and the underlying principles on which the practices must rest. The larger part of the writing on pruning gives mere advice or directions, or details some person's experience, without analyzing or clarifying the subject. The practice must differ with every person and every condition, but the principles are general. The ideas that are associated with pruning may be grouped around three centers: (1) pruning proper, or the removal of a part of a plant for the purpose of bettering the product and improving the character of the remaining part; (2) pruning or the disposition or placing of the individual branches, a practice that ordinarily is coincident with pruning proper; (3) trimming, or the shaping of the plant into some definite or arbitrary form.

The principles that underlie pruning proper may be associated with two purposes—the lessening of the struggle for existence amongst the parts of a plant, and the cutting away of certain parts for the purpose of producing some definite effect in the formation of fruit-buds or leaf-buds or in modifying the habit of the plant.

There are more branches in the top of any plant than can persist; therefore there is struggle for existence. Those which have the advantage of position persist. Nature prunes. Dying and dead branches in any neglected tree-top are illustrations of this fact. Whenever the struggle for existence is greatly lessened, the remaining branches receive a greater proportion of the plant's energy, and they therefore make stronger growth, yield better produce, or are more productive in flowers and fruit. Pruning is essentially a thinning process.

There exist the widest variations of opinion as to the merits of pruning, particularly as it applies to fruit-trees. Some persons oppose any pruning whatever. Undoubtedly a certain type of novice places too high estimate on pruning, as if it were the one essential operation; others carry the practice to needless extremes; but the reasons for pruning lie in the nature of the plant, and the useful results are attested by long experience. It is one of the cardinal practices in the growing of many kinds of plants, along with tilling, fertilizing, combating pests and diseases; and it is not to be considered as a thing apart or as a remedy or corrective for all deficiencies.

In itself pruning is not a devitalizing process; it is devitalizing only when it is carried to excess or when the wounds do not heal and disease sets in. It is rather an invigorating process, since it allows more nourishment to be distributed to the remaining parts of the plant. The notion that pruning is devitalizing arises from false analogy with animals, which suffer shock or injury when parts are removed. The fact that pruning is not a devitalizing process is proved by every tree. The tree is a record of successive prunings. Note the number of branches on the seedling tree in the nursery- row of the forest, and then consider that all these branches, with the exception of the leader itself, will probably perish in the course of time. The forest tree develops a bole and the side limbs are pruned away by natural causes. (Fig. 3198.)

Knots are records of this natural pruning. In the greater number of cases the limbs die and are removed when still very young, and they leave small record in the grain of the wood; but all visible knots are histories of the removal of large branches. As a rule, it is only when the knots become knot-holes that injury results. A knot-hole means decay, and this decay may extend into the heart of the tree, finally causing it to become hollow. A discolored or decayed heart is an indication of disease. The disease originates on the outside of the plant; it is the result of inoculation. This inoculation takes place through some bruised or broken part; it is usually an infection of filamentous fungi. These fungi gain a foothold in the dead and dying cells of the wound, and as they grow they are able to destroy the living cells. The larger the wound, the greater is the liability to infection. It is very important, therefore, in the pruning of trees, that the wounds shall be as small as possible and shall heal quickly. This means that the best pruning is that which is practised annually, so that the branches to be removed do not attain to large size. This annual pruning also most desirable for other reasons, as will be seen.
Pruning when transplanting.

Woody plants should always be pruned when they are transplanted. This is because the roots are pruned in the very process of removal, and the tops should be reduced in proportion. For some time after the plant is transplanted, it has very little vital connection with the soil, and if all the top is allowed to remain there is much evaporation from it and a dissipation of the energies. How much of the top shall be removed depends on how much of the roots was removed in digging on climate, and also on personal desires of the operator. It is a general practice to cut back the top of a plant at least one-half on transplanting; in some cases still more of the top is removed. In broad-leaved evergreens, some of the leaves may be cut in two at transplanting, to reduce transpiration. (Fig. 3199, after Wester.)

Another question is the particular form in which the top shall be left. Some growers prefer to remove all side branches, if it is a fruit-tree, and leave a straight whip. (Fig. 3200.) They are then free to start the new branches where they like. This is allowable with very young trees and it is much employed with peach trees, as much as these trees are planted when the top is only one season's growth. If trees are two or three years old and well branched, as is the case with apples and pears, most persons prefer to leave three or four of the main branches to form the starting point of the future top. (Fig. 3201.) These branches may be headed back half or more of their length. Some years ago a method of very severe pruning came into notice under the name of the Stringfellow or stub-root system, taking its name from the late H. M. Stringfellow, of Texas (page 1598, Vol. III), who wrote much concerning it. The fullest presentation of Stringfellow’s ideas will be found in his book, “The New Horticulture.” It advises that practically all the roots be cut away and that the top be shortened to a straight stick 1 or 2 feet long, without side branches. It is the supposition that when the roots are reduced to their lowest terms in this way, the new root-branches that arise will take a more natural form and the tree will assume more of the root character of a seedling. This method of transplanting has not gained acceptance.

In most cases, it will be better, particularly in trees that are three years or more old, to prune them only moderately, shortening them in all around, allowing a part of the original root-system and a part of the top to remain.

Whatever the way of pruning at transplanting, good live buds should be left on the tree; the practice of pruning two-year-old wood to a whip is therefore to be discouraged, for only dormant buds (if any) then remain on it.

Pruning fruit-trees.

Fruit-trees are pruned for the purpose of enabling them to produce a superior quality of fruit. In America, they usually are not pruned primarily to make them assume any definite or preconceived shape. It is best, as a rule, to allow each variety of tree to take its own natural or normal form, pruning it only sufficiently, so far as shape is concerned, to remove any unusual or unsymmetrical growths.

1. The fundamental conception in the pruning of fruit-trees is to reduce the struggle for existence, so that the remaining parts may yield larger and finer products.

2. The result of pruning fruit-trees should be to keep the tree in bearing condition, not to force it into such condition. If the tree has received proper care from the time it is planted, it should come into bearing when it reaches the age of natural fruitfulness. Pruning aides to keep the tree in proper bearing condition. When trees have been much neglected, pruning may be the means of reinvigorating them and setting them into a thriftier condition. In such cases it is one of the means of renovating the tree, as are tilling, fertilizing, and spraying.

3. Heavy pruning of the top in any year tends to produce very vigorous growth on remaining parts. This is because the same amount of root energy is concentrated into a smaller extent of top, thereby causing a heavier growth. This is allowable if the pruning is performed when the plant is dormant.

4. Heavy pruning of the root tends to lessen the production of wood, because the same amount of top receives a less supply of soil-water.

5. Trees that grow much to wood are likely to be relatively unproductive. It is an old maxim that checking growth induces fruitfulness, so long as the plant remains healthy. This, of course, does not mean that trees of decreased vigor are more fruitful, nor that the maintenance of full growth from the first is to be avoided. Orchards that are kept in a vigorous thrifty condition are most productive, other things being equal; but when very thrifty trees do not bear, the checking of the growth may induce the desired results. If the tree is thrown into redundant growth every two or three years by very heavy pruning, it tends to continue to produce shoots at the expense of fruit. When a tree is to be brought into bearing condition by general good treatment, the aim should be to keep it in that condition by a relatively light annual pruning. Violent pruning is allowable only when trees have been
neglected and it is necessary to bring them back into bearing condition by renewal or to re-shape them.

6. The operator should know where the fruit-buds are borne before undertaking the pruning of any fruit-tree; otherwise he may destroy too many of them. If he knows the position of the fruit-buds, he may prune in such a way that the fruit appears without the removal of much wood, and thereby reduce the struggle for existence to a minimum. Every species of tree has its own method of fruit-bearing. The pear bears its fruit largely on old spurs. The peach bears mostly on the long wood of the last season's growth, particularly when trees are young. If one is to thin the fruit of the pear by pruning, therefore, it is necessary to remove part of the spurs. In the peach it is necessary to cut out or to cut back a part of the previous year's growth. Each species of plant is a law unto itself in these regards.

7. Heading-in under certain conditions (which the operator must judge by observation) tends to promote fruitfulness. If the heading-in is very severe it may amount to a heavy pruning, and in that case it may set the plant into shoot-bearing rather than into fruit-bearing. It is not to be supposed that heading-in is necessarily to be advised in order to make trees bear. They may bear just as well if they are never headed-in, provided they are otherwise well pruned and well cared for. Whether one shall head-in the fruit-trees or not, is in part a personal question. If the trees are growing too rapidly, it is well to head them back. This may be necessary when trees are growing on very fertile soil in order to keep them within bounds; but the heading-in under these conditions may not conduce to greater fruitfulness. When trees are planted too close together, it may also be necessary in order to prevent the plantation from becoming too thick. Some growers like a low-headed and rounded top; this is a question of personal preference and of the general management of the plantation. If the orchardist desires such form, it is necessary to head-in the tree. It should be remembered that the more a tree is headed-in the thicker it tends to become in the crown and the more inside pruning is necessary. Whenever there is danger of fruit-rot, as in plums and early peaches, it is a question whether the thick form of top is the most advisable.

8. Pinching-in the annual growths in early summer tends to augment the development of fruit-buds, although these buds may not be developed the very year in which the pinching-in is performed. This is a special practice, however, which can be employed only on small areas and with particular trees. It is essentially a garden practice and not an orchard practice. In the orchard, one must depend for fruitfulness on the general good care of the plantation, and in this care pruning is one of the essential factors.

9. Pruning fruit-trees usually resolves itself into a thorough and systematic thinning out of the weak, imperfect and interfering branches. Thereby, the energy of the plant is saved and is deflected to those parts that are capable of bearing a useful product. The sun and air are admitted. The tree becomes manageable for spraying and for picking. All the fruits have an opportunity to develop. How much or how little to thin, is a special question. In humid climates, much thinning may be necessary. In dry hot climates, as on the Plains, but little thinning is allowable, else the branches may sunscald. Figs. 3202 and 3203 illustrate two pruning ideals.

10. Scraping the rough bark from old trunks may be a desirable practice, since it destroys the breeding places of insects and fungi. Trees that have been continuously thrifty, however—that have received uniformly good tillage, fertilizing, pruning, spraying—rarely need to be scraped, as the bark remains relatively smooth and firm. Only the loose outer bark should be removed. On ornamental trees, the bark is a part of the characteristic beauty, and it should not be scraped. Although not a pruning question, this is closely associated with pruning practices.

Pruning ornamental plants.

Ornamental trees and shrubs are pruned for three purposes: (1) to enable them to produce greater quantity of bloom; (2) to make them take some desired form; (3) to remove unusual or injured growths.

The pruning of woody plants for the production of flowers is controlled largely by the flower-bearing habit of the plant. Most early-blooming plants develop their flower-buds the year before. Heavy pruning, therefore, particularly heading-in, when the plants are dormant, cuts off the flower-buds and the amount of bloom is lessened. If these plants are pruned just after the flowers are passed in spring, the best results will be secured, since the new growths will then develop flower-buds for the year following. Among spring-flowering
shrubs that may be pruned after flowering (while in leaf), are deutzias, dierivas or weigelas, forsythias, lilacs, flowering almond, wisteria, exochorda, and many spireas and viburnums. It may be advisable, however, to prune such plants in winter for the purpose of thinning them, thereby allowing the flower-buds that remain to produce larger bloom. In most ornamental plants, however, it is the number of flowers rather than the size of each which is desired.

Plants that bloom late in the season, as hydrangea and most species of clematis, make their flower-buds on shoots which arise that very season. With such plants, it is well to prune rather heavily while they are dormant in order to cause them to throw up a profusion of strong shoots in the spring. These shoots will bear that summer. Among the summer-flowering shrubs that may best be pruned when dormant, are hydrangeas, althea or hibiscus, ligustruros, trumpet creeper, ceanothus, potentillas, vitex, symphoricarpos, and many kinds of clematis, loniceras, jasminum, and some spireas.

Pruning to make the plant assume some definite form is essentially a method of shearing or heading-in. If it is desired to have a very regular and definite shape, it is well to shear the plant at least two or three times a year in order to keep down the exuberant growths. It is a common practice to shear the plants only in the winter, but if this shearing is somewhat violent, as is usually the case, the plant throws up numerous strong shoots very early in spring and it remains shapeless during a large part of the growing season. Except in very special cases and for formal landscape work, it is much better to let shrubs and trees assume their natural and characteristic forms; these forms, in fact, constitute the beauty of the species.

Training.

There is relatively little careful training of plants in North America, largely because of the expense of the skilled labor necessary to perform it. Land is also relatively cheap, and room can be given for the natural development of most plants. In many parts of the Old World, fruit-plants must be grown in very small areas, and it may be necessary to train them on walls, sides of buildings, or on trellises of various kinds. Trained fruit-trees may generally be referred to one of three categories: the wall tree, which is trained against a continuous surface; the espalier, which is trained on a trellis, the branches starting at nearly right angles from a central shaft; the cordon, or training to a single or double strand near the ground. Properly, an espalier is a trellis (page 1146), but the word is commonly used for the plant that is trained on the trellis. There are many variations in the methods of training and pruning in each of these three classes, and the methods are such as can scarcely be well elucidated in writing. The Old-World literature is replete with instructions. In recent American literature, the fullest account is to be found in "The Pruning-Manual." In order that trees may be well trained on walls, espaliers, and cordons, it is necessary that the training be begun in the nursery. The Old-World nurseries grow plants that are trained for various uses, but the American nurseries do not. If, therefore, the American is to train trees in any of these formal shapes, he should secure specimens that are not more than one year from the bud or graft, and begin the training himself. The illustrations (Figs. 3204-3206) suggest some of the special methods of training fruit-trees. On such trees, if skilfully trained and carried out in patient detail, the best excellence in individual fruits may be attained.

Pruning after frost-injury.

When woody plants have been much injured by freezing, it is the best practice to remove all dead parts as soon as the line of demarcation is evident.

The kind of corrective pruning to be employed when trees have been much shattered by winter cold is a subject that needs further investigation. It is not a single or a simple problem, as much depends on the previous state of the trees and on other conditions. Speaking of peach trees, Chandler writes (Research Bulletin No. 8, Missouri Experiment Station): "Pruning the trees severely following a winter when the wood has been killed, although apparently in the best condition of maturity, seems to reduce the amount of killing. However, such pruning following winters when the wood has been killed on account of its not having reached the proper condition of maturity in the fall, generally due to the presence of wet weather following a drought the season before, is liable to result in greater loss than if no pruning were done."

On the proper practice to pursue in the case of frozen citrous trees, T. F. Hunt issued the following advice...
to California growers following the freeze of January, 1913. "Relative to badly injured trees, it appears best not to prune until the new growth has started. It is best to delay the pruning until a distinct line of demarcation develops between the injured and uninjured wood. At the Citrus Experiment Station last year five-year-old lemon trees were frosted. Good results were obtained by waiting until the new growth had reached from 4 to 6 inches in length; in that instance about six weeks were required. Allowing the injured limbs to remain not only makes it possible to determine how much it is best to prune, but the limbs and leaves afford shade to the bark of the tree, which is accustomed to protection.

It may be desirable, in some instances, to spray the trunks and limbs of large and severely pruned trees with whitewash in order to reflect the sun's rays. Wrapping the trunks of young trees with loose sun protectors would seem extremely desirable.

"It seems reasonably certain that no injury to the tree can result from any of the materials passing from the frozen oranges into the tree. An examination of those oranges which have been too badly frozen to be fit for shipment shows that most of them only partially have been killed; consequently, they are presumably respiring carbon dioxide. This loss of energy would be reflected in the tree's activities. For shade and forest trees, which are the leading avenues for distribution of food, healing is a very slower process, and the wound made by severing a branch heals by means of a callus which forms from the growing tissue between the bark and wood. (Fig. 3207.) This tissue rolls over the wound, finally joining in the center and completely covering the old wood. The old wood itself takes no part in the healing process; in fact, it dies. When the healing is complete, the old wood is merely covered and preserved from external injury and infection, much as fruit in a jar is preserved by being protected with a tight cover. There is no dressing that will hasten the healing process except as it keeps the wood from decay. In other words, the whole object of dressing a wound is to protect it. The dressing hinders bacteria and fungi from securing a foothold and thereby prevents the rot. Wounds that are exposed for some years nearly always become unsound at the center because of the intrusion of these organisms, and even if the wounds should subsequently heal over, the infection may still extend down the heart of the tree and finally cause its death. The best covering for a wound is one that protects it best from weather, microbes, and fungi and which persists the longest. Ordinarily, good white lead paint, applied heavily and renewed occasionally, is a good protective covering for fruit trees. Grafting-wax may afford a fair protection, if it is applied warm and thin so that it soaks into the tissue. If it is merely spread over the surface, it soon blisters and becomes loose and affords relatively little protection. For shade and forest trees, which are treated by "tree surgeons," special dressings and disinfectants are employed.

The rapidity with which wounds heal depends very largely on their position on the tree and the way in which they are made. Wounds along the main branches, which are the leading avenues for distribution of food, heal more speedily than those on the weaker side branches. If the wound is close to the trunk it may be expected to heal better. (Figs. 3209, 3210.) If a stub is left several inches long (Fig. 3210), it seldom heals until it rots back to the main branch or trunk; and by that time the decayed part may have extended deep into the tissue of the tree. It is a common notion that a limb should be cut at right angles to the direction of the limb itself and beyond the bulge at its base. It is a better plan, however, to make the wound parallel to the direction of the branch or trunk that remains, and closer to it. This wound may have a somewhat larger superficial area, but it is much nearer the source of the healing food-supply.

When to prune.

It will be gleaned from the above discussion that the time of pruning depends on many circumstances, and chiefly on the result which it is desired to reach. So far as the healing of the wound is concerned, it is perhaps best to prune when the vegetative activities begin in spring so that the wound is quickly covered or "healed." For the purpose of checking growth and producing other definite results, it may be necessary to prune at other times of the year. As a general rule, however, the best time to prune is in late autumn to early spring, when labor can be had and before the rush of spring work comes on. In practice, it resolves itself largely into a question of the convenience of the operator.

The wound.

The wound made by severing a branch heals by means of a callus which forms from the growing tissue between the bark and wood. (Fig. 3207.) This tissue rolls over the wound, finally joining in the center and completely covering the old wood. The old wood itself takes no part in the healing process; in fact, it dies. When the healing is complete, the old wood is merely covered and preserved from external injury and infection, much as fruit in a jar is preserved by being protected with a tight cover. There is no dressing that will hasten the healing process except as it keeps the wood from decay. In other words, the whole object of dressing a wound is to protect it. The dressing hinders bacteria and fungi from securing a foothold and thereby prevents the rot. Wounds that are exposed for some years nearly always become unsound at the center because of the intrusion of these organisms, and even if the wounds should subsequently heal over, the infection may still extend down the heart of the tree and finally cause its death. The best covering for a wound is one that protects it best from weather, microbes, and fungi and which persists the longest. Ordinarily, good white lead paint, applied heavily and renewed occasionally, is a good protective covering for fruit trees. Grafting-wax may afford a fair protection, if it is applied warm and thin so that it soaks into the tissue. If it is merely spread over the surface, it soon blisters and becomes loose and affords relatively little protection. For shade and forest trees, which are treated by "tree surgeons," special dressings and disinfectants are employed.

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PRUNUS (ancient Latin name of plum). *Rosaceae.*

The Stone-fruits, as Plum, Cherry, Peach, Nectarine, Apricot, Almond. Pink-flowered and white-flowered shrubs and trees of wide distribution, grown for fruit, and also for ornamental foliage and flowers.

All woody plants: Ivs. alternate, simple, usually serrate and more or less gland-bearing; fls. mostly in spring, sometimes preceding the leaves, either solitary or in clusters, perfect, the pistil single (more than 1 in abnormal forms) in a cupule or cup (usually designated the calyx-tube), the stamens numerous and perigynous, the petals and calyx-lobe's 5: fr. a drupe, usually 1-seeded by the abortion of one of the 2 ovules. (Fig. 3213.)—The species are probably 175, mostly in the Northern Temperate zone, although a number of blossoms are native in the Andean parts of S. Amer.

The genus as here outlined includes several well-marked groups, some of which are regarded as distinct genera by many authors. In their extreme or typical forms, these subgenera are very distinct, but the groups as a whole are well defined and nothing is contributed to clear definition by raising the groups into generic rank, and it is an advantage for easy reference to have all forms treated in one place rather than to scatter them under several different names. A marked group is Padus, with flowers in true racemes; and its ally, Laurocerasus, is also fairly well distinguished.

Horticulturally, Prunus is one of the most interesting genera by many authors. In its extreme or typical forms, these subgenera are very distinct, but the groups as a whole are well defined and nothing is contributed to clear definition by raising the groups into generic rank, and it is an advantage for easy reference to have all forms treated in one place rather than to scatter them under several different names. A marked group is Padus, with flowers in true racemes; and its ally, Laurocerasus, is also fairly well distinguished.

Some of the ornamental species are not grown on their own roots, but are worked on stocks that can be grown easily and cheaply and of which seeds can be secured in abundance. The commonest stocks for the ornamental kinds are the plum (*P. domestica*), peach, and sweet cherry. On the plum are grown the dwarf almonds and the double-flowering and fancy-foilage plums. The Myrobalan plum (*P. cerasifera*) is sometimes used for the same purpose. Peach stocks may be used for the same species, as a rule; and they are also employed, particularly in the South, for many fruit-bearing plums. The cherry is a good stock for the various kinds of double-flowered, weeping and fancy-leaved cherries. It is an important point in the growing of these grafted prunuses to remove all sprouts from the stock as soon as they appear. This is particularly true of the dwarf almonds, since the stocks are usually stronger-growing species and tend to sucker from the root.

In North America there has been a remarkable contemporaneous evolution of fruit-bearing plums from the native species. Several hundred orchard varieties have been described, and the trees are grown commercially over a wide range of country in the South, in the Mississippi Valley and on the Plains,—in regions in which the common *Prunus domestica* is 9 lives. The Japanese grafted trees sent to this country, in the Orient—farther Asia and the Chino-Japanese region—the peach and apricot groups probably had their origin, as well also as the fruit known to us as the Japanese plum; but Japan is noted for its cherries cultivated for the same reason as the indifferent *P. Pseudo-Cerasus,* among the cherries, is natively grown for fruit in China and Japan.

The Japanese flowering cherries are singularly beautiful and attractive. They should be better known in this country. A number of forms have been long introduced and a few of them are advertised, but apparently they have not been carefully chosen as to hardiness and adaptability. David Fairchild reports that the trunks of the less vigorous forms of his ten-year-old collection in Maryland are sometimes winter-killed, especially on the southwest side, but there are many which, at least in Maryland, are hardy and form good-sized trees. The dropping single forms (*P. subhirtella var. pendula*) are among the hardiest and most showy from a distance, but are surpassed by the wonderful double forms (*P. serrulata*) which produce great masses of flowers as beautiful and quite as large as many semi-double roses. The question of stock is important. In Europe and Eurasia, the plum, cherries, apricots, and almonds have their original development, chiefly from the three species-groups, *P. Cerasus, P. avium,* and *P. domestica.* Ornamental forms are incidental or secondary. In North America, the horticultural development has been chiefly in edible forms of plums. In the Orient—farther Asia and the Chino-Japanese region—the peach and apricot groups probably had their origin, as well also as the fruit known to us as the Japanese plum; but Japan is noted for its cherries cultivated for the same reason as the indifferent *P. Pseudo-Cerasus,* among the cherries, is natively grown for fruit in China and Japan.

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are on a wild stock called the Mazakura (P. Lannestiana) which grows easily from cuttings and according to experiments made by the Department of Agriculture is almost immune to the cherry leaf-spot. As the grafting is at the surface of the ground, and as the trunks of the fruit trees are the parts winter-killed, it is yet an open question as to whether the substitution of a longer-lived hardier stock would produce harder longer-lived trees.

E. H. Wilson, of the Arnold Arboretum, who has made a critical study of these Japanese cherries both in the Orient and at the Arboretum, thinks it will, and has suggested the trial for this purpose of P. serrulata var. schizocarpa. The Mazakura grows readily from cuttings, but P. serrulata var. schizocarpa does not. Does have been successfully propagated on the latter, and we shall be able to determine whether the stock transmits a greater longevity to them. With the tests being made by the Arnold Arboretum, the Department of Agriculture and in New York city, and the botanical studies of Wilson and Miyazaki, we should soon have a reliable planting of these very desirable oriental cherries. In anticipation of this, the names of many of the Japanese forms have been inserted in the following systematic account, although one may expect variations in the rendering of them into English.

In very recent years, the knowledge of the genus has been greatly extended by explorations in China, whence many new species (particularly in the subgenus Cerussa in P. Padus) have been introduced which will probably find their way into cultivation. The taxonomy of the American native plums has also received much recent attention. Aside from the earlier writings of Bailey and Waugh on the native edible plums and cherries, see Hedrick, "The Plums of New York," 1911 and "The Cherries of New York," 1915 (also with similar accounts of all other pomological species), and Wight, "Varieties of Plums Derived from Native American Species," Bulletin No. 172, Bureau of Plant Industry, United States Department of Agriculture, 1915, and "Native American Species of Prunus," Bulletin No. 179 (1915). For the oriental Prunus, particularly those native in China, see the work by Koehne and others in "Plante Wilsoniana," vol. 1, 1911-1913, and Wilson's "Cherries of Japan" (1916), published by the Arnold Arboretum, Boston. As this writing is being closed in the printery, a paper on the Japanese cherries appears in Japan: Maruyar, "Japanese Plums," in Journal of Jap. Sci. Tokyo, vol. 34, art. 1 (1916) with eighty-nine colored figures.

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KEY TO THE GROUPS.

A. LEAVES CONVEX IN THE BUD (i. c., rolled up, showing well as the leaves begin to emerge from the bud): ovary usually furrowed lengthwise. There are exceptions in some of the American native prunes (Nos. 14, 15, 19 and others) in which the leaves are compound in the vernation; also No. 10: these species and their allies are intermediate between the true prunes and the cherries.

I. PRUNOPHORA, PLUMS, PRUNES, AND APRICOTS, Nos. 1-20.

AA. LEAVES FOLDED OR CONVOLUTE (ROUGH-SHAPED, FOLDED LENGTHWISE ALONG THE MIDRIB) IN THE BUD.

B. FLOWER NORMALLY SOFT-HAIRY (EXCEPT IN 2D VAR.); STONE OR PEARL OFTEN FURROWED AND PUNCHED: FLOWER SHORT AND WIDE-SPREADING.

II. AMYGDALUS, ALMONDS, AND PEACHES, Nos. 27-34.

BB. FLOR. VERY JUVENILE, GLABROUS OR ONLY SLIGHTLY HAIRY; STONE SMOOTH OR ROUGHISH.

C. FLOWERS IN FLEXIBLE OR CYMOSAE.

CC. FLOWERS IN RACEMES.

III. CRASSUS, COMMON OR FASCICULATED CHERRIES, Nos. 35-69.

IV. PADUS, RACEMOSE CHERRIES, Nos. 70-82.

Subgenus I. PRUNOPHORA. APRICOTS AND PLUMS.

Fr. sulcate, glabrous and usually glaucous (except in the apricots), the stone compressed and usually longer than broad and smooth or nearly so: style solitary or in umbel-like cymes, mostly appearing before the leaves or with them; leaves mostly convolute (but often compound) in the vernation, generally ovate or lance-ovate:

A. APRICOTS—THE FLOR. SOLITARY OR IN 2D, BEFORE THE LEAVES, AND THE FLOWER (AT LEAST UNTIL RIPE): STONE USUALLY SOLICERE ON THE MARGIN; PENDLE DECEIVING FROM THE NATURE. SEE APRICOT.

1. Armeniaca, LINN. (Armeniaca vulgaris, Lam.). COMMON APRICOT. Figs. 279-284, vol. I. Small round-topped tree with reddish bark much like that of the peach tree: leaves ovate to round-ovate, sometimes slightly cordate at the base, abruptly short-pointed, glabrous (at least above), closely serrate, the stalks stout and gland-bearing: flower pinkish, solitary and sessile or very nearly so, appearing from lateral buds of last year's growth (sometimes on short-year-old spurs) before the leaves: flower variable, nearly smooth when ripe, short-stalked like a peach, usually somewhat flattened, mostly yellow and overlaid more or less with red, the leaf flat and smooth, ridged or sulcate on one edge. Probably Siberia (Dahurian, Manchuria) to China as a native plant. It early reached Eu., where it was once supposed to be native of Armenia, whence the name Armeniaca. The Russian apricot is a hardy race of this species. Var. pendula, Dipp., has hanging or pendulous twigs. Var. variegata, Hort., has white-variegated foliage. — P. Armeniaca is apparently widespread in farther Asia and it is variable. By some authors the main forms are separated as species but the differences appear to be too unimportant or inconsistent for clear definition and they are here retained as varieties.

Var. sibirica, Koch (P. sibirica, Linn. Armeniaca sibirica, Pers.). SIBERIAN APRICOT. Bush or small tree, 10 or 12 ft. high: leaves small and glabrous, or sometimes sparingly bearded beneath, ovate to rounded, long-pointed, unately crenate-serrate or flake-white or pink, appearing early in the season and usually in great profusion, subascid, the calyx minutely puberulent: fruit globular, rarely more than 1/2 in. diam., yellow with a reddish cheek, scarcely fleshy, practically inedible, finally splitting; stone smooth, very sharp-edged. Mongolia, Dahuria. L.B.C. 17: 1627. — Sometimes planted as an ornamental bush.

Var. mandshurica, Maxim. (P. mandshurica, Koehne). Leaves rounded, subcordate or cuneate at base, at apex long-cuneate and acute, margin strongly double-toothed, the teeth sharp and twice longer than wide: peduncle long (about 1/2 in.): flower nearly globular, scarcely 1 in. long, yellow, red-spotted, succulent and sweet; stone small and smooth, the margin obtuse, the seed sweet. Manchuria. — Distinguished by the narrow sharp teeth and double serration of the leaves; kept as a distinct species by some authors.

Var. persica, Maxim. (P. Persica, Komar.). Leaves broad-elliptic, at base short-cuneate, at apex acuminat, very glabrous, the margins crenate-serrate: peduncles hispid: flowers: fruit subglabrous, deeply umbilicate or sulcate, red, tomentose, the flesh grayish brown and sweet and free from the minutely reticulated stone which has one very sharp edge. Japan, cult. — Retained as a separate species by some, being marked by the cuneate base of the leaves.

2. Mume, Sieb. & ZuK. (Armeniaca Mume, Sieb.). JAPANESE APRICOT. Fig. 3214; also Fig. 279, vol. I. Tree of the dimensions of the common apricot, but the bark greenish or grey and the foliage diller in color; branches green: leaves relatively small, narrow-ovate to nearly round-ovate, long-pointed, finely and sharply serrate, more or less sebaceous, lighter-colored beneath, the petals mostly gland-bearing: flower aseolate or nearly so, fragrant: flower mostly smaller than that of P. Armeniaca, yellow or greenish, the dry flesh adhering to the pitted stone. Japan, where it is much grown for its fruit. Flora 50: 150-154. R.R. 1885: 564. G.C. III. 29: 183. — Planted in some extent in the S., particularly in the form known as Bungo or Bungoune apricot or plum, but of minor value. When top-worked on plum, it withstands the long winters of Cent. N. Y., but does not bear. The apricot cult. as Chinese or Shense is also of this species. There are many double-flowered forms in Japan, where it is much prized for decoration. Var. goethiata, Koehne. Lvs. as in P. Mume, rather large: calyx-tube and lobes pubescent. Japan. Var. abo-pieta, Hort. Fls. double: rose in bud then white. Ct. 52: 1513. Other Latin-named varieties are recorded, as forms lactinata, Maxim., var. microcarpa, var. viridicalyx, and var. cryptopetala, Makino.

3. Brigantica, Vill. (Armeniaca brigantwca, Pers. P. Armeniaca subsp. brigantica, Dipp.). ALPINE PLUM. Shrub or small thornless tree, with mostly smaller leaves and smaller smooth subacid fr. the size of a small green-gage plum: leaves broad-oval or ovate, the blade 2-3 in. long, abruptly short-pointed, very sharp-serrate, above glabrous or essentially so, beneath lighter-colored and more or less hairy on rib and nerves, the petiole gland-bearing and usually less than 1 in. long: flower white, about 1/2 in. across. French Alps.

4. Dasycarpa, Ehrl. (P. Armeniaca var. dasycarpa, Koehl). PURPLE OR BLACK APRICOT. Small tree, of
the stature of the common apricot: lvs. smaller and narrower, mostly elliptic-ovate, finely and closely serrate, thin, dull green, the stalks slender and nearly or quite glandless; fls. large and long-stalked, showy; frs. globular and plum-like; on a distinct st., pubescent at maturity, dark purple, the flesh soft and sourish; stone fuzzy. Probably native to Manchuria. B.R: 1243. L.B.C. 13:1250.—Sometimes planted, mostly as an ornamental tree, for the fr. has little value compared to that of the common apricot. Hardy in the N.

B. Group of Eurasian plums: lvs. relatively broad, usually prominently reticulated and more or less pubescent (at least beneath), the young twigs mostly pubescent, fr.-clusters with mostly 1 or 2 fls. from each bud.

c. Fl.-sts. glabrous.

5. cerasifera, Ehrh. (P. domestica var. Myrobalan, Linn. P. Myrobalanana, Loisel.). CHERRY PLUM. Slender twigsy gardener, often thorny, the tree small or sometimes shrub-like; twigs usually soon becoming glabrous: lvs. rather small and thin, also lightish green, becoming nearly or quite glabrous, short-ovate and short-pointed, finely serrate; fls. rather small as compared with most forms of P. domestica, white or blush, slender-stalked: fr. small (usually 1 in. or less diam), globular and cherry-like, depressed about the st., yellow or red, the flesh soft, juicy, and sweet-flavored. Probably native to the Caucasus and S. W. Asia, although early attributed to N. Amer. B.M. 5934. Gn. 55, p. 282. J.H. III. 28:267.—The Myrobalan plum is a culture-form of this species, with rather large and good fr., by some regarded as a subspecies or variety Myrobalana. It is extensively used in this country as a stock on which to bud the domestica plums, the seedlings being imported in great quantities from Eu. It is a smaller tree than P. domestica, with much more slender growth, smoother twigs and lvs., smaller and mostly earlier fls., and also smaller softer fr. with a depression about the st. It tends to dwarf the domestica, plums, but its influence in this direction is not sufficient to discourage its use as a stock. Its advantages as a stock are its cheapness, the ease with which all domestica varieties “take” on it, and the readiness with which it can be grown in the nursery row. It is not used to any extent as stocks for other plums than the domestica. Spon­taneous trees are sometimes found about old nursery grounds, and it occasionally appears in orchards when the top of a plum tree dies and sprouts arise from the root. There are also a few varieties prop. for the early juicy frs., but they are little known. It makes a good ornamental tree. The Marianna, much used for stocks of many kinds of plums in the S. (and growing from cuttings), is probably a hybrid of this species with P. hortulana or P. angustifolia. There are several cult. forms of P. cerasifera, one of the best being the plant known as P. planterinensis, Horta., with full white bloom and red fls. There are also forms with yellow- and white-variegated lvs., and a weaving form (var. pendentia, Horta.). A form with narrow willow-like lvs. (var. acuti­folia or angustifolia, Horta.) is also advertised. A form with twisted or contorted foliage is shown in R.H. 1895, p. 201.

Var. Pissardii, Kochae (P. Pissardii, Carr. P. cerasifera var. atropurparea, Dipp.). A handsome form with purple lvs. and dark wine-red fr.—Intro. into France by Pissard, gardener to the Shah of Persia, and first fully described in Revue Horticole in 1881. It is a cultural form of P. cerasifera. It is one of the best of all small purple-Ivs. trees, holding much of its color in the American summers. It seems to be harder wherever the common plum will stand. The best color is secured on the strong growths; therefore it is well to head back the tree frequently. R.H. 1881:190; 1884:396. G.C. III. 1:413; R.H. 1905:392. Gn. 78, p. 286. G.M. 57:394.

Var. divaricata, Bailey (P. divaricata, Ledeb. P. cerasifera subsp. divaricata, Schmidt.). Branching from the base, the branches wide-spreading and some of them nearly or quite prostrate: lvs. broader toward the base: fr. not depressed about the st., yellow. Macedonia to N. Persia. B.M. 6519.

6. Cocomilla, Ten. ITALIAN PLUM. Allied to P. cerasifera. Bush or small tree, with thorny branches and young growth glabrous: lvs. oval or broadly ovate to roundish obovate, sharp-serrate, glabrous above, more or less pubescent on nerves beneath or glabrous, tapers­ing below, somewhat pointed: fls. usually in pairs, appearing with the lvs. or just preceding them, white or yellow, the flesh soft and sourish; stone not prominently sulcate: peduncle and pedicels: fr. little larger than a very large pea, very deep glaucous-blue, usually persistent until winter, scarcely edible. Cent. and S. Eu. to N. Afr. to N. Persia and Siberia. G.C. III. 42:308.—Sometimes planted in this country, chiefly in the double-fl. form, var. plena, Horta. (Gn. 50, p. 76; 61, p. 363. G.M. 44: 163). It is an excellent bush or small tree for protecting the borders and corners of drives and walks. The short stiff thorny branches make a good barrier. The tree is perfectly hardy where the plum can grow. The little frs. are usually astrin­gent, but there is a sweet-fruited form. It has been supposed by some that the domestica plums may have come from this species, but this is very doubtful, at least within the period of human experience with them.

Var. purpurea, Horta., has purple foliage; fls. small and very numerous, pink: tree less spiny than the type.
From specimens in the herbarium at the Royal Garden, Kew, as *P. domestica*, *P. spinosa*, *P. domestica* subsp. *institia*, *P. syriaca*, *P. damascena*, *P. domestica* var. *institia*, *P. domestica* var. *pubipes*, and other kinds of plums. A form with small foliage and small firm oval or ovoid frs. borne mostly in clusters: fr. various, but firm in texture and usually not depressed about the st.; stone large, slightly rough or pitted. —Native country unknown, but of Eu. or the Euranian region. If it exists in a truly wild state, it is to be sought in the Caucasus and trans-Caucasus regions. It is run wild in many parts of the world. Focke says that *P. domestica* is unknown in an originally wild state, and that the typical form of the species is the prune (Zwetsche), *P. domestica*, Borkh. There are various forms of *P. domestica* grown for ornament, as double-fl.d., yellow-lvd., and variegated-lvd. As a fr.-plant it is widely variable. It is the parent species of the old-time or common plums, as distinguished from the Japanese and American plums. The synonymy of the main varietal groups is shown by Waugh, Bot. Gaz. 26, pp. 417-27 (Dec., 1898), and 27, pp. 478-81.

Var. *institita*, Bailey (*P. institita*, Linn. *P. domestica* subsp. *institita*, Schl. *P. institia*, Borkh.) *Damson*, *Bullace*, and probably also *St. Julian*, and other kinds of plums. A form with small foliage and small firm ov当代 or ovov. frs. borne mostly in clusters; tree small and compact. —*Damson* is a general name for small-fruited or small-lvd. forms of the plum. When the plum runs wild, it usually reverts to this form. Some of the Damsons (as the French, Shropshire, Farleigh) are commercial orchard varieties, being used for culinary purposes. The *Mirabelle* plum is *P. institita* var. *syriaca*, Koehne. There is much difference of opinion as to the systematic position of the plum designated by Linnaeus as *P. institita*, but in character it is somewhat intermediate between *P. domestica* and *P. spinosa*. It is probably one stage in the reversion of the plum toward wild or half-wild forms. The *P. domestica* var. *dannascena*, Linn., is indefinite, and the name may well be dropped.

Other forms of *P. domestica* have received Latin class-names, as var. *maliformis*, Linn. (*P. syriaca*, Dipp.), including the *Mirabelle* (a small-lvd. form with small yellow fr., not unlike the Damsons) and others;

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**PRUNUS**

8. *domestica*, Linn. (*P. communis*, Huds.), COMMON GARDEN PLUM. Figs. 3068 to 3072. Strong-growing small tree with pubescent twigs: lvs. large and thick, dull green, much reticulated, pubescent beneath, ovate or obovate, coarsely and irregularly serrate; fls. white, large, usually in clusters: fr. various, but firm in texture and usually not depressed about the st.; stone large, slightly rough or pitted. —Native country unknown, but of Eu. or the Euranian region. If it exists in a truly wild state, it is to be sought in the Caucasus and trans-Caucasus regions. It is run wild in many parts of the world. Focke says that *P. domestica* is unknown in an originally wild state, and that the typical form of the species is the prune (Zwetsche), *P. domestica*, Borkh. There are various forms of *P. domestica* grown for ornament, as double-fl.d., yellow-lvd., and variegated-lvd. As a fr.-plant it is widely variable. It is the parent species of the old-time or common plums, as distinguished from the Japanese and American plums. The synonymy of the main varietal groups is shown by Waugh, Bot. Gaz. 26, pp. 417-27 (Dec., 1898), and 27, pp. 478-81.

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Other forms of *P. domestica* have received Latin class-names, as var. *maliformis*, Linn. (*P. syriaca*, Dipp.), including the *Mirabelle* (a small-lvd. form with small yellow fr., not unlike the Damsons) and others;

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**PRUNUS**

9. *saficina*, Lindl. (*P. triflora*, Roxbg., nomen nudum. *P. japónica*, Hort., not Thunb. *P. Hallan*, Tamari. *P. elongata*, Schl. *P. Bolan*, Hort. *P. Mads*, Hort.). JAPANESE PLUM. Fig. 3216; also Figs. 3073, 3074. Strong-growing small tree, with smooth often shining reddish or cinnamon-brown twigs: lvs. mostly obovate-oblong, abruptly but prominently pointed, closely obtuse-serrate, the veins looping near the margin, bright often shining green above and dull beneath; fls. few from each bud (most commonly about 3), showy, white or very nearly so, slender-stalked: fr. various, mostly large and firm, yellow or light red (never blue-purple) with pronounced suture and tending to be pointed at the apex. R.H. 1895: 160. Gn. 78, p. 195. —Chinese, but intro. into this country from Japan (in 1870), and now widely distributed and much grown for its fr. The Japanese plum is hardy, in some of its varieties, as far north as Ottawa. It is prized because of its great productivity, long-keeping qualities and beauty of its fr., and its greater immunity from black-knot. As a class, the fr. is of lower quality than the domestica plums. The season of the Japanese plums begins considerably in advance of the domestica and holds nearly as late. The greater number of the varieties are clingstones, but there are some freestones among them. A race of hybrids with *P. tortulana* and *P. aquatica* is now appearing.

Var. *pisipes*, Bailey (*P. triflora* var. *pisipes*, Koehne). Pedicels densely pubescent or only rarely subglabrous: calyx-tube pubescent a third or half the length. —Cult. abroad.

10. *gymnódon*, Koehne. Shrub, with crowded unarmed branches: lvs. large and more or less facciated, conduplicate in vernation, narrow-obovate or obovate-oblong, about 2-3 in. long, at base acute or cuneate; at apex short-acuminate and very acute, serrate with glandless teeth, glabrous or slightly hairy beneath; stipules linear or nearly filiform, often cut: fls. appearing with the lvs., white, calyx-lobes obovate and obtuse, entire or nearly so; petals spatulate-obovate, shortly clawed, about 3/4 in. long. fr. not described. Manchuria. Cult. abroad. —From *P. saflcina* (*P. triflora*) this species differs in the conduplicate lvs., which are little involute
on margin, glandless lf.-serratures, very short pedicels and smaller fls.

11. thibética, Franch. Ornamental tree, 15-20 ft., with blush-pink fls., and with convolute lvs. which are oblong and obtuse, crenate, the teeth glandular-calloso at their apex: fls. with the lvs., on pedicels ¾-¾ in. long. Blush-pink petals ¾ in., or less long, scarcely equaling the stamens. W. China, in thickets.

12. Simonii, Carr. (Pérsica Simonii, Decne.). SIMON or APRICOT PLUM. Fig. 3217. A straight-growing fastigate tree: lvs. rather long-oblancoelate or lance-oblong, somewhat thick and heavy, dull, very velvety below, finely but unevenly obtuse-serrate, conduplicate or trough-shaped in habit; fls. nearly white, on short stalks, often 2 or 3 together, preceding the lvs.: fr. 1-2 in. diam., flattened lengthwise, very firm in texture, perfectly maroon-red, possessing a deep suture, the yellow flesh closely adhering to the small spongy-rouched nearly orbicular pit; peduncle usually not adhering to the mature fr. Named in honor of Eugene Simon, who sent pits from Cézanne to Fr., prior to 1872; botanically it is, apparently, a hybrid of this species and P. salicina.

13. subcordata, Benth. PACIFIC PLUM. Small tree or bush, usually only a few feet high, but sometimes rising to 20 or 25 ft.; lvs. round-ovate, or orbicular, obtuse, mostly broad or subcordate at base, either sharply or obtusely serrate (usually incised-serrate), thick, soft-pubescent beneath but becoming more or less glabrous; fls. white fading to rose, less than 1 in. across, in clusters of 4 or less and appearing before or with the lvs.: fr. globular or short-oblung, usually dark red, in the largest wild forms somewhat over 1 in. diam., the flesh subacid and clinging to the flat, smooth, or slightly roughened stone. High lands and mountains, Calif. and Ore. S.S. 4:154.—The fr. is gathered for domestic uses, and the tree is sometimes planted about houses, being handsome, maroon-red, and sometimes pubescent on young shoots, which are reddish.

Var. Kétloggii, Lemmon. SISSON PLUM. Taller and more slender: bark ash-gray; lvs. usually not cordate, mostly forming thickets, with gray branches or gray-brown twigs; lvs. obvate, oblong-obovate or sometimes oblong-ovate, acuminate, thickish, the margins mostly sharp-serrate or sometimes almost incised, not glossy, strongly reticulated beneath and pubescent on the veins: fr. large, white, slender-stalked, the calyx-lobes entire and pubescent on the inside, appearing in small clusters in advance of the lvs.: fr. various, but mostly small and hard, the skin tough and glaucous and not shining, yellow and variously overlaid with red; stone turgid. Woods and copse. Mass. and N. Y. to Mann., Utah, and Mex. at least in part. S.U.S. 4:150.—In the E., the frs. are usually austere, and often not fit for eating; but in the W., edible-fruited forms are found in abundance. It is the most prolific source of cult. native plums for the cold N., giving rise to such varieties as Blackhawk, Cherokee, Craig, Forest Garden, De Soto, Golden Queen, Gaylord, Rollingstone, Newton, Hawkeye.

Var. m61lis, Torr. & Gray (P. lanata, Mack. & Bush. P. americana var. lanata, Sudw.). Lvs. and shoots soft-pubescent or sometimes almost tomentose. III., Iowa, Mo. —To this form belong the Wolf, Van Buren, Quaker, and American Eagle plums. There is also a double-fld. variety.
15. nigra, Ait. (P. borealis, Poir. P. mollis, Torr. P. americana var. nigra, Waugh). CANADA PLUM. Lvs. mostly broader, the teeth glandular and remaining on mature lvs. as small callous points, but the teeth otherwise nearly or quite blunt and thereby differing from the sharply and deeply serrate lvs. of P. americana;

16. mexicana, Wats. (P. australis, Muns. P. reticulata, P. tenuifolia, P. polyandra and P. arkanesana, Sarg.). Big-Tree Plum. The southern representative of P. americana, as P. nigra is the northern; it is tree-like, not sprouting from the roots or forming thickets: lvs. oblong-ovate to ovate, 3-5 in. long, rounded or subcordate at base, abruptly acuminate at apex, sharply and sometimes doubly serrate, short-pubescent above at least when young and long-pubescent beneath (and often confused with P. americana var. mollis); petiole usually bearing 1 or more short-stalked glands at or near the apex; fls. ½ in. across, white, in small nearly sessile umbels, the pedicels usually glabrous; calyx-lobes mostly reflexed, nearly or quite as long as the tube, dentate at apex or sometimes entire, obscurely glandular, pubescent within; petals variable in shape, usually pubescent and mostly entire; fr. globose or rarely oblong, sometimes 1 in. or more diam., purplish red with bluish bloom; pit or stone obovoid or nearly globular, turbid, the surface smooth or essentially so. S. W. Ky. and Tenn. to Okla. and Mex.—Wild fr. is sometimes gathered, and it varies in size and quality, but the species has received little attention horticulturally, although used experimentally as a stock to which its non-suckering habit adapts it. It is said that a hybrid has been produced with P. salicina. Wight, who has recently re-characterized this species, writes that "Although long confused with Prunus americana, and in the herbarium sometimes difficult to distinguish from P. americana var. lanata, the species is nevertheless a very distinct one. It never forms thickets, as does P. americana and its subspecies, but occurs always as a tree with a well-defined trunk, which in the older trees differs in its furrowed bark. The young leaves as they appear are mostly somewhat obtuse at the apex instead of acuminate; the older leaves are usually broader in proportion to their length, and the serration of the margin is slightly less pronounced. The flowers also have petals somewhat broader in proportion to their length than in P. americana, while the stone is obovoid or round and more turbid."

17. hortulana, Bailey (P. hortulana var. Waylandii, Bailey). Hortulan Plum. Fig. 3220. Tree distinct, not sprouting from the root or forming thickets or hedges, 15-30 ft. tall, with thinnish exfoliating bark and brownish twigs; lvs. oblong-obovate or elliptic-ovate, the blade 3-4 in. long, rather broad to rounded at the mostly oblique base, long-acuminate, yellowish green, glabrous above and more or less shining, slightly pubescent or practically glabrous beneath, the margins shallowly and obtusely serrate or crenate-serrate; petiole usually bearing 1 or 2 or more small glands toward the apex; fls. preceding the lvs., white, small (about ½ in. broad), the pedicels slender and glabrous; calyx-lobes about as long as the tube, oblong-ovate, glabrous on margin but otherwise glabrous or nearly so on exterior, mostly obtuse; petals oval to nearly orbicular, clawed; fr. globose or short-oblong, ½-1 in. diam. in the wild, red to yellow and mostly white-dotted, with little or no bloom, not thick-skinned; pit or stone various, globose to oval or oblong, the surface more or less reticulated. Cent. Ky., Tenn., to Iowa and Okla.—This species has yielded a good number of cult. varieties, as Kanawha, Golden Beauty, Cumberland, Leptune, Wayland, Moreman, Sucker State. The species was first distinguished in 1892 to designate varieties of plums intermediate between P. americana and P. angustifolia (the two species at that time clearly separated); these intermediate varieties were then said to "represent at least two other species, and perhaps even more" (G. F. 5:90), one of which it was proposed to separate as P. hortulana. Later students have separated P. Munsonian from these varieties, and have redefined other species. Subsequently it was supposed that P. hortulana represents a range of hybrids between P. americana and P. angustifolia, and it is not yet known what part hybridization has played in the origin of these forms, although the evidence accumulates that separate specific types are involved.

Var. Municri, Bailey, is nearer to P. americana, and represents the northward extension of the group; it is known by its thicker and drier bark, which are very veiny below and oarely toothed and somewhat obovate in outline, and by a late firm fr.
To this form belong the Miner, Langsdon, Clinton, Forest Rose. The Miner is apparently the first horticultural variety of native plum to receive a name; the seed that produced the original tree was planted in 1814.

EE. Stature of bushes: lvs. and fls. small; far S. W.

18. rivularis, Scheele. (P. tezana, Scheele). CREEK PLUM. Slender-stemmed shrub to 8 ft., forming thickets, with gray or reddish twigs and early-ripening fr. (June):

3221. Prunus angustifolia var. Watsonii (×§). No. 20.

19. Reverchonii, Sarg. (P. pygma, Muns., not P. pygmina, Wild.). HOE PLUM. Shrub, 2–6 ft., with gray bark and chestnut-colored twigs, forming dense thickets and yielding late-ripening fr. (Aug., Sept.): lvs. ovate to oblong-ovate or somewhat obovate, rounded at base, short-acuminate at apex, 1–3 in. long, glandular-serrate, glabrous above, more or less pubescent beneath; petioles with 1 or 2 glands near apex, or glandless: fls. white, with the lvs. or before them, less than 3/16 in. broad, on slender glabrous pedicels; calyx-lobes as long as tube, ovate or oblong-ovate, usually pointed, glandular, little pubescent on exterior, with age reflexed; petals obovate-orbicular or oblong-obovate, short-clawed; fr. nearly globose, 3/16 in. or somewhat more diam., red and with light bloom; pit or stone oval to subglobose, the surface smooth or obscurely roughened. Texas.—Apparently of little horticultural value, as the fr. is small and poor, although eaten by Indians. No improved varieties are reported.

20. angustifolia, Marsh. (P. Chickasaw, Michx. P. stenophylla, Raf.). CHICKASAW PLUM. MOUNTAIN CHERRY. Small bushy-topped twiggy tree, 8–10 ft. high or often only a shrub forming dense thickets, with slender zigzag reddish branches: lvs. lanceolate or oblong-lanceolate and conduplicate (trough-like), shining, 2 in. or less long, mostly narrowed toward base, at apex acuminate or short-acute, glabrous or sometimes sparingly pubescent on nerves beneath, finely and closely serrate; petiole glandular or not near apex: fls. white, preceding lvs., about 1/16 in. across, on glabrous pedicels; calyx-lobes ovate-obtuse and shorter than tube, not glandular, exterior glabrous; fr. small and early, cherry-like, slender-stemmed, red or yellow and yellow-dotted, shining, thinly glaucous, the flesh soft and juicy and clinging to the small rough stone. Del. to Fla. and Texas, being abundant in sandy places. S.S. 4: 152.—This species has given rise to several pomological varieties, as Caddo Chief and Ogeechee; it is an early-fruiting species, more or less thorny.

Var. Watsonii, Waugh (P. Watsonii, Sarg.). SAND PLUM. Fig. 3221. Bush, 3–6 ft. high, with more zigzag twigs than in P. angustifolia, more spiny, the lvs. smaller, less pointed and less conspicuously serrate, the fls. smaller, the fr. with thicker skin. Dry regions of Kans. to Texas and New Mex. (also reported from Neb. but perhaps intro.), and planted by the settlers, who prize it for its fr. G.F. 7: 135 (adapted in Fig. 3221). Several named pomological varieties issue from this variety, as Strawberry, Welcome, Red, Yellow, and Purple Panhandle. Var. Watsonii is named for Dr. Louis Watson, of Kans.

Var. Varians, Wight & Hedr. BIG CHICKASAW PLUM. Rather larger than P. angustifolia itself, more robust and a less crabbed grower, lvs. and pedicels longer, and stone usually more pointed at apex. Oka., Texas, in more fertile soil than the species.—Apparently a range of forms growing under better conditions than those in which the plants taken as the type of P. angustifolia are found, and giving rise to many early-ripening plums, such as Yellow Transparent, Emerson, Coletta, Clark, African. Supposed to have furnished hybrids with P. Mussoniana and P. salicina. The Marianna most probably represents a cross between some form of P. angustifolia (perhaps var. varians) and P. cerasifera.

21. Mussoniana, Wight & Hedr. WILD GOOSE PLUM. Figs. 3222, 3223; also Figs. 3076, 3077. A range of forms separated out of the old Hortulana class, of larger and freer growth than the variants of P. angustifolia, hardier, with larger and more pointed lvs., and larger fls. bearing glandular calyx-lobes: forming thickets, reaching 20–25 ft. in height; lvs. 3–4 in. long, lanceolate to oblong-lanceolate, rounded at base, at apex acuminate, margins closely glandular-serrate, shining and glabrous, usually slightly pubescent on veins beneath; petioles usually with 2 glands near apex. Frs. white, 3/16 in. or more broad, either with the lvs. or preceding them, on slender glabrous pedicels; calyx-
3223. Prunus mossonianiana.—The Wild Goose plum (X §; stone X §). No. 21.

var. tarda. Beadle). A hill-country form: lvs. ovate-oblong to oblong, obtuse, equaling the tube, glandular on margin, mostly glabrous on exterior: fr. globular or oval, bright red or yellowish and marked with whitish dots, late-ripening; pit or stone mostly oval, pointed at apex, the surface usually roughened. Ky. and Tenn. to Miss., Texas, Mo., and Kans.—The botanical status of this group is yet doubtful, although well marked in some forms. From it have come many pomological forms, as Wild Goose, Newman, Milton, Robinson, Potawattamie, Osage, Whitaker, Jewell, and Texas Belle.

cc. Les. mostly as narrow as lanceolate-ovate, or else small and shortish, thin or thinnish (except P. maritima), finely and usually evenly serrate, becoming glabrous or nearly so (except in forms of P. umbellata and P. maritima), beneath at maturity; fr. mostly thick-skinned. Species of the beach plum or P. maritima group, mostly plants of low growth and dwarf habit.

22. orthosepala, Koehne. Fig. 3224. A much-branched spreading bush about 4 or 5 ft. high, with young branchlets chestnut-colored: lvs. oblong-lanceolate to obovate-lanceolate, about 2 in. or less long, narrowly pointed at base, at apex acute or acuminate, glabrous and shining, serrate; petiole glandless or with 1 or 2 glands near apex; fls. small (Y2 in. across), white, in clusters of 2-5, appearing with or before the lvs.: fr. globular, bright red or yellowish and marked with whitish dots, late-ripening; pit or stone oval, pointed at apex, the surface usually roughened. Pa., Conn. S.S. 4:153. G.F. 3:429, from which Fig. 3225 is reduced.—In a very limited way the species has come into botanic gardens and collections. As an ornamental subject it has merit, for it bears profusely of fls. and fr. The plums, or

“sloes,” are collected from the wild for the making of pies and preserves.

Var. Davisii, Wight, along gravelly ridges in the northern part of the southern peninsula of Mich., bearing blue fls. used locally for jellies and conserves, is distinguished by lvs. broader in proportion to their length and less acuminate. From P. maritima, which it resembles, it differs in the reddish color of twigs, more glabrous lvs. and pedicels, and the stone pointed rather than rounded at base.

24. umbellata, Ell. Black Sloe of the S. Twiggy small tree (10-20 ft.), with compact head and very slender glabrous branchlets, often more or less thorny: lvs. small (mostly 2 in. or less long), light green and broader than in P. cerasifera.

Var. injucunda, Sarg. (P. injucunda, Small. P. mitis, Beadle). A hill-country form: lvs. oval or oblong-oval, usually somewhat longer and broader than in P. umbellata itself, narrowed toward the base, acute or acuminate, mostly pubescent beneath and somewhat pubescent above: fls. appearing later (March, April); calyx pubescent rather than glabrous. N. C. to Ga., Ala., and Miss., apparently passing into var. tarda.
PRUNUS

Var. tárda, Wight (P. tárda, Sarg.). Tree, 18-20 ft., distinguished from P. umbelata by lighter-colored bark, later-ripening fr., and more oblong stone. W. Miss. to Texas and S. Ark., the nearly globular, yellow, red, or blue fr. (about \(\frac{3}{8}\) in. diam.) ripening in Oct. and Nov.


3225. Prunus alleghaniensis (X3%). No. 23.

P. pubescens, Pursh. P. littoralis, Bigel. P. pubigera, Steud.) BEACH PLUM. SHORE PLUM. Fig. 3225. Decumbent straggling more or less thorny bush with rough and warty branches and slightly pubescent young growth: lvs. oval or obovate-oval, short-acute or nearly obtuse, closely serrate, dull green, often somewhat pubescent beneath: fls. small, white, slender-stalked, borne in few-fld. umbels preceding the lvs.: fr. about \(\frac{3}{8}\) in. diam., depressed-globular (somewhat flattened at the ends), with a slight cavity about the st., mostly deep dull purple when ripe and covered with a heavy bloom, the flesh brittle and mostly sweet and juicy and free from the small turbid cherry-like stone (which is pointed at both ends), the skin thick, tough, and more or less acrid. Sands of the seashore, New Bruns. to Va., and also some miles inland; its reported occurrence at the head of Lake Michigan has not been verified. B.M. 8289. Gn. 4:257 (bush in bloom).—The main sts. are decumbent, and strong shoots stand upright to a height of 2-6 ft., or sometimes even 10-12 ft. P. maritima is a handsome plant in cult. because of the great profusion of its early spring bloom, and the frs., when produced, are also ornamental. As a fr.-plant, it is known in the variety Bassett American, which, however, has never become popular because of its small size. The species is very variable, and no doubt several botanical varieties could be distinguished. Yellow-fruited forms are known (forma flaves, G. S. Torr.). A species related to P. maritima, but not in the trade, is P. Gravessii, Small, with orbiculare very obtuse and often apiculate lvs. and stone pointed at base. Known only from the original locality at Groton, Conn., near Long Island Sound, an unarmed bush about 3 ft. high, with a dark rather rough bark and usually puberulent twigs.

26. gracilis, Engelm. & Gray. OKLAHOMA PLUM. A straggling shrub, closely allied to P. maritima, in clumps or thickets, 1-4 ft. high, with grayish bark and reddish brown pubescent young twigs: lvs. oval or ovate, rarely ovate-lanceolate, 1-2 in. long, narrowed either way but sometimes obtusish at apex, finely but lightly pubescent above, strongly pubescent beneath, finely serrate; petiole glandless or with 1 or 2 glands near apex: fls. preceding the lvs., white, \(\frac{1}{2}\) to nearly \(\frac{3}{4}\) in. broad, on pubescent pedicels; calyx-lobes ovate and acute, entire or denticulate, glandless; fr. globular or ovoid, \(\frac{1}{2}\)-\(\frac{3}{4}\) in. diam., mostly red and with light bloom; pit or stone oval, somewhat obtuse at the ends, the surface nearly smooth. W. Ark., Okla. and N. Texas, in dry sandy places.—This species appears to have yielded no named pomological varieties, although the fr. is sometimes collected from the wild for market. P. venulosa, Sarg., is a larger shrub, forming denser thickets, with larger and more coarsely serrate lvs. and glabrous pedicels. It is from N. Texas, but whether a good native species or a hybrid of P. gracilis and P. Reverchonii is undetermined; of no horticultural promise.

Subgenus II. AMYGDALUS. Almonds and Peaches.

Fr. sessile, large, mostly pubescent; fls. solitary from lateral buds on the previous year's growth, appearing in advance of the lvs., the latter conduplicate in the bud.

27. triflora, Lindl. (Amygdalus pedunculata, Bunge. Amygdalopis Lindleyi, Carr. Prunopsis Lindleyi, André. Prunus umifolia, Franch.) FLOWERING ALMOND. (See Nos. 39, 40.) Fig. 3227. Lvs. broadly orbiculare or obovate, usually broader above the middle, soft-hairy, abruptly pointed, coarsely doubly serrate, tending to be 3-lobed above: fls. solitary, short-pedicelled, and mostly in advance of the lvs., clear pink, sometimes white, usually double (var. plena, Hort. Fig. 3224) calyx-tube hairy inside between stamens, the sepals pilose or glabrous on outside; sepals and petals (in single frs.) 5-10: fr. small, red-hairy when young, but becoming glabrous. China. B.M. 8051. I.H. 8:305. F.S:18:1352. H.H. 1508:91; 1870, p. 288 (fr.); 1880, p. 367 (fr.); 1884:396; 1907, pp. 154, 155. Gn. 21, p. 275; 28:346; 55, p. 374; 59, p. 135; 79, p. 17. G.M. 44:210; 52:247. G. 26:462; 33:19. H.F. II. 7:139. Gn. 5:165; 6:289; 8:196.—A most desirable bush, hardy in Cent. N. Y. and Ont. It is a good subject for blooming in pots. It is sometimes grown as a standard worked on plum, but it is then short-lived; better results are to be expected from own-rooted plants (by layering or root-grafting). Sometimes it rises to the stature of a small tree. The double-fld. form (var. plena) is the one commonly seen in gardens, but the single-fld. form is the better. A sport producing several pistils has been recorded (Amygdalopis). Not to be confused with the forms of P. japonica and P. glandulosa, which have smaller and relatively longer-stalked fls. and usually more than 1 from the bud, and different lvs.

Var. Pézoldii, Bailey (P. Pézoldi, Koch. P. virgata, Hort.). Branchlets and adult foliage glabrous:-lvs. ovate or elliptic, usually at or below the middle, not 3-lobed, gradually narrowed or acuminate above, glabrous, with sharp teeth; fls. smaller than in P. triflora and with shorter pedicel, rose-colored; calyx-tube glabrous inside as are the lobes or sepals on the
outside, the sepal and petals usually 10; fr. spherical; stone hard, bony and more rugose. Probably China.

23. orientalis, Koehne (Amygdalus orientalis, Mill. A. argentea, Lam.). ORIENTAL ALMOND. Shrub, 3–10 ft. high, with woolly twigs: lvs. small (3/4–1 1/2 in. long), nearly or quite sessile (petiol less than 1/2 in. long), oval, oblong or narrow-obovate, nearly obtuse or short-pointed, entire or obscurely serrulate: fls. solitary, nearly 1 in. across, light rose-color, with or just preceding the lvs.: fr. ovate or oblong, more or less pointed, thinly pubescent but becoming glabrous. Asia Minor, Syria. L.B.C. 12:1137.—Variable; several species-names of the same general geographical region are probably to be referred to it, or they may represent very closely related species.

29. nana, Stokes (Amygdalus nana, Linn.). RUSSIAN ALMOND. Fig. 3227. Bush, 3–5 ft. high: lvs. narrowly elliptic or elliptic-lanceolate, 2 or 3 in. long, thick and rather stiff, scarcely pointed, lighter colored and the veins prominent beneath, smooth, the edges set with sharp spreading saw-like teeth: fls. usually solitary, rose-color or white, nearly 1 in. or less across, sessile, with or just preceding the lvs.: fr. small and hard, pubescent, bitter, with a large wrinkled sharp-pointed somewhat cordate, unequal-sided pit. Russia and W. Asia. B.M. 161. L.B.C. 12:1114.—This plant has been intro. into this country recently as a fr-plant, although it possesses little merit for that purpose. It is cult. in Eu. for its fls. and it has been thought that the flowering almond of our gardens belongs to it; but our flowering almonds are P. triloba and also in part P. glandulosa and P. japonica. This Russian almond is very hardy, enduring the climate of the northern Prairie states, where it ripens its little almond-like frs. in July. A small-fruited form of the apricot (P. Armeniacæ) has been intro. as Russian almond. Prunus nana is cult. in 2 or 3 forms. Var. campestris, Hort., has white fls. of larger size. Var. geðérica, DC., has dark rose-colored somewhat smaller fls. and narrower, longer lvs. Var. cochin-chinensis, Hort., is a larger plant with white fls. Var. rubra, Hort., has red fls. over 1/2 in. across. G.C. III. 52: suppl. Nov. 23 (1912). For another use of the name P. nana (for the choke cherry), see No. 72.

30. Sweginzowii, Koehne. Small glabrous shrub very like P. nana, distinguished by large and fl-like stipules and unequal very sharp double teeth of the lvs.: fls. deep rose-colored; calyx tubular, nearly 1/2 in. long, the lobes oblong and glandular-fimbriate; petals oblong-obovate with cuneate base, nearly 1/2 in. long, Turkistan.

31. Fenzliana, Fritsch. Much like P. communis, but lower and more bushy and thorny: lvs. smaller, gray-green or bluish green; fls. more nearly white: fr. more peachlike in form, being not so pointed or elongated as in P. communis, but scarcely fleshy; stone shorter and more nearly orbicularly outline. Caucasus.— Said to be a very showy early-blooming species.

AA. Plant a tree or tree-like.

b. Fr. hard, splitting at maturity.


—Grown as an ornamental tree, but chiefly for the nuts (pits or stones of the fr.). There are double-fl., white-fl., and variegated-fl. forms, also dwarf and weeping forms, under such names as alba-plena, rosso-plena, purpurea, compacta, variegata, pendula. The forms may be ranged in two classes: Var. típica, Schneid., the hard-shelled or brittle-shelled almond, of which there are also bitter-kernelled and soft-kernelled forms (vars. amara and dulcis); Var. frágilis, Schneid., the soft-shelled or brittle-shelled almond, of which there are also vars. amara and sativa. See Almond. P. persicoides, Asch. & Graebn. (Amygdalus communis var. persicoides, Ser. A. persicoides, Zabel), is an old hybrid of P. Persica and P. communis, with foliage much like the latter but usually more sharply toothed, and fr. intermediate or perhaps more peach-like, usually ovoid-obtuse and little succulent.

bb. Fr. soft and fleshy, usually not cracking or opening to the stone.

33. Persica, Sieb. & Zucc. (Amygdalus Persica, Linn. Prunus vulgaris, Mill.). PEACH. Figs. 2785–2791. Much like the almond in botanical characters and by some thought to be derived from that plant, but now generally agreed to be an original species and to be native to China (Fig. 2791, p. 2495): lvs. broad-lanceolate or oblong-lanceolate, coarsely serrate, the petiole usually gland-bearing and 1/2 in. or less long (shorter than the width of one side of the blade): fls. solitary, pink, appearing before the lvs., the sepals more or less pubescent on outside: fr. soft, pubescent at maturity, the stone deep-pitted and very hard. Widely cult., especially in N. Am., where it thrives under a great variety of conditions.—There are 2 well-marked forms, the cling-stones or pavies (Persica vulgaris, Risso), and the freestones (Persica domestica, Risso). There are many ornamental forms of the peach tree: double-fl., Fig. 2789. (F.S. 10:969; 13:1299, 1300. R.H. 1852:221); white-fl., dark-fl., etc.; purple-fl.; variegated-fl.; dwarfs. These forms are catalogued...
under such names as *Prunus vulgaris flore albo-plena*, *flore roseo-plena*, *flore saquingue-plena* representing different colors of double-fl.d. pech, and *P. vulgaris foliis purpureis* representing the purple- or blood-lvd. pech. One of the best of these fancy forms is var. *camellifolia*, Hort., with its subvar. *plena*, the former with very large carmine fls. and the latter with double fls. (Fig. 2759). There are forms (var. *persicodor*) with different colors of fls. on different branches of the same tree; also compact or dwarf, pyramidal, weeping, and purple-lvd. forms. See Peach.


3229. *Prunus pumila*—*Sand cherry* (X). No. 35.

lus nectarina, Ait. *Prunus* *Punica* var. *nectaria*, Maxim.). *Nectarine*. Fig. 2453, p. 2116. Fr. smooth, usually smaller; lvs. usually more strongly serrate. The nectarine is said to have sprung from the pech, both through seed- and bud-variation. There are 2 types, as in the pech: *lingstone* or *brugnon* (*Prunus* *lilis*, Ral.), and *fissi—for* (*Prunus* *violacea*, Rass). The nectarine is not generally cult. in this country, although it is popular in Calif.

Var. *platycarpa*, Bailey (Punica *platycarpa*, Decne.). *Flat Peach*. Fr. much flattened endwise, and scarcely thicker in that direction than the length of the pit or stone, with a calyx-like eye or broken cavity at the top; stones small, flat, compressed, rough, and irregular. China. R. H. 1870:111. Trans. Hort. Soc., Lond. 4:512.—Grown in the southern states, where it has given rise to various globular peaches. The Peen-to is a form or variety (Fig. 2784, p. 2403) originated in 1809 with P. J. Berckmans, Augusta, Ga., from seeds sent from Austral., where it was probably intro. from China; on account of its very early blooming, this variety is not grown commercially in any of the regular peach sections of the U. S., as it is very likely to be caught by frosts, nor is the quality superior; for the original of the Improved Rocky Mountain cherry/*Prunus cuneata*, Raf. (*P. pumila* var. *cuneata*, Bailey). Fig. 3230. Erect, 1–4 ft.; lvs. thin, oval, short-stalked or spatulate, very strongly toothed, especially at apex: fr. much larger. Bogs and cool woods and about lakes in the northern states, and in the mountains as far south as N. C.—Not in the trade, so far as known, and not promising horticulturally.

37. *Besseyi*, Bailey (*P. pumila* var. *Besseyi*, Waugh. *P. rosebudii*, Reagan. *P. prunella*, Daniels). *Western Sand Cherry*. Figs. 3231, 3232. Known from *P. pumila* by its more prostrate habit, lvs. spreading (more erect in *P. pumila*), broad and thick, usually elliptic, elliptic-oval, or elliptic-lanceolate; stipules on strong shoots, large and green, serrate: fr. nearly or quite twice larger, on short stalks, usually sweet, in certain selected forms as much as %in. diam. This is the sand cherry of the Plains and the W., ranging from Kans. to Man., and west to Wyo. and Colo. B. M. 8156.—The original of the Improved Rocky Mountain cherry, a plant grown for its large sweet fr. Large-fruited forms of this species are much prized on the Plains for pies and other uses, and the species is promising horticulturally. Many hybrids with other species of *Prunus* have been secured by Hansen. The species is useful as a stock for certain other cherries, prunes, and

Subgenus III. *Cerasus*. Cherries.

Fr. globular or oblong, not sulcate, glabrous and usually not glaucous, the stone turgid (usually nearly globular), and rarely conspicuously longer than broad and smooth: fls. in umbel-like fascicles (mostly solitary in *P. tomentosa*), commonly with or immediately preceding the lvs.

A. Fls. arising from 2 lateral buds (the central one usually a fr.-bud or branch-bud) on the previous season's growth, usually appearing in advance of the lvs., the pedicels having no common peduncle outside or beyond the bud-scales: petiole usually very short: plant dwarf. (*Microcerus*.)

B. Sepals or calyx-lobes reflexed: fls. pedicelled and umbel-like, 4 or less (sometimes only 1).

C. Lvs. entire at base or below the middle, very shallowly serrate toward the apex: fr. black at maturity.

35. *pumila*, Linn. *Sand Cherry*. *Dwarf Cherry*. Fig. 3229. Decumbent or prostrate at the base when old, but the young growth strictly erect and often reaching 5–8 ft. in height, the slender twigggy growth reddish and glabrous: lvs. narrowly oblanceolate, acuminate, short-pointed or nearly obtuse, the margins beyond the bud-scales: petiole usually very short: plant dwarf. (*Microcerus*.)

30. *cuneata*, Raf. (*P. pumila* var. *cuneata*, Bailey). Fig. 3230. Erect, 1–4 ft.; lvs. thin, oval, short-stalked or spatulate, very strongly toothed, especially at apex: fr. much larger. Bogs and cool woods and about lakes in the northern states, and in the mountains as far south as N. C.—Not in the trade, so far as known, and not promising horticulturally.

37. *Besseyi*, Bailey (*P. pumila* var. *Besseyi*, Waugh. *P. rosebudii*, Reagan. *P. prunella*, Daniels). *Western Sand Cherry*. Figs. 3231, 3232. Known from *P. pumila* by its more prostrate habit, lvs. spreading (more erect in *P. pumila*), broad and thick, usually elliptic, elliptic-oval, or elliptic-lanceolate; stipules on strong shoots, large and green, serrate: fr. nearly or quite twice larger, on short stalks, usually sweet, in certain selected forms as much as %in. diam. This is the sand cherry of the Plains and the W., ranging from Kans. to Man., and west to Wyo. and Colo. B. M. 8156.—The original of the Improved Rocky Mountain cherry, a plant grown for its large sweet fr. Large-fruited forms of this species are much prized on the Plains for pies and other uses, and the species is promising horticulturally. Many hybrids with other species of *Prunus* have been secured by Hansen. The species is useful as a stock for certain other cherries, prunes, and
even peaches for cold countries where the trees must be protected. See Hansen, Bull. No. 87, S. Dak. Exp. Sta. (1904), and subsequent bulletins.

38. *utahensis*, Dieck. UTAH HYBRID CHERRY. Apparently a hybrid of *P. angustifolia* var. *Watsonii* and *P. Besseyi*. A small tree-like bush: lvs. lance-elliptic to oblong-oval, short-pointed or nearly blunt, finely serrate, slightly conduplicate, glossy above and much reticulated beneath: fr. cherry-like, somewhat larger than that of *P. Besseyi* (about \(\frac{3}{4}\) or \(\frac{3}{4}\) in., diam.), of deep mahogany-color, with a thin plum-like bloom, \(\frac{1}{2}\) in. long in fr.: petals twice or more as long (becoming \(\frac{3}{4}\) in. long in fr.): spikes numerous. 

Appears to have been raised about 50-60 years ago from seed of J. E. Johnson, in Nebr. Mr. Johnson subsequently grew near) by J. E. Johnson, in Nebr. Mr. Johnson subsequently moved to Utah, whence the fr. was distributed. It has little value as a fr.-plant, but it is an attractive ornamental subject, both in fl. and fr.

39. *japonica*, Thunb. (P. nana, Hort., in part. *P. sinensis*, Hort., of Amer. gardens). Fig. 3233. Bushy plant, rarely over 5 ft. high: lvs. ovate, ovate-orbicular, or otherwise on the broad order (rarely as narrow as ovate-lanceolate) acuminate or even caudate, not at all inclined to be lobed, coarsely double-serrate or crenate, glabrous beneath or short-hairy on midrib and nerves: fr. in 2's and 3's, rose-colored or bluish, stalked (the stalks lengthening), appearing with the lvs.: fr. glabrous or short-oblong, \(\frac{3}{4}\) in. diam., smooth and shining, wine-red. Cult. from Japan, but probably native to China. To what extent this species is cult. in this country is yet to be determined. It runs into several well-marked forms. Var. *eu-japonica*, Koehne. Branches erect and virgate: petals \(\frac{3}{4}\) in. long, ovoid-oblong, red, stalked (the stalks lengthening), appearing with the lvs.; calyx-lobes or sepals, \(\frac{3}{4}\) in. long at the middle, short-peduncled and glandular-ciliate: fls. solitary at base; fls. simple (not double). Var. *gracillima*, Koehne. Branches wide-spreading, the branches very slender and somewhat deflexed: lvs. ovate-oblong, oblong, oblong-lanceolate, or otherwise on the narrow order, little or not at all acuminate but gradually tapering, widest at or below the middle, closely serrulate or crenate, often times in part somewhat that doubly serrate, glabrous beneath or slightly hairy along the midrib: frs. about 2 in. long; petals \(\frac{3}{4}\) in. long at anthesis, blush, pink or white. China. B. M. 8260 (as *P. japonica*).—*P. glandulosa*, Torr. & Gray (Ampelodus glandulosus, Hook.), the "wild peach," a very different plant on prairies in Texas, promising, must take the name *P. texana*, Dietr. (P. Hookeri, Schneid.). The *P. glandulosa*, Thunb., assumes many forms. Var. *glabra*, Koehne. Fls. simple or double, white or rose, with glabrous pedicel and style: stipules persistent: fl-blane glabrous both sides or hairy in the axes of veins beneath: young branches puberulent at base. B. R. 1801, (as *P. japonica*, white-fl.). I. H. 1: 183 (as *P. japonica* flore abo-pleno.). Var. *Pardonii*, Koehne, probably not cult.: differs from var. *glabra* in petals and pedicels being puberulent: fls. simple: style glabrous. Var. *trichostyla*, Koehne. Fls. single or double, white or rose, the pedicels glabrous or puberulent, style plisse at base: stipules persistent: young branches glabrous or puberulent: petals whitish, about \(\frac{3}{4}\) in. across. Frequent in cult.; it has been described under such names as *Prunus sinensis*, *P. japonica* flore-pleno, and *Cerasus japonica*. The growth is wiry and erect, the branches glossy and purple-brown. Var. *salicifolia*, Koehne. Stipules deciduous: fls. mostly only 1 from a bud: branches erect and virgate, to 3 ft. high, glabrous: fl-blade narrow, or linear-elliptic, acuminate or acute, simply or doubly serrate, Liao-tung Peninsula; probably not cult.—*P. glandulosa* is a common "flowering almond" of American gardens. It is cult. chiefly in two forms, the double flower (var. *glabra* forma abo-plena, Koehne), and the double pink (var. *trichostyla* forma sinensis, Koehne). What other botanical forms may be in cult. as flowering almond needs to be determined.

40. *grandulosa*, Thunb. Fig. 3227. Long confused with *P. japonica*, but differing markedly in the foliage: lvs. ovate-oblong, oblong, oblong-lanceolate, or other wise on the narrow order, little or not at all acuminate but gradually tapering, widest at or below the middle, closely serrulate or crenate, sometimes in part somewhat that doubly serrate, glabrous beneath or slightly hairy along the midrib: frs. about 2 in. from the bud, slender-stalked (pedicels about \(\frac{3}{4}\) in. long at anthesis), blush, pink or white. China. B. M. 6768 (as *P. japonica*).

41. *humilis*, Bunge. Erect shrub, 1-4 ft. high, with slender dark brown branches: lvs. 2 in. or less long, elliptic-ovoid, or other wise on the narrow order, little or not at all acuminate, but gradually tapering, widest at or below the middle, short-peduncled and short-pedicellate, white with red-based petals, \(\frac{3}{4}\) in. diam., appearing with the lvs.; calyx-lobes oblong, obtuse, and ciliate, as long as the tube; petals twice exceeding calyx-lobes or sepals, orbicular and crenulate: fr. \(\frac{3}{4}\) in. long, ovate-globose, red. N. China. B. M. 7235.
PRUNUS

42. tomentosa, Thunb. (Cerasus tomentosa, Wall.). Small compact but wide-spreading tree, or in Amer. a tree-like bush, the young growths pubescent-tomentose: branches close-jointed, causing the lvs. and fls. to be membranous; lvs. broad-ovate, short-stalked, abruptly contracted into a short point, the margins incisely and sometimes unequally serrate, dull and rugose above, densely pubescent-tomentose beneath: fls. white as to petals but with bright red calyx and pedicel, small, sessile, usually 1 or 2 or a joint, appearing just before the lvs. or as the lvs. begin to unfold, from pink buds: fr. light red, globular, the size of a very small cherry, sessile or very short-stalked, sparsely hairy, eaten in Japan. N. China and Manchuria. B.M. 8196. A.G. 12:77. G. F. 5:581.—A worthy hardy small tree, making a very dense top, peculiar in the ovate-oblong, small, very much like most other cherries in appearance. On floral characters the species gives rise to many forms, 2 or 3 of which are in cult. Var. Spachthana, Koehne. Fls. white, appearing with the lvs., and somewhat scattered on the branches, the pebuls about ½ in. broad; calyx lobes or sepals somewhat longer than the tube. Var. Graebneriana, Koehne, differs from var. Spachthana in the large fls. (petals ½ in. broad) which are crowded, and calyx-lobes about equaling the short-tubular calyx-tube. Var. endotricha, Koehne. Lvs. elliptic or oblong, 1–2 in. long, the petiole very short: fls. white, very abundant: fr. about ½ in. long and nearly as broad, dark red, sparingly pubescent.—P. tomentosa is hardly even in the Dakotas, and improved fruit-bearing races of importance are likely to arise.

43. incana, Stev. (Cerasus incana, Spach. Amigдалus incana, Pall. A. sina var. incana, Loud.). Slender-twigged shrub of medium size (3–5 ft.): lvs. small, the petiole short and soft-hairy or glandless or bearing glands at the top, the blade about 2 in. (1–2½ in.), ovate-oblong, elliptic or lance-elliptic, short-pointed or obtuse, finely sharp-toothed, white-tomentose beneath: fls. mostly in 2’s, appearing with the lvs. just in advance of them, light rose- to red, about ½ in. across, the petals emarginate the pedicels short or none. Fro bright red, the size of a very small cherry, sparingly hairy, eaten in Japan. Japan. N. China and Manchuria. B.M. 8360. (Nearly nat. size.) No. 27.

44. prostrata, Labill. (Cerasus prostrata, Loisel.). Crooked or scraggy shrub to 6 ft., with tomentose somewhat erect or spreading branches: lvs. 1 in. or less long, short-ovate or ovate-orbicular, rarely lanceolate, obtuse, serrate, mostly very white beneath, the petiole short and glandless; fls. mostly single (sometimes fastened), rose-red, appearing with the lvs., nearly sessile; calyx-tube about ½ in. long, cylindric, pubescent or glabrous, the lobes oblong, obtuse, and entire; petals exceeding calyx-lobes or sepalS, very broad: fr. about ½ in. across, the petals emarginate, the pedicels not exceeding the bud-scales: fr. bright red, the size of a pea, smooth, juicy. S. Eu. and W. Asia. R.H. 1853:281. B.R. 25:58. G. F. 44, p. 243 (If.).—P. Malwrei, Zabel, is a hybrid of P. incana and P. pumila.

45. microcarpa, C. A. Mey. (Cerasus microcarpa, Boiss. P. diffusa, Schneid.). Shrub of variable habit, 7 ft. or less, tall, dark brown or tawny, branches usually pubescent when young, but soon glabrous; lvs. sessile, usually somewhat pubescent; petals very short, thinly pubescent: fls. 2 or more together, about ½ in. across, pale rose or white, appearing with the lvs. or just preceding them, on pedicels ½ in. or less long; calyx-tube reddish outside. the lobes very short and ovate and ciliate; petals obovate, ½ in. or less long: fr. ovoid, about ½ in. long, red or yellowish. Asia Minor, Persia. B.M. 8890.

AA. Fls. from a single bud above the If.-scale, rather than from 2 lateral buds that spring from the scales at the base of the central bud as in A (where the buds are therefore typically in 3’s, whereas in AA they are placed singly on the axial growth of the previous year or are clustered on a spur): inf. umbellate and sessile or branching and peduncled: petiole usually long, or at least prominent: plant a tree or tree-like in most species. (Typoscorus.)

n. Sepals or calyx-lobes reflexed.

c. Lvs. roundish,—nearly as broad as long: If.-clusters on the ends of the branches.

46. Mahaleb, Linn. (Cerasus Mahaleb, Mill. Prunus odorata, Lam. Padus Mahaleb, Borkh.). Mahaleb Cherry. St. Lucie Cherry. Small slender tree with hard glabrous branches: lvs. 2–3 in. long, light green, round-ovate to orbicular, abruptly very short-pointed, usually subcordate at base, the margins closely calloused-serrate; fls. small, tree-white, in small terminal umbels in May and June (in N. Y.), appearing when the tree is in nearly full leaf: fr. very small, dark red, not edible. Cent. and S. Eu. and the Caucasus.—Extensively imported for cherry-tree stocks, and frequently run wild. There are several cult. forms, as: var. chrysocarpa, Hort., with yellow fr. (Gn. 62, p. 181); var. albo-marginata, Dipp., with white-edged lvs.; var. variegata, Hort., with variegated foliage; var. pendula, Hort., with weeping or drooping branches (G. M. 44:210); var. globosa, Dieck, with rounded head; var. compacta, Hort., with compact condensed head; var. monstrosa, Kirch., has very short and thick branches and branches; var. Cupaniina, Fiori & Paol. (P. Cupaniina, Cass.), is smaller than the type: lvs. much smaller (½ to about 1 in. long): peduncles short, 3–6-fld.: lvs. smaller. Sicily. Var. transilvania, Schur. Fls. small, numerous in the cluster; sepals reflexed. Transylvania.

c. Lvs. distinctly longer than broad: fl.-clusters mostly lateral.

d. Fl.-clusters branching and leafy (with prominently broad If.-like bracts).

47. Maximowiczii, Rupr. Tree, to 50 ft., with horizontal branches: lvs. obovate or elliptic-obovate, coarsely double-toothed, prominently veined, glabrous, rather short- acuminate, the petiole hairy and glandless and about ½ in. long: fls. obovate, about ½ in. across, long-pedicelled, appearing with the full foliage on slender open leafy-bracted peduncled clusters, the stalks, broad serratbracts, and calyx hairy: fr. size of small pea, black. Manchuria, Korea, Saghalin, Japan.—A distinct and attractive species.
DD. Fl. clusters sessile, umbellate, not branching.

b. Teeth of lvs. very short or small: native bird cherries, bearing very small, white fls. on slender pedicels in naked small lateral umbels, and a profusion of very small red of Mackerel fls.

49. pennsylvanica, Linn. (Cerasus pennsylvanica, Loisel. C. borealis, Michx. Prunus borealis, Poir. P. persicaeflora, Desf. Cerasus persicaeflora, Loisel.) Common Wild Plum or Pin Cherry. Fig. 3235. Shallow-rooted tree with slender, red-barked branches, 25-40 ft. high and sometimes 1½ ft. in diam. of trunk; lvs. oblong-lanceolate-acuminate, light green and nearly or quite glabrous, the apex acute, sharply serrate: fls. small, white, slender-stalked, appearing with the lvs., pink, solitary or mostly 2 or 3 together, the bracts oblong to rotundate and glandular-serrate, persistent, the peduncle very short to ½ in. long; calyx-tube glabrous; lobes triangular, obtuse or acute, glabrous or at the apex sparsely ciliate; petals ½ to more than 1 in. across; calyx-tube glabrous; lobes triangular, obtuse or acute, glabrous or at the apex sparsely ciliate; petals about ½ in. long, oval: fr. oblong-red. Cent. and W. China. Var. media, Koehne, differing in having hairs on the midrib and nerves of the fl. underneath.

50. emarginata, Walp. (Cerasus emarginata, Douglas.) Shrub, 3-10 ft. high, sometimes a small tree, forming dense thickets: lvs. oblong-ovate or oblanceolate, mostly obtuse, closely serrate, often somewhat pubescent beneath: fls. tinged green, appearing with the lvs. in 6-12-ft. glabrous or pubescent coryms: fr. larger than that of P. pennsylvanica, almost black when ripe, the flesh thin and bitter; stone ovoid. Mountains. Brit. Col. to Calif. S.S. 4: 157.—Sometimes offered as an ornamental tree.

51. mollis, Walp. (P. marginata var. mollis. Brew. Cerasus mollis, Douglas.) Small tree, reaching 30-50 ft., straight and graceful, with reddish cherry-like bark: young growth soft-pubescent: lvs. 1-3 in. long, oblong to oblong-oblancoolate, mostly acute, serrate, mostly or quite glabrous above, pubescent underneath, the stipules narrow and laciniate: fls. white, in 5-10-fld. clusters; calyx-lobes oblong, obtuse, and entire, becoming reflexed, much shorter than the tube; petals obvate, about 2 lines (½ in.) long: fr. ½ in. or less long, brown,涩 wrinkled, keeled on one edge. Woods, Brit. Col. to Calif.

EE. Teeth of lvs. mostly prominent (exception in No. 52).

52. fruticosa, Pall. (P. Cerasus var. pumila, Linn., not P. pumila, Linn. P. Chamæcerasus, Jacq. P. pumila, Hort. P. intermedia, Poir. Cerasus Chamæcerasus, Loisel. C. hümiliis, Hort. Cerasus sibirica, Hort.). Dwarf Cherry, or Ground Cherry. of Eu. Spreading bush, 2-4 ft. high, with slender glabrous branches: lvs. varying from oblong to oblong-lanceolate, the apex acuminate or sometimes almost obtuse, closely serrulate, thickish, shining above, the pediole short: fls. white, in nearly or quite sessile umbels: fr. small, globular, purple-red, very sour. Highlands and mountains of Germany, Austria-Hungary, and S. Russia.—P. eminemis, Beck, is a hybrid of P. fruticosa and P. Cerasus.

Var. péndula, Dipp. (Prunus and Cerasus japonica péndula, Hort.), is a most ornamental form with drooping branches, excellent for top-working on standard stocks (Fig. 3236). G.W. 10, p. 511. This is sometimes confused with P. semperflorens (No. 53), but is distinguished at once by its foliage, its early blooming, its fls. in clusters, and its dwarf habit. This is the form of P. fruticosa chiefly known in this country. A similar pendulous form, but with larger and more crenate-serrate lvs., is known as P. réflexa, Hort.; perhaps a hybrid of P. fruticosa and P. semperflorens. Var. variegata, Hort., has lvs. marked with yellowish white.

53. Cerasus, Linn. (Cerasus vulgaris, Mill. C. caproniaria, DC. P. austera, Mill. P. nana, Poir. MORELLO CHERRY. Figs. 907, 910, Vol. II. Rather low round-headed tree with gray bark and no central leader (compare Figs. 907 and 906, Vol. II), suckering from the root: lvs. ovate-ovate or short-ovate, abruptly short-pointed, stiff and parchment-like and
Minor and perhaps to S. Eu.—P. Cerasus is the common pie cherry of old yards. It escapes into fence-rows and other waste places, forming dense thickets, as does the plum. It sprouts from the root. The various Morellos belong here; also the Montmorency, Louis Phillippe, and others. There are at least 2 well-marked groups of these pomological cherries—those with uncolored juice (Amarelles, the \textit{Prunus} \textit{acida} of some), and those with colored juice (Morellos or Griottes). To the former group belong the Montmorency, Early Richmond, and several early varieties. Many botanical Latin names have been applied in this group of cherries, and the interpretation of the relative systematic standing of the different forms is much confused. For our purpose, the leading forms may be ranged as follows: Var. \textit{frutescens}, Schneid. (\textit{P. acida}, Koch), comprising the bushy small-fruited spontaneous or run-wild forms. Var. \textit{typica}, Schneid., comprising the tree-like cult. forms of many kinds. To this latter group or class belong not only the orchard sour cherries, but also wild forms more or less cult. for ornament, as \textit{P. acida} var. \textit{dumosa}, Hort., a bushy form blooming profusely when young. Gn. 78, p. 201.

Var. \textit{semperflorens}, Loud. (\textit{P. semperflorens}, Ehrh. \textit{Cerasus semperflorens}, DC.). \textit{EVERBLOOMING CHERRY. ALL-SAINTS' CHERRY.} Figs. 3237, 3238. A horticultural state of \textit{P. Cerasus} var. \textit{typica}: small tree or a bush, usually top-worked on other stock, with a straggling or drooping habit, the slender twigs glabrous: lvs. oval to oblong-ovate, short-pointed (or acuminate on the strong shoots), irregularly dentate, rather hard and firm in texture: fls. white, on long axillary and terminal peduncles from May till September: fr. like a small pie cherry, but mostly longer-stalked and smaller, dark red.—Its habit of blooming all summer makes it a desirable ornamental subject. The lvs. resemble those of \textit{P. Cerasus}, except that they are smaller. Known in France as \textit{Cerisier de la Toussaint} ("All-Saints' cherry") and in Germany as \textit{Allerheiligen Kirsche}. There is a form with yellow-variegated lvs. The Everblooming cherry appears to be very little planted in this country, but it is an interesting form.

54. \textit{avium}, Linn. (\textit{Prunus} \textit{Cerasus} var. \textit{avium}, Linn. \textit{Cerasus avium}, Moench. \textit{C. nigra}, Mill. \textit{C. dulcis}, Gaertn.). \textit{SWEET CHERRY. MAZZARD.} Figs. 3239; also Figs. 906, 908, 909, Vol. II. Tall robust tree with red-brown bark, sometimes 100 ft. high, the young trees with a strong central leader and pyramidal growth, the old seedling trees sometimes becoming 2 ft. and more in diam. (see Fig. 908, Vol. II): lvs. generally oblong-ovate and gradually taper-pointed, dull and soft in color and texture, hanging as if limp on the young growths: fls. in dense clusters on lateral spurs and appearing with the hairy strongly conduplicate young lvs., the scales of the fl.-buds large and persistent for a time; calyx-tube glabrous, constricted near the top, the lobes reflexed and entire: fro globular, depressed-globular or heart-like, mostly sweet, yellow or red. Its habit of blooming all summer makes it a desirable ornamental subject. The lvs. resemble those of \textit{P. Cerasus}, except that they are smaller. Known in France as \textit{Cerisier de la Toussaint} ("All-Saints' cherry") and in Germany as \textit{Allerheiligen Kirsche}. There is a form with yellow-variegated lvs. The Everblooming cherry appears to be very little planted in this country, but it is an interesting form.
Mazzard stocks, mostly imported, are used as stocks for cherries, although Mahaleb is more popular with propagators because (like the Myrobolan plum) it is easier and cheaper to grow, runs more uniform and is capable of being budded through a long season.

There are many ornamental forms of the *P. avium*, as: var. *pyramidalis*, Hort., tree making a pyramidal crown; var. *pendula*, Hort., with drooping branches (Gn. 59, p. 267); var. *variegata*, Hort., with yellow and dull white markings on the foliage; var. *aspplenifolia*, Kirchn., with deeply toothed and cut lvs.; var. *plena*, Hort., with double fls. (G.M. 53:9. G.W. 6, p. 329. Gn. 78, p. 249); var. *salicifòlia*, Dipp., with very narrow lvs. *P. Fontanesiana*, Schneid. (*Cerasus Fontanesiana*, Spach. *P. græca*, Desf.), is probably a hybrid of *P. avium* × *P. Mahaleb*, like *P. avium* in habit; young branchlets pubescent; lvs. about 4 in. long, differing from those of *P. avium* in the more crenate gland-tipped serrations; does not produce true flowers. This form is known as *P. Juliana* var. *pendula*.

Var. *regalis*, Bailey (C. regalis, Poit. & Turp.). *Duke Cherries*. Differ from the Heart cherries in having an acid flesh (and for that reason often erroneously referred to *P. Cerasus*). May Duke is the leading representative. Said by Hedrick ("Cherries of New York") to be "unquestionably hybrids between the Sweet cherry and Sour cherry," *P. avium* and *P. Cerasus*. Var. *duricina*, Bailey (*Prunus Cerasus var. duricina*, Linn. *C. duricina*, DC. *C. Bigarrella*, Roem.). *Bigarreau* or *Hard-Fleshed Cherries*. Distinguished by the firm breaking flesh of the fr., which is mostly of light color. Here belong the Windsor, Yellowish Spanish, and cheaper to grow, runs more uniform and is capable of being budded through a long season. glabrous: fro size of small pea, black. China, Japan, Korea. G.C. III. 7-008; 19:467. Gn. 56:300. A.G. 12:399. This showy species occurs in cult. in many forms, with fls. white or pink and otherwise variable, often under the name of *P. Pseudo-Cerasus*. A very double pink and rather small-flld. fls. is forma rosa Wilson (f. *Shidare-Sakura*, Koehne). Var. *spontanea*, Wilson, is a wild form in China, Korea, and Japan, with single white or pink fls. about 3/4 in. across, and lvs. greenish brown to reddish brown when unfolding. This form is also cult. in the Orient. It makes a tree to 75 ft. high and 12 ft. in girth. Forms of this variety are *Lammas*, Wilson, bush or small tree with pale fls. and rather glaucous under surface of lvs., the peduncle elongated, cult. in Japan; *Kosioyama*, Wilson, fls. single, pinkish, lvs. slightly hairy on upper surface of midrib, cult. in Japan and intro. in this country; f. *præcoço*, Wilson, fls. single and rather small, pale pink, blooming in late winter in Japan, and also intro. in this country. Var. *pubescens*, Wilson (*P. tenuiflora*, *P. Leveilliana*, *P. mesadina*, *P. Velichii*, *P. vescioides*, *P. quecnardiana*, *P. alliaria*). Lvs. green below and more or less sparsely pubescent, the pediole somewhat bearded, and pedicels pubescent: fls. single, white or pink. China, Korea, Japan; said by Wilson to have the widest distribution of any Japanese cherry, and it is there cult., and forms of it have been intro. in this country. Wilson recognizes the following forms of this variety: *santa* (Meiğetsu), lvs. slightly villous above and pale beneath, the fls. single, white changing to pale pink; *Shibayama*, fls. single and pink of little horticultural value; *Taisanfubun*, first described under this species, is now referred by Wilson to *P. yedoensis*. Var. *sachalinensis*, Makino (*P. Pseudo-Cerasus var. sachalinensis*, F. Schmidt. *P. sachalinensis*, Koidz. *P. Sachalinensis*, Roehl. *P. moraefrons*, Drasch.). Fig. 3239. Large tree attaining a height, in its native places, of 60-80 ft. with trunk 9-13 ft. in girth and head 30-50

3239. Prunus avium

(×)g. No. 54.

Var. *Juliana*, Bailey (*Prunus Cerasus var. Juliana*, Linn. *Cerasus Juliána*, DC.). *Heart or Geas Cherries*. Fr. heart-shaped, with soft flesh, as in the varieties Governor Wood, Black Tartarian, Black Eagle. These are the Guigniers and Hauniers of the French. A weeping form is known as *P. Juliana* var. *pendula*.

Var. *regalis*, Bailey (C. regalis, Poit. & Turp.). *Duke Cherries*. Differ from the Heart cherries in having an acid flesh (and for that reason often erroneously referred to *P. Cerasus*). May Duke is the leading representative. Said by Hedrick ("Cherries of New York") to be "unquestionably hybrids between the Sweet cherry and Sour cherry," *P. avium* and *P. Cerasus*. Var. *duricina*, Bailey (*Prunus Cerasus var. duricina*, Linn. *C. duricina*, DC. *C. Bigarrella*, Roem.). *Bigarreau* or *Hard-Fleshed Cherries*. Distinguished by the firm breaking flesh of the fr., which is mostly of light color. Here belong the Windsor, Yellowish Spanish, and cheaper to grow, runs more uniform and is capable of being budded through a long season. glabrous: fro size of small pea, black. China, Japan, Korea. G.C. III. 7-008; 19:467. Gn. 56:300. A.G. 12:399. This showy species occurs in cult. in many forms, with fls. white or pink and otherwise variable, often under the name of *P. Pseudo-Cerasus*. A very double pink and rather small-flld. fls. is forma rosa Wilson (f. *Shidare-Sakura*, Koehne). Var. *spontanea*, Wilson, is a wild form in China, Korea, and Japan, with single white or pink fls. about 3/4 in. across, and lvs. greenish brown to reddish brown when unfolding. This form is also cult. in the Orient. It makes a tree to 75 ft. high and 12 ft. in girth. Forms of this variety are *Lammas*, Wilson, bush or small tree with pale fls. and rather glaucous under surface of lvs., the peduncle elongated, cult. in Japan; *Kosioyama*, Wilson, fls. single, pinkish, lvs. slightly hairy on upper surface of midrib, cult. in Japan and intro. in this country; f. *præcoço*, Wilson, fls. single and rather small, pale pink, blooming in late winter in Japan, and also intro. in this country. Var. *pubescens*, Wilson (*P. tenuiflora*, *P. Leveilliana*, *P. mesadina*, *P. Velichii*, *P. vescioides*, *P. quecnardiana*, *P. alliaria*). Lvs. green below and more or less sparsely pubescent, the pediole somewhat bearded, and pedicels pubescent: fls. single, white or pink. China, Korea, Japan; said by Wilson to have the widest distribution of any Japanese cherry, and it is there cult., and forms of it have been intro. in this country. Wilson recognizes the following forms of this variety: *santa* (Meiğetsu), lvs. slightly villous above and pale beneath, the fls. single, white changing to pale pink; *Shibayama*, fls. single and pink of little horticultural value; *Taisanfubun*, first described under this species, is now referred by Wilson to *P. yedoensis*. Var. *sachalinensis*, Makino (*P. Pseudo-Cerasus var. sachalinensis*, F. Schmidt. *P. sachalinensis*, Koidz. *P. sachalinensis*, Roehl. *P. moraefrons*, Drasch.). Fig. 3239. Large tree attaining a height, in its native places, of 60-80 ft. with trunk 9-13 ft. in girth and head 30-50

3240. Prunus serrulata var. sachalinensis

(×)g. No. 55.
ft. across, producing valuable wood; bark reddish and lustrous; older branches chestnut-brown, lvs. large, oval to broadly ovoid or hand-shaped slightly acuminate, coarsely sharp-toothed, glabrous and lustrous, turning to crimson and yellow in autumn, mostly with glands on petiole or base of blade; fls. 2–4, very showy, rose-pink, appearing before the lvs., simple (not double), light rose-color, about 1⅓ in. across, the pedicels slender, to ⅛ in. long and with glandular serraate bracts or involucres; petals ovate and emarginate; calyx-lobes ovoid-lanceolate, acute, entire; stamens 20–25; fr. size of pea, bright red and becoming black and shining at maturity. June. N. Japan, Sashalin, Korea. B.M. 8411. C.G. III. 19:517; 55:346. G.F. 10:463 (shown reduced in Fig. 3240).—A tree of great ornamental value, hardly in N. Y. and Mass., bearing profusely of its handsome broad fls. From P. serrulata it is distinguished by its broader more coarsely serrate lvs. of which the serratures are scarcely pointed: lvs. glabrous, bronze-metallic green when unfolding, becoming yellow, orange, and crimson in autumn; serration simple and double on same fl., the teeth gland-tipped and mucronate or aristate; fls. appearing with the lvs. or slightly in advance, ⅔–1⅓ in. across, rose, pink, or nearly white. The forms of var. sachalinensis comprise some of the handsomest and best of the flowering cherries of Cent. and N. Japan. Of this important and very worthy variety, the following forms are recognized by Wilson, most of which have been intro. into N. Amer. recently and of minor horticultural value:

- Pseudo-Cerasus, var. Shirofugen, B.M. 8012 and G.C. III. 19:466 (both as P. Pseudo-Cerasus). R.H. 1872, p. 198 (note); 1873:351. Forms dibida, Wilson (P. serrulata fl. dibida and speciosa, Koehne P. mutabilis, Miyoshi, in part), has single white fls. This form is considered by Wilson to be the parent of the cult. kind taken as the type of P. Lannesiana and "also of the greater number of the double-fl. Japanese cherries;" thought to be indigenous on island of Oshima. It makes a tree to 30 ft. or more tall, with thick spreading or somewhat ascending branches, with a pale gray bark which is smooth even on old trees; fls. pinkish in the bud, white when open, glabrous throughout, either with the lvs. or preceding them, the peduncle usually ⅔–1 in. long but sometimes wanting; fr. ovoid, black, and shining.

Some of the cult. kinds of P. Lannesiana in Japan, many of which have recently been intro. into this country, are ranged by Wilson under the following forms:

- Pseudo-Cerasus, var. donarium (P. donarium, Sieb.), fls. white and double, fragrant; Fudanazakura, a precocious form that blooms at almost any season, the single fls. white or nearly so, of little horticultural value; Gozanomanioi, fls. white, single, very fragrant; Hatazakura, fls. single, white, and fragrant, of minor value; Menokami, fls. very fragrant, white, single or nearly so; Ohshibayama, of minor value, the fls. white flushed pink, single or semi-double; Sulfisha (Sunzime), one of the handsomest; with very large fragrant single or nearly single white fls. flushed pink; Chusakuraba (Taketake), fls. very fragrant, single, white; Wasinoyuno, fls. single, fragrant, white; Amayadori, excellent, botanically much like P. serrulata var. sachalinensis, with double fls. clustered at ends of branchlets, pale pink passing to white; Hatazakura, fls. semi-double, white tinged pink, the inner petals reduced and rudimentary, said by Wilson to be a very beautiful cherry, with fls. suggestive of apple.
blossoms;" Horai's, fls. white, semi-double; Hosokawa, "a pleasing form" with fls. single or semi-double, pure white, and fragrant; afinis (Jenio), "a lovely plant with fls. of remarkable whiteness," very fragrant, single or semi-double; kokesimidus, of minor horticultural interest, the fls. or semi-double, white suffused pale pink; kunitshirotsi, fls. white, fragrant, semi-double to double, one of the best of the late-flowering forms, with fragrant double fls. white flushed pink; Senriko, beautiful form, with very large fragrant semi-double fls. pale pink passing to white; Siriotae, the finest of all the double-fls. white cherries, the fls. large and fragrant and pure white; Sobanzakura, fls. white, double; Suruyadai-odora, late-flowering, the fls. nearly white, semi-double, fragrant, pendulous on long slender pedicels; Ariake, "a very striking form," with very large and fragrant single or semi-double pale pink fls.; ezeta (Banriko), of minor horticultural value, with single fls. "pale washy pink;" campanulata (Gyozaakura), pink, single or semi-double; Kirigaiya, fls. fragrant, single, pale pink; Kongosan, of minor interest, with single or semi-double fls. Gyozaakura, "the cherry used by the Japanese for a stock on which to graft all the garden forms of P. lannesiana and P. serrulata," with few white or pinkish fls.; Tanza, "a very pleasing form," with single fls. on long slender pedicels; Tenpo, "a perfect form," with rose-pink semi-double fls. clustered near ends of branchlets; Moidan (Botanazakura), "one of the very best forms," bearing very large, pale pink, fragrant, semi-double fls.; Gosozaakura, fls. semi-double, pale pink; amabilis (Fuyuzaki), "a good form," with slightly fragrant, double and semi-double, pale pink fls.; Iseakura, semi-double, fragrant, pink; Mikurunakaisi, double, pale rose; Ochikichima, fls. large, double, pale pink; Ogo, "a very beautiful form, commonly cult. in the temple grounds at Kyoto," with fls. pale pink and semi-double; Gyoza, "one of the best forms," the very large fls. semi-double and pale pink; versicolor (Yayakekobono), fls. very large, fragrant, semi-double, soft pink, very beautiful; nobilis (Yozakura), resembles P. serrulata var. sashihana, "a fine cherry," with pink double clustered fls. of good size; Gyoza, semi-double fls., pale yellow with greenish stripes, free-flowering; grandiflora, "a very striking form," with profusion of large semi-double or double fls. (Gn. 76, p. 229, as P. serrulata flore utero pieno. Gt. 52:1513 as P. serrulata grandiflora)." 57. Sieboldii, Wittm. (Cerasus Sieboldii, Carr. P. Pseudo-Cerasus var. Sieboldii, Maxim. Cerasus Widerere, Hort. JAPANESE FLOWERING CHERRY Strong-growing tree, like a sweet cherry, producing showy pink double fls. with the lvs. or just in advance of them; lvs. oval or ovate, abruptly acuminate, rounded at base, densely soft-pilose beneath, the margins very sharply gland-serrate; petiole hairy, usually bearing 1 or 2 small glands at apex: fls. 1-11/2 in. across, 2-4 on each short peduncle, the pedicels more or less pilose; calyx-tube sparsely hairy or nearly glabrous, the ovate rather obtuse entire lobes about equaling the tube; style hairless. Japan, China. R HOR. 1186, p. 371. Gn. 33, p. 420. G. W. 16, p. 355. Gt. 51:1494a. A. G. 12:400, 401.—Wilson writes that in habit and general appearance this species strongly resembles P. lannesiana, but is distinguished by the pubescent ciliate-acuminate lvs. which are sharply and often obscurely doubly serrate near small teeth; fls. double or semi-double, normally pink and preceding the foliage; if the fls. precede the lvs., the pedicel is greenish brown, when coiled with the foliage the peduncle is much elongated and the fls. may then be nearly or quite white.

58. yedoensis, Mats. (P. paracerasus, Koehne. P. yedoensis var. nudiflora, Koehne.) Near P. serrulata, differing in the pedicels, style, and usually extending the calyx being hairy; and near P. Sieboldii, differing in young lvs. pale green rather than bronze, and calyx-lubes sharp-serrate rather than entire. From Japan, but wild specimens unknown.—A tree-like shrub or good­planted tree, with young branches glabrous but becoming nearly or quite glabrous in autumn or the second year: lvs. obovate or broadly ovate-elliptic, 3-5 in. long, acuminate, strongly double-serrate with serratures acuminate and gland-tipped, glands minute, hairy on midrib and veins beneath: fls. in a 3-6-fl.d. short or nearly corymbose or cluster, with narrowly spatulate bracts, the pedicels 1/2-1 1/2 in. long and densely pilose; petals broad-ovate or suborbicular, about 3/4 in. long or a little more, deeply emarginate; stamens about 37-39. The fls. are slightly fragrant, in clusters of 2 to several, usually preceding the lvs. but sometimes coetaneous, white to pink. "This is the cherry," writes Wilson, ‘so generally planted in the parks, temple grounds, cemeteries, and streets of Tokyo. This is the occasion of a popular festival in the city of Tokyo. The oldest authentically known trees were planted only a little over 40 years ago, and the species was not recognized as distinct till 1901. To Wilson the species is strongly suggestive of a hybrid between P. serrulata and P. ascendens and the wild form of P. lannesiana. It is hardly at the Arnold Arboretum. Taizanfuku (P. fruticosa f. ambiguus, Miyoshi) is a form with young shoots and petioles pubescent, fls. borne near ends of shoots, moderately double and of medium size, pink.

EE. Calyx-tube obtuse at base, campanulate or cylindrical: fr. red to black.

F. Blossoms appearing before the lvs.: teeth of lvs. large, acute, acuminate, or sessile-acuminate: stone nearly or quite smooth.

59. Conradina, Koehne. Graceful tree, to 25 ft., with rather thin glabrous or canescent shoots and large foliage: lvs. obovate or obovate-oblong, rarely roundish ovate, 2-6 in. long and about half as wide, the base usually rounded or even subcordate, apex narrow-acuminate, double-serrate, the teeth gland-tipped, glabrous or becoming so above and below; petiole about 3/4 in. long, glabrous, mostly with 3 glands; style linear, glandular-fimbriate; fls. white or pink, before the lvs.; peduncle sometimes about 3/4 in. long but usually very short; pedicels (mostly 2-4 in the umbel) 3/4-3/4 in. long, glabrous; calyx-tube glabrous; lobes or sepals erect-spreading or spreading, petals reddish, petals or petals-petiole pubescent, fls. borne near ends of shoots, moderately double and of medium size, pink.

FF. Blossoms appearing with the lvs.: teeth of lvs. small or minute: stone prominently rugose.

60. serrula, Franch. Tall tree, with young branches thinly pubescent but becoming nearly or quite glabrous in autumn: lvs. lanceolate, 2-4 in. long, base acute, apex acuminate, strongly but shortly double-serrate, the teeth slender and gland-tipped, soon glabrous above, hairy along rib and in nerve-axle beneath, at base usually with 3-5 glands; petiole 3/4-3/4 in. long, glabrous, pubescent, achenes linear, the following var. subacida, Koehne, which has smaller teeth on the lvs.: fls. white, usually in 3's: fr. ovoid or globular-ovoid, about 3/4 in. long, red. W. China.—Cult. abroad; hardy in Mass.

dd. Fruiting pedicel prominently thickened.

61. cerasoides, Don (P. Puddun, Roxbg. Cerasus Puddum, Wall. C. Phoibisa, Hamilton). A Himalayan representative of P. pseudocerasus, described by Hooker as a large tree of brilliant appearance in flower, glabrous except the puberulous young shoots, the rose-red or
white fins. solitary, fascicled, or umbellate, the calyx-tube narrowly campanulate and the petals oblong-obovate or linear-oblong, less hairy, ovate to lanceolate or obovate, acuminate, sharply serrate, glabrous, 3·5 in. long, the petals with 2·4 glands: fr. oblong or ellipsoid, obtuse at both ends, with nearly yellow or reddish flesh; stone bony and furrowed. Temp. Himalaya, 3,000–8,000 ft.—The name is catalogued in S. Calif., with the statement that the tree “blossoms in November and ripens its fruit in April.” Hooker (Fl. Brit. India) places it with species having “flowers appearing before the leaves.”

62. campanulata, Maxim. (P. cerasoides var., campanulata, Koiz.). Closely related to P. cerasoides: tree, to 25 ft.; lvs. ovate to elliptic-ovate, glabrous, usually doubly serrate, 3·5–6 in. long; fls. pendulous, campanulate, ½ in. long, deep rose-colored; calyx purple to about ¾ in. long, red. For. in S. Japan. Gn. 56:300 (as P. pendula).—Very ornamental; not hardy N. A beautiful species as grown in Japan. The Himalayan species (P. cerasoides) has more coriaceous and more sharply toothed lvs. in which double serration is usually not so marked.

63. rufa, Steud. Small tree, to 20 ft., the young growth densely tomentose: lvs. ellipsoid-lanceolate or oblong-lanceolate, 1·4 in. long, narrowed to very short petiole, long-acuminate, glabrous or puberulent on rib or nerves above and beneath, very sharply glandular-serrate; petiole pubescent, glandless; stipules thread-like and fasciculate; lvs. pink, ½ in. diam., solitary, paired or fascicled in the axils of previous year’s growth, appearing with the lvs. or preceding the leaves. Temp. Himalaya, 3,000–8,000 ft.—The name is catalogued in S. Calif., with the statement that the tree “blossoms in November and ripens its fruit in April.” Hooker (Fl. Brit. India) places it with species having “flowers appearing before the leaves.”

64. subhirtella, Miq. (P. Miqueliana, Maxim. P. Hinnquina var. ascéndens, Schneid.). Plant a large shrub or small forking tree, with erect branches, shorter and relatively broader than in var. pendula (blade about 2 in. long except on terminal shoots), oval or ovate, abruptly narrowed above and below, sharply and more or less doubly serrate, more hairy beneath and sometimes thinly short-hairy above, the glands small or wanting; lvs. 1 in. across. Much cult. in Japan, but unknown wild; less known in this country than var. pendula, but perhaps more beautiful. B.M. 7505. G.C. III. 33:163; 35:285. Gn. 63, p. 177. G. 25:137; 31:283.—This is the spring cherry of Japan and said by Wilson to be “the most floriferous and perhaps the most delightful of all Japanese cherries.” Appears to have been intro. into N. Amer. first in 1894 by the Arnold Arboretum. The fins. normally appear in advance of the lvs., varying in color from nearly white to pink; calyx reddish. Sometimes a few lvs. appear in autumn. Wilson writes that in its typical form this species may be separated from its varieties in herbarium material by its usually smaller and more glabrous lvs. and by its very numerous fins. which have less hairy and more highly colored calyx-tube and sepals. In living trees, the species is marked by its small size and ascending branches.

Var. pendula, Tanaka (Cerasus pendula, Sieb. C. itosokara, Sieb. Prunus itosokara, Sieb. P. pendula, Maxim. C. japonica var. r. Koiz., Hort.). Rosebud Cherry. Japanese Weeping Rose-flowered CHERRY. Fig. 3242. Small tree, with drooping crooked branches; lvs. lance-elliptic to obovate or oval on older shoots (blade 3·4 in. long), acuminate, mostly narrowed at base, sharp-serrate, usually with a pair of large glands at base of blade or on apex of petiole, glabrous above, thinly hairy on rib and veins underneath; lvs. ½ in. across, on long minutely pubescent stalks, in small clusters, from lateral buds before the lvs. appear, rose-pink, the petals notched at the tip, the calyx-tube funnel-shaped and red; style hairy: fr. very small, globular, black-red, somewhat astringent. Jap. B.M. 8034. B.H. 1876, p. 228. Gn. 30:454. G.1871:536. G. 30:177. G. F. 2:487 (old tree). Gng. 2:269. M.D.G. 1890:320, 321.—One of the handsomest of early-flowering trees, producing its chaste pink fins. in profusion. Hardy in Cent. N. Y. Seedlings sometimes have more erect and spreading branches. Should be grown from seeds or worked on the upright forms of the species, according to Wilson, for it does not thrive on the European cherry stocks.

Var. ascéndens, Wilson (P. pendula var. ascéndens, Makino. P. itosokara var. ascéndens, Koiz. P. Her-nquina, Koehne. P. microdepta, Koehne.). Regarded by Wilson as the prototype of P. subhirtella and var. pendula. A tall strong tree with massive wide-spreading branches but the branchlets rather sparse and causing the head to have a thin appearance: lvs. somewhat larger than in P. subhirtella itself. Differs only in habit from var. pendula, and the two cannot be distinguished on the herbarium sheet. It is cult. in Japan, but is yet unknown as a horticultural plant in N. Amer. and Ed., although recently intro. Indigenous in Cent. China and probably also in Korea and Japan.
autumn are smaller than those of spring, and in each case when the flowers are produced before the leaves or after the leaves have fallen, the peduncle does not elongate and the plants present no striking differences. But on some individuals in the spring the leaves and flowers unfold at the same time and the peduncle is then much elongated. Such specimens look utterly dissimilar, yet whether the flowers open before or at the same time as the leaves is not fixed and may vary on the same individual from year to year."—Wilson.

65. canescens, Bois. Attractive shrub, 5-7 ft.: lvs. lanceolate, 2-2 1/2 in. long, short-haired on both surfaces, deeply bidentate, the teeth broader than long, cuneiped or mucronate, gland-tipped: fls. 2-3 together, racemose, single, on the young shoots, white tinted rose; calyx-tube about 1/4 in. long; calyx-lobes or sepals shorter than the tube, serrulate or rarely entire, glabrous or nearly so on the inside; petals nearly 1/4 in. long, oblong: fr. small, red. Cont. and W. Chn.

66. lobulata, Koehne. Tree, to 35 ft. or so, later cult. abroad: lvs. oblong, ovate, or oblong-lanceolate, 1-3 in. long, somewhat acuminate, doubly serrate with the teeth strongly acuminate and other glandless or the gland a minute terminal point, glabrous or nearly so except perhaps sparsely hairy on nerves, with 1 or 2 glands at base of blade or at apex of petiole, apex of blade obtuse or obscurely emarginate: fls. white: fr. globose or nearly so, about 1 in. long. W. China.

68. nappeana, Mark. (P. tosgénæus and P. nikoensæ, Koehne). Allied to P. inescæa. Bushy tree, to 20 ft.: older branches chestnut-brown: lvs. ovate, long-acuminate, usually rounded at base, incised doubly serrate, pubescent above and on the veins beneath or nearly glabrous, 2-2 1/2 in. long: fls. 1-3, nodding, with leafy bracts at base; calyx pubescent; petals white or pink, rather fusing: fr. ovoid, purplish black, 1/4 in. long. Japan. S.I.F. 1:28.—Cult. in Japan, making a very ornamental bush, but apparently unknown to planters in N. Amer.; it is now growing at the Arnold Arboretum.

69. apetalæ, Franch. & Sav. (Cerasus apetalæ, Sieb. & Zucc. P. erdqvistii, Koidz. P. Tschonenkisæ, Koehne). Shrub or tree, with young branches glabrous: lvs. oblong or obovate-oblong, 1-2 in. long, cuneate at apex, doubly serrate and if so if somewhat lobed, the teeth narrow and tipped by gland, close-villosous above and villous beneath, especially on the nerves; petiole short, densely villous, usually with 1 or 2 glands: fls. with deep purple calyx and sepals and very small fuscous petals, 1-2 together, appearing with the lvs., the pedicels nearly 1 in. long and hairy; sepals or calyx-lobes ovate, about 1/4 in. long, very slightly hairy outside: fr. shorter than the style. The P. apetalæ mentioned in horticultural literature may be a form of P. Maximowiczii; but the present description is of the true species. Var. pilosa, Wilson, has much larger lvs. and the branches are less hairy, and the flowers more forobious than the type; superior horticulturally. P. apetalæ is little known in cult. in this country.

Subgenus IV. Pâdus (including Laurocerasus).

Racemmed Cherries.

Fr. small and globular, rarely used for eating: fls. white, small, in distinct racemes, not preceding the lvs. or else arising from the axis of persistent lvs. of the year before.

a. Pâdus proper: lvs. deciduous: fls. on leafy shoots of the season (exception in No. 71).

b. Calyx-lobes persistent at the base of the fr.: fls. appearing relatively late in the season: large trees.

70. serotina, Ehrh. (Pâdus serotina, Agardh. Cerasus serotina, Loisel.). WILD BLACK CHERRY. Strong straight tree, reaching 100 ft., with very dark brown bitter aromatic bark: lvs. oblong, lance-oblong or oblong-ovate, tapering to a point, thickish and firm, shining above, with many small incurved callous teeth: fls. in long, loose racemes, appearing when the lvs. are nearly full grown: fls. size of a pes, purple-black, bitterish, ripening in late summer and Sept. Generally distributed from Nova Scotia to Dakota, south to Fla. and Texas. S.S. 4:159. F.E. 32:533.—A valuable timber tree, furnishing lumber for cabinet work and house finishing; also a fine lawn tree. It is a handsome form with very long, shining lvs. Var. pendula, Dipp., has drooping branches. G.Z. 26:241. Var. pyramidalis, Zabel, is of narrow pyramidal growth. Var. variegata, Hort., has yellow-marked lvs. Var. cartagineae, Dipp. (var. cartaginæae, Hort., by error. P. cartilaginææ, Lehm.), is a handsome form with very long, shining lvs. Var. asplenifolia, Hort. (Cerasus serotina var. asplenifolia, Kirchm.), has narrow deep toothed lvs. For a note on the nomenclature of P. serotæa, see No. 72.

71. neomontana, Sudw. (Pâdus serotina var. neomontana, Small), of the high mountains of the southern Alleghanies, has ample leathery coarsely serrate lvs. which are pale or whitish beneath, stout few-fil. diverging racemes, and sepals and filaments pubescent. The P. serotina group is not well held to include other species in the southern states and southward, but apparently they are not in cult. outside botanic gardens: P. estenia, Small (Pâdus estenia, Small), differs from P. serotina in having sepal or calyx-lobes deltid and slightly broader than long and the calyx-petal delicately reticulated rather than plain. River-valleys, Texas. P. Cuthbertii, Small (Pâdus Cuthbertii, Small), differs from P. serotina in having young parts (young shoots, raceme-axis and pedicels) pubescent rather than glabrous: lvs. oblongate, cuneate at base, sparingly pubescent beneath and becoming glabrate and glaucous with age: drupe red. Woods, Ga. P. alabamænsæ, Mohr (Pâdus alabamænsæ, Small), is distinguished from P. Cuthbertii in having lvs. ovate, oblong or elliptic and acute or acuminate, and drupe purple. Mountains, Ga., Ala. P. australis, Bead. (Pâdus australis, Small), has young parts pubescent: lvs. not glaucous but densely and permanently clothed with colored tomentum. Ala. P. Capollï, Koehne (P. Câpollin, Cav. Cerasus Capollï, DC.), from Mex., a very large tree with long and slender pedicels: lvs. lanceolate, long-acuminæ: fr. large. P. scutifolia, HBK., in S. Amer. and probably not in Mex. as reported: evergreen, differing little from P. Capollï and rather sparingly pubescent beneath and becoming glabrate and glaucous with age. It is a valuable timber tree, furnishing lumber for cabinet work and house finishing. Var. neomontana, Sudw., differs from P. serotina in having young parts (young shoots, raceme-axis and pedicels) pubescent rather than glabrous: lvs. oblongate, cuneate at base, sparingly pubescent beneath and becoming glabrate and glaucous with age: drupe red. Woods, Ga. P. serotina, Small, differs from P. serotina in having young parts (young shoots, raceme-axis and pedicels) pubescent rather than glabrous: lvs. oblongate, cuneate at base, sparingly pubescent beneath and becoming glabrate and glaucous with age: drupe red. Woods, Ga.

72. P. neomontana, Sudw. (Pâdus serotina var. neomontana, Small), of the high mountains of the southern Alleghanies, has ample leathery coarsely serrate lvs. which are pale or whitish beneath, stout few-fil. diverging racemes, and sepals and filaments pubescent. The P. serotina group is not well held to include other species.
beneath, with 1 or 2 large glands near base of blade or at apex of the petiole (which is $\frac{1}{4}$-$\frac{1}{2}$ in. long); fls. appearing on the ends of leafless shoots, white, long-stalked, less than $\frac{1}{4}$ in. across, the racemes 2-8 in. long and dense (1-1½ in. long). Amurland, Manchuria.

CC. Peduncle bearing lvs.

72. virginiana, Linn. (Cerasus virginiana, Loisel. Prunus nana, Du Roi. Padus nana, Roem.). Cerasus Cruciata, Fig. 2943. Bush or sometimes a small tree 30 ft. tall, with rough speckled bark and a strong odor when bruised: lvs. thin, oval-oblong or obovate, abruptly pointed, very sharply serrate, with spreading or at least not incurved teeth: fls. in short, dense racemes in spring with the lvs.: fr. size of pea, in summer, red or amber-colored (the latter var. leucocarpa, Wats.), puckery; stone smooth. Generally distributed over N. N. Amer. to the Arctic Circle and occurring in the mountains of Mex. S. S. 4: 158.—Now and then a large-fruited variety is found fit for eating. Sometimes planted for ornament. There is a weeping form, var. pendula, Hort.; a dwarf form, var. nana, Hort.; a narrow-leafed form, var. salicifolia, Hort. Other more or less distinct forms may be distinguished. Recently the name P. nana, Du Roi, has been used for this species, and P. virginiana has been made to supplement the name P. serotina (No. 70). Linnaeus had two plants under P. virginiana in Species Plantarum. The synonyms cited by him clearly designate P. serotina (the black cherry), except one, which is an Iter; but his original description, to which he gave the name P. virginiana and which is based on material preserved in his herbarium, is of the choke cherry; and there seems to be no occasion to change the names of these well-known plants.

73. demissa, Walp. (P. virginiana var. demissa, Torr. Cerasus demissa, Nutt.). Lvs. more rounded than in P. virginiana or even suborbate, thicker, pubescent, serrate with straight teeth, the petals glandular: fr. red, large, and edible. Wash., Ore., Calif., and probably eastward. Considered by many to be worthy of improvement as a fruit-plant. Var. melanocarpa, Nels. (P. melanocarpa, Schaeff.), has smooth lvs. and fr. nearly black when mature and more astringent: shrub or small tree: lvs. smooth or nearly so on both surfaces, the small serratures incurved or appressed, the petals glabrous: fls. white, in erect or ascending compact racemes. Rocky Mt. region and probably westward.

74. Padus, Linn. (P. racemosa, Lam. Padus racemosa, Schneid. Padus vulgaris, Borkh. Cerasus Padus, DC.). EUROPEAN BIRD CHERRY. Very like P. virginiana, but has larger fls. on longer pedicles; fls. white, in longer and looser often drooping somewhat leafy racemes: lvs. elliptic to oblance-ovate to oval, broad at base, abruptly acuminate, very sharply serrate, glabrous, the petiole gland-bearing at apex: fls. appearing a week later; petals $\frac{1}{4}$-$\frac{1}{2}$ in. long and twice exceeding the stamens: stone rough. Eu. and Asia. Gn. 53, p. 92. G. M. 44: 209. G. 20: 601; 27: 209.—Common in cult. in many forms: Var. pendula, Dipp., drooping; var. variegata, Hort., in several forms, as aurea, aucuba-folia, marmorea, Alberti. Var. leucocarpa, Koch, has white or yellowish lvs. Var. bracteosa, Ser., has large lvs. at the base of the racemes. Var. commutata, Dipp. (P. Grayana, Hort., not Maxim.), is noteworthy because it is one of the earliest of all trees to leaf out in spring. G. F. 1: 293. Var. plena, Hort., is a double-flowered form. Variable in its foliage. Makes a shapely tree 10-20 ft. tall. Var. cornuta, Henry (P. corvuta, Steud.), of the Himalayas, has lvs. rounded at base and bluish green beneath with reddish hairs in the axils of the veins: pedicles and long racemes pubescent: fr. $\frac{1}{2}$ in. or less diam. the stone smooth. P. Lauchiana, Bolle, is a hybrid of this and P. virginiana.

75. Grayana, Maxim. (P. Padus var. japonica, Miq.), is allied to P. Padus. A small tree, 20-30 ft. high, with a slender trunk, ample membranaceous long-pointedセットo-serrate lvs. biglandular at the base but without glands on the petals, a peculiarity which best distinguishes this species, although the hair-like teeth of the lvs. are characteristic and apparently constant: style long rather than short as in P. Padus, Japan.

76. Ssiburi, Schmidt. (P. Padus Ssiburi, Schneid.) Smaller-flowered than P. Padus, with a smooth or only obscurely roughened stone: lvs. ovate, long-acuminate, strongly serrate with narrow teeth, not papillose beneath; petals $\frac{1}{2}$-$\frac{1}{4}$ in. long, with usually 2 or more glands at apex: raceme 4-7 in. long, glabrous; petals white, about $\frac{1}{2}$ in. long, equaling the stamens. Manchuria, Saghalin, Japan.

aa. Laurocerasus: lvs. persistent (evergreen): fls. in spring in the axils of the lvs. of the previous year. (Cherry-laurels.)

bb. Racemes longer than the lvs.

77. lusitanica, Linn. (P. lusitanica, Mill. Laurocerasus lusitanica, Roem.). PORTUGAL LAUREL. Tree, 20 ft. tall, but usually grown as a tub-plant and comparable with Laurus nobilis: lvs. thick and leathery, ovate-lanceolate to long-lanceolate, sharp-serrate; fls. white, in racemes that exceed the lvs., appearing in late spring or early summer: fr. round-oval, nearly black, in small. Spain, Portugal, and Canary Isls.—It is a small tree in its native places, but becomes a bush farther north. It is sometimes planted in the open in our southern states, but in northern latitudes it is more often grown in a greenhouse. There is a form (var. angustifolia, Hort.) with narrow lvs., another (var. myrtifolia, Nichols.) with small lvs. and compact habit, and another (var. auro-variegata, Hort.) with yellow-variegated lvs., and one (var. variegata, Nichols.) with variegated white. Azórica, Nichols., is a free grower with red stigs.: lvs. more coriaceous and more coarsely serrate than the type: racemes short and densely fld.: shrubby. Azores. G. 30: 123. Var. Hisa, DC. Lvs. narrower and more oblong than in the type, about 5 in. long; racemes 6-8 in. long, the fls. less crowded. Madeira and Canary Isls.

bb. Racemes not longer than the lvs.

c. Calyx-lobes toothed or undulate.

78. Laurocerasus, Linn. (Cerasus Laurocerasus, Lam. Padus Laurocerasus, Mill. Laurocerasus officinalis, Roem.). CHERRY-LAUREL. ENGLISH LAUREL. Bush or small tree (reaching 10 ft.) with handsome evergreen foliage: lvs. coriaceous and glossy, short-stalked, oval, lanceolate, oblong-elliptic or oblanceolate, narrowed into a short point, recurved, serrulate; very with 2-4 glands at the base of the blade: fls. small, white, in axillary or terminal short racemes in spring, the calyx-lobes 3-toothed: fr. ovoid-acuminate, small, blackish. S. E. Eu. to N. Persia. Gn. 50, p. 315.—One of
the most popular broad-lvd. evergreen plants in Eu., and somewhat planted in the southern states. It is also grown in tubs and used for house-decoration. Some of the forms will stand far north as Washington, and var. schiaplanes is hardy in Cent. N. Y. When grown in the open, the cherry-laurel should be allowed to ripen its wood thoroughly before winter sets in. Protection from severe winds is always desirable. The plant may be propagated by means of long cuttings of ripe wood; also by layers. Named varieties are worked on common stocks. The cherry-laurel is very variable. Some of the many horticultural forms are as follows:

Var. angustifolia, Nichols, lvs. very long and narrow, and plain hairy as far north as Washington; var. Bértini, with very broad lvs.; var. camellifolia, Nichols, with recurved lvs.; var. canescens, Hort., and var. ciliata, Hort., with slender twigs and dark foliage which is gray-green beneath, also hardy; var. japońska, Hort., a narrow-lvd. form, like var. angustifolia; var. latifolia, Hort., with broad lvs., hardy at Washington; var. versilfíasis, Hort., also with broad foliage; var. microphylla, Hort., with small, narrow lvs., only 1/2 in. long; var. rotundifolia, Nichols, with short-oblong blunt lvs. (Gn. 28, p. 405); var. parvifló, Nichols, lvs. only 1/2 in. long and 1/4 in. broad, closely serrate: shrub; var. schiaplanes, Spach, with small nearly or completely entire lvs. dark green above and very light green beneath, small yellowish flowers: shrub (K.H. 1905. p. 409). W. G. 5, p. 177, var. schiaplanes (Zabeliana); var. variegata, Nichols, lvs. marbled or blotched with dull white.

79. caroliniana, Ait. (Prunus sempervirens, Wild. Cerasus caroliniana, Michx. P. carolinae, Mill. Laurocerasus caroliniana, W. Brandeg. MOCK ORANGE of the S. Tree. 20--40 ft. lvs. oblong-lanceolate-accumulate, usually entire but sometimes remotely spinose-serrulate, thick, dark green and shining above, pale slender hairs usually 10 or rarely 30 ft.: branchlets pubescent: lvs. ovate-oblong, acute or obtuse, cuneate or rounded at the base, crenulate, glabrous, 1/2--1 in. long; fls. white, 1/2--1 in. across, in 4-6-fld. racemes, to 4 in. long. W. Carolina.-P. angustifolia, Nicholls, a slender lvd. form, like var. latifolia, with broad lvs., hardy at Washington; var. versaillensis, Hort., also with broad crown: -lvs. holly-like, ovate to ovate-lanceolate, acute or obtuse, cuneate or rounded at the base, crenulate or nearly or completely entire lvs. dark green above and very light green beneath, small yellowish flowers: shrub (K.H. 1905. p. 409). W. G. 5, p. 177, var. angustifolia (Zabeliana); var. variegata, Nichols, lvs. marbled or blotched with dull white.

80. sphaerocarpa, Swartz (Laurocerasus sphaerocarpa, Roem.). Small glabrous tree, 20--40 ft. fls. elliptic, 2--3 in. long, acuminate, shining, entire, the petals slender and acuminate: fr. globose, 2--3 in. across; calyx perisistent. W. China.-P. hybrida Koehne. Lvs. rounded at the base, bluntish, with 2--4 in. across, densely tomentose, finally glabrous, 2--4 in. long; fruits to 5 in. long. W. Himalayas. B.M. 81. ilicifolia, Walp.

81. ilicifolia, Walp. (Cerasus ilicifolia, Nutt. Laurocerasus ilicifolia, Roem.). ISLAY. WILD CHERRY. MOUNTAIN HOLLY. Evergreen bush or small tree, rarely becoming 30 ft. tall, with a dense crown: lvs. holly-like, ovate to ovate-lanceolate, obtuse, acute, or sometimes even acuminate, mostly broad and sometimes rounded at the base, the margins coarsely spiny-toothed, the blade thick and shining: fls. white, in slender racemes less than 2 in. long in spicate, 1/2 in. across: fr. rather large (sometimes 4 in. across), nearly globose, purple or nearly black; stone ovate. San Francisco to Low. Calif. Gn. 3, p. 131. S.S. 4: 162. G.F. 5: 475 (tree).—A most worthy garden-plant.


CHERRY. Lvs. longer and more acuminate, usually even fr. larger: Islands off the coast of S. Calif. (Santa Cruz and Santa Catalina). S.S. 4: 163.—Considered to be more desirable as a garden-plant than No. 51. It grows rapidly under cult., making a compact very dark green crown. Useful also in pots and tubs. P. occidentalis, Swartz, a different plant, grows from Cuba to Trinidad. It is not in the trade. Grisebach describes it as an open tree, to 25 ft., with ovate-oblong, acuminate, rounded at the base, bluish, with 2 glandular spots at the base beneath: racemes lateral, puberulous or glabrous: fr. ovoid, slightly apiculate, nearly 1 in. long, purple. The fr. is said to be "of very fine flavor."

P. pedunculata, Koehne. Allied to P. Padus. Tree. to 40 ft.: branchlets finely velvety: lvs. oblong-obovate, acuminate, subacute or rounded at base, serrulate and puberulous beneath, 2--3 in. long; fruiting raceme to 5 in. long: fr. globose, 1/2 in. across. W. China.—P. cordifolia, Koehne. Allied to P. Maximowiczii. Tree. to 30 ft.: lvs. oblong, acuminate, usually rounded or almost circular at base, densely serrate, finally globose, 1 1/2--2 1/2 in. long: fls. white, about 1/2 in. across, in 4--6-fld. racemes. W. China.—P. maximowiczii, Koehne. Allied to P. corymbosa. Tree. to 20 ft.: lvs. acuminate: fr. globose, 1/2 in. across, nearly or completely entire lvs. dark green above and very light green beneath, small yellowish flowers: shrub (K.H. 1905. p. 409). W. G. 5, p. 177, var. maximowiczii (Zabeliana); var. variegata, Nichols, lvs. marbled or blotched with dull white.

P. pedunculata, Koehne. Allied to P. Padus. Tree. to 40 ft.: branchlets finely velvety: lvs. oblong-obovate, acuminate, subacute or rounded at base, serrulate and puberulous beneath, 2--3 in. long; fruiting raceme to 5 in. long: fr. globose, 1/2 in. across. W. China.—P. cordifolia, Koehne. Allied to P. maximowiczii. Tree. to 20 ft.: lvs. acuminate: fr. globose, 1/2 in. across, nearly or completely entire lvs. dark green above and very light green beneath, small yellowish flowers: shrub (K.H. 1905. p. 409). W. G. 5, p. 177, var. maximowiczii (Zabeliana); var. variegata, Nichols, lvs. marbled or blotched with dull white.
**FRUNUS**

long, sharply serrulate, fuscous-tomentose beneath: fruiting raceme 5 in. long, glabrous; fr. subglobose, 5mm. across. W. China.—P. setulosa, Batal. (P. napalensis var. sericea, Batal). Tree, to 4 ft.: lvs. elliptic to oblong, rounded or cuneate at base, remotely serrate, white at first, later grayish tomentose, 3½-5 in. long, racemes 3½-5 in. long, densely short-pilose; fr. subglobose, 5½ mm. long, black. W. China.—P. stellifera, Koch. (subgen. Pachycentron, Batal.). Tree, to 20 ft.: lvs. elliptic to narrow-oblong, long-acuminate, broadly cuneate or nearly rounded at base, sharply serrate, glabrous beneath, 3½-5 in. long; racemes up to 1½ in. long, without lvs. at the base; fr. globose, 5½ mm. across. Cent. China.—P. tingitana, Koehne. (Amygdalus communis var. tingitana, Batal.). Tree, to 20 ft.: lvs. lanceolate, glabrous, obtuse or acute, cuneate or rounded at base; fr. globose, dark red, 5½ mm. across. W. China.—P. rehderiana, Koehne (subgen. Pachycentron, Batal.). Tree, to 35 ft.: lvs. oblong-obovate to obovate-oblongacutate, cuneate or nearly rounded at base, sharply serrulate, glabrous beneath, glabrous except the bearded axis. 2½-4½ in. long; racemes without lvs. at base, 3½-4 in. long, fr. globose, about 5½ mm. across. (P. Schneid.). Tree, to 30 ft.: lvs. elliptic to oblong-oblongacutate, acuminate, usually cuneate at base, remotely serrate, whitish beneath, 3½-5 in. long; racemes pubescent, 5½-6½ in. long; fr. ovoid, 5½ mm. long, black. Cent. China. Var. leboicola, Koehne. Lvs. lanceolate-acuminate; racemes glabrate.—P. Zappeyana, Koehne=P. concinna. L. H. B.

**PSÁMMA**

*Ammophila.*

**PSEUDERÁNTHÉMUM** (Greek, false Eranthis, the genus resembling Eranthis from which it was separated.) Smooth bushes or shrubs with often coarse-toothed leaves and mostly brilliant colored flowers; glaucous, glaucous-subglabrous, glabrous, glabrescent, glabrate, glaucous except the bearded axis. Inference racemose, 3½-3½-branched or simple in the axis of the bract; fls. long-tubed, corolla with the limb spreading; lobes almost equal or the 2 rear ones smaller; stamens short, fastened in the tube, 2 staminoids present, true stamens 4 or less.—Sixty to 70 species, occurring in the tropics of both hemispheres. Pseudo-eranthemum, as characterized by Lindau in Engler and Prantl, Pflanzenfamilien IV 3b:330, includes Eranth- 

**PSEUDOLÁRÍX**

*E. Schomburgkti,* Hart. (Eranthis Schomburgkti, HOOK. f.). Small shrub, much branched; lvs. small, elliptical or subovate; fls. very numerous, axillary, solitary, pure white, almost sessile. Polynesia. B.M. 5405. See p. 1126.

*F. TRACY HUBBARD.*

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**Deciduous, with horizontally spreading whorled branches:** lvs. linear, in dense clusters on short spurs, those of the young shoots spirally arranged; staminate fls. catkin-like, slender-stalked and clustered at the end of short spurs; cone short-stalked, pendent, with ovate-lanceolate deciduous scales and with bracts about half as long as the scales; each scale with 2 seeds with winged arils; ovary ovoid-oblong. Asia (?). The only species known wild only from a restricted region in E. China, where it grows in the mountains at an altitude of about 3,000-4,000 ft. It is closely allied to *Larix,* but differs by the staminate, pendulous, clustered, staminate fls. and by the deciduous cone-scales, which separate from the axis at maturity, as in the byr.
The golden larch is a beautiful tree with its long, spreading branches pendulous at the extremities and clothed with light green feathery foliage turning to a clear yellow in fall. The tree seems to remain free from insect pests and fungous diseases and is hardy in Massachusetts, and probably farther north. It requires a sunny open position and a well-drained moderately moist soil; it does not thrive nor look well if crowded by other trees. The golden larch should be raised only from seeds. If grafted on its own roots or on the common larch, it is sometimes done, it rarely grows into a symmetrical tree.


Alfred Rehder.

PSEUDOPAXIS (false Panax). Araliaeae. A small and horticulturally unimportant group of greenhouse araliaceae distinct for their foliage, flowers having never developed in cultivation, so far as known, in America. Glabrous shrubs or rarely trees in cult.: lvs. digitately compound, and sometimes simple, the juvenile lvs. quite unlike mature specimens: fls. dioecious, in raceme or paniculate umbels; calyx oblong or toothed; corolla of 5 distinct, valvate petals; stamens 5; ovary 3-celled: staminate fls. axillary, larger than the scale, 2-lobed at the apex, the midrib produced into a rigid awn; each scale with 2 nearly triangular seeds with a wing shorter than the scale. —Four species, 2 in W. N. Amer., 1 in Japan, and 1 in W. China. Very similar in habit and foliage to Abies, from which Pseudotsuga var. glauca can be easily distinguished by the more slender and flexible lvs. and the elongated, ovate or ovate-oblong, acute, not resinous winter buds; from Tsuga mays be distinguished without cones by the smooth branches, not roughened by the more or less twirled terminal bud, and the longer lvs. The light red or yellow wood is hard and durable and much used for construction, for railway ties and for masts. The bark is sometimes used for tanning leather.

N. Taylor.

PSEUDOPSUGA (Greek, false Tsuga). Syn., Abietia. Pinaceae. Ornamental woody plants grown for their regular pyramidal habit and evergreen foliage; also important timber trees.

Tall evergreen trees with whorled branches: lvs. more or less 2-ranked, linear, flattened, green and grey above, with a striated white band on each side of the prominent midrib beneath; cones ovoid, linear, flattened, the midrib bundle in the center: staminate fls. axillary, cylindrical: cones pendent, ovate-oblong, maturing the same season; scales rounded, rigid, persistent; bracts longer than the scales, 2-lobed at the apex, the midrib produced into a rigid awn; each scale with 2 nearly triangular seeds with a wing shorter than the scale. —Four species, 2 in W. N. Amer., 1 in Japan, and 1 in W. China. Very similar in habit and foliage to Abies, from which Pseudotsuga var. glauca can be easily distinguished by the more slender and flexible lvs. and the elongated, ovate or ovate-oblong, acute, not resinous winter buds; from Tsuga mays be distinguished without cones by the smooth branches, not roughened by the more or less twirled terminal bud, and the longer lvs. The light red or yellow wood is hard and durable and much used for construction, for railway ties and for masts. The bark is sometimes used for tanning leather. The Douglas spruce, which is the only species well known in cultivation, is a tall tree of symmetrical habit with regularly whorled branches clothed with more or less two-ranked linear leaves, with orange-stained and purplish-pistillate catkins and with pendulous medium-sized cones, of a bright appearance on account of the protruding bracts, falling off as a whole. It is one of the tallest and most important forest and timber trees of western North America, and in its forms of the higher altitudes it is hardly as far north as Canada. When it finds a congenial home it is among the most desirable conifers for park planting and it grows rapidly, but where rapid growth is not desired, the var. glauca may be planted, which is of much slower growth and more compact habit. It thrives best in a porous sandy loam, and its cultivation does not differ from that of Picea, which see. Varieties may be grafted on the type.

The Douglas spruce is a tree for the millionaire. It would be difficult to exaggerate its beauty. As a forest tree it perhaps produces a greater crop of lumber to the acre than any other species. It probably grows faster than any other conifer. Indeed, the complaint is sometimes made that it grows too fast to make a compact lawn tree. It is said to have grown 5 ft. in 5 years when planted at the base of a Douglas spruce, because the foliage is so soft that single specimens are sometimes injured by high winds. Specimens planted on the prairies without protection from hot winds may sometimes have their buds injured by late spring frosts. It is, of course, a mistake to use this kind of spruce for a windbreak. The Douglas spruce is generally propagated by seeds. Seeds of conifers gathered on the Pacific slope are tender, while those gathered in Colorado produce hardy trees which endure...
both drought and cold. Unlike the firs, the Douglas spruce has fine fibrous roots like the Norway spruce and transplants as readily. The writer has transplanted many stocky young trees growing in the open to the nursery and has saved 90 per cent of them. They seem to thrive as well as nursery-grown Norway spruces of the same size. The yield of seed from a wagon-load of cones is light, and it is somewhat difficult to grow seedlings. In some circumstances it will be cheaper in the end to procure young trees. The yield of seed from a wagon-load of cones is light, and it is somewhat difficult to grow seedlings. In some circumstances it will be cheaper in the end to procure young trees.

The Douglas spruce is remarkable for its wide variation in form and color. The needles may be short or long, light green, dark green, or have a bluish or silvery cast. The deep blue and silvery foliage is characteristic of the deep gorges of high altitudes. (C. S. Harrison.)


PSEUDOTSUGA

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in a broad cluster, the filaments about \( \frac{\text{3 in.}}{\text{2 in.}} \), style about \( \frac{\text{3 in.}}{\text{2 in.}} \), stigma subcapitate, greenish: fr. globose, ovoid or pyriform, 1-4 in. long, commonly yellowish in color with flesh varying from whitish or yellowish to deep pink; flavor sweet or somewhat acid, with a pronounced musky aroma; seeds usually numerous, reniform or flattened. Flowers mostly abundant in spring and produced the main crop of frs. in Aug. and Sept. Mex. and Cent. Amer. - This species is variable, and occurs in a wide range of horticultural forms. The two species \( \text{psidium} \) and \( \text{pomiferum} \) of Linnaeus are considered to be nothing more than a species. A small plant was offered by Reasoner Bros. of Fla. under the name of \( \text{p. guineense} \), is said to be a horticultural variety of \( \text{p. guineense} \). The variety \( \text{Perico} \) has been disseminated in Fla.; other forms are commonly listed by nurserymen under such names as "sweet," "sour," "red-fleshed," and the like. In Calif., where this species is less commonly grown than in Fla., an oval yellow-fleshed form is called lemon guava, a pyriform white-fleshed one is known as pear guava, and a yellow one with pink flesh is called Hawaiian guava.

The name guava, by which the fruit is known in Spanish (the plant guayabo) is generally considered to have come from the island of Santo Domingo. Both Barbosa Rodrigues and Tavares, however, assert that it should be applied to the Pipi Indians in Brazil. In French the fruit is called goyave, the plant goyavier; in Portuguese goiaba, the plant goiabeira; and in German guava, the plant guavatbaum. The aboriginal name in Mexico is xalxocotl, meaning sand-apple or sand-plum. Xocotl is the name applied by the Aztecs to all sour fruits, in contradistinction to zapotl which indicated all sweet fruits.

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Friedrichsthaliurn, Niedenzu (Calyptrodium Friedrichsthaliurn, Berg). COSTA RICA. CAS. ARICA. Shrub or small tree, 25-35 ft. high, with rather slender branches and smooth, dark brown bark. The young branchlets are dark-colored, slightly pubescent; lvs. oval or oblong-oval, 1\( \frac{\text{2 in.}}{\text{3 in.}} \) to 3 in. long, acuminate, the base acute, deep green, thickly chartaceous, smooth, almost glossy above, puberulent below, sparsely pellucid-punctate, midrib prominent below; peduncles axillary on the young branchlets, 1-fl.; petals 5, suborbicular; stigma peltate; ovary 5-locular: fr. globose, small, sour. Costa Rica, Guatemala, and probably other parts of Cent. Amer. - Of comparatively recent intro. into the U. S. It grows well in S. Fla., but seems too tender for most parts of S. Calif. It may succeed in protected locations. The frs. are considered especially valuable for jelly-making, because of their acidity. A plant which has been disseminated in this country under the name of \( \text{P. laurifolium} \), intro. from Trinidad, appears to be this species.

mölle, Bertol. GUISARO. SOUR GUISARO. GUAYABA ACIDA. Shrub or small tree, of rather slender growth, the young branchlets, peduncles, and lower surfaces of the lvs. reddish velvety; lvs. oblong-oval, 3-5 in. long, thick at apex, obtuse, angular, base obtuse or shortly acute, rigidly chartaceous, light green, puberulent below: peduncles erect, 3-fl.; ovary 4-locular: fr. globose, about 1 in. thick, pale yellow when fully ripe, with whitish pulp containing many rather small seeds. The flavor is acid and not especially agreeable. S. Mex. and Cent. Amer. - This species has been offered in Fla. for years but has never been extensively planted. It is fairly hardy, and has been grown in Calif. It fruits very prolifically, its season being late summer.

- A. Branchlets terete.

Arica, Radili. BRAZILIAN GUAVA. ARAÇÁ DO CAMPO. Large shrub, the young branchlets hisrate: lvs. oblong-oval, large, obtuse, subvelvety above, pubescent below, the veins reticulate, somewhat raised: peduncles axillary, 1-3-fl.; fr. ovoid or oblong, yellow, sweet only when fully ripe. Common on the dry uplands of Brazil. - The species disseminated in Calif. by Franceschi under the name of \( \text{P. araca} \) does not agree with this description; it is a plant strongly resembling \( \text{P. cattleyanum var. lucidum} \), but with broader and somewhat thicker lvs., the frs. usually larger, of a deep yellow color, with few seeds and a more prominent calyx.

Cattleyanum, Sabine. STRAWBERRY GUAVA. Shrub or small tree, up to 20 ft. high, the bark smooth, green-
S. African species thrive in well-drained sandy peat, and still others perennial. The shrubby kinds are propagated by cuttings of half-ripened shoots the herbaceous species by division when the new growth begins. The S. African species thrive in well-drained sandy peat, the others in ordinary garden soil.

Valuable.—P. guineense, Pers., is a synonym of P. fluviatile, Rich. A species with branchlets tomentose, glabrous: lvs. oval, glabrous: peduncles opposite, 1-ft. Cayenne.—P. guineense, Swartz., is a synonym of P. Arno Berg, but DeCandolle considers it a distinct species. He distinguishes it from P. Arcaea by the lvs. less soft, glabrous above, with the notches not raised as in the latter. More recently Urban uses it in preference to P. Argiena, which latter is made a synonym by its states that it resembles P. Guajava, but is easily distinguished by the less numerous transverse veins, not impressed above. Swartz, in describing P. guineense, stated that it came from Aft., and was cult. in Santo Domingo, but as all pedalium are now known to be American, he was doubtless mistaken regarding its origin.—P. tectoria, Raddi, intro. by Franceschi, resembles P. Cattelanum very closely, but DeCandolle considers it a distinct species. He distinguishes it from P. Arcaea by the lvs. somewhat more attenuate toward the base, and obovate or obovate-oblong (cf. Berg in Linn. xxvii) groups the species, P. Cat­telanum and P. hamile under the name of P. varia. Brazil.—P. montanum, Swartz, is a species from the mountains of Jamaica, with 4-angled branchlets: lvs. oblong-oval, acuminate, glabrous; peduncles many-ft.: fr. subrounded.

F. W. POPNOE.

PSILOSTROPE (Greek, naked bud, referring to the naked receptacle). Syn. Riddelia, Compositae. Low and corymbose branched woody perennial herbs with alternate and spathulate or linear lvs., the cauline entire, and with small heads of yellow fls., the ligules large in proportion, pale or whitish in age and thin-papery: achenes narrow, lanceolate, obscurely striate and angled. About 2 species, N. Amer. P. Cattelanum and P. hamile under the name of P. varia.

Tetragonolobus, DC. GOA BEAN. Root large, annual: lfts. ovate, acuminate, 3-6 ft. 2-6 in.; racemes lax, few-ft.; pedicels elongated: fls. large, light blue; calyx glabrous, lateral teeth obtuse, 1 in. long: ped-6 to 9 in.; fr. winged, ½-in. broad, usually much crisped and toothed. India.—Also grown in tropical and subtropical regions for the young tubers which are eaten raw or cooked, or for the young pods which are an excellent vegetable.

F. TRACY HUBBARD.

PSORALEA (Greek, scaly; referring to the glabrous seed) which occur on the plants. Leguminosae. SCURFY PEA. Herbs, shrubs, or subshrubs useful as border plants.

Usually copiously sprinkled with resinous black or purplish dots and strongly scented: lvs. pinnate or trifoliate, rarely unifoliate; stipules free or adnate to the petiole: fls. in racemes or spikes, axillary or terminal, blue, purple, or white; calyx not enlarged after flowering, unequally 5-lobed; standard ovate or orbicular, clawed, wing oblong or falcate, keel incurved, obtuse, dark-colored; ovary sessile: pod ovoid, short, indehiscent, 1-seeded.—About 115 species common in the tropics and subtropics of both hemispheres, 20 species in N. Amer. The genus comprises both greenhouse and hardy plants, some annual, others biennial, and still others perennial. The shrubby kinds are prop. by cuttings of half-ripened shoots, the herbaceous species by divisions when the new growth begins. The S. African species thrive in well-drained sandy peat, the others in ordinary garden soil.

Plants hardy in the N.

Number of lfts. 7.

PSORALEA

Psoralea, Torr. & Gray. Perennial herb, stemless or nearly so, about 1 ft. high, with numerous, usually purple fls., in ovate or oblong, dense spikes: fls. 7, digitate, obovate-oblong, 1 in. long: fl. st. longer than lvs., rigid. April–June. Rocky hills, Tenn.

Number of lfts. 3.

C. Les. digitiately compound.

Lanceolata, Pursh. Perennial herb, much branched, glabrous or nearly so, densely dark-glandular, 1–2 ft. high. Lfts. sessile, bright green, entire, linear or ob lanceolate; fls. bluish white, 3 lines long. June, July. Kans to W. Canada west to Wash., etc. B.B. 2:291.

C. Les. pinnately compound.

Physodes, Douglas. Perennial herb, slender, 1–2 ft. high. Lfts. ovate, about 1 in. long: fls. in short, close racemes; calyx ½-in. long, becoming enlarged and inflated until nearly ¾-in. long; corolla ¾-in. long, white or purplish. Mountains of coast ranges, Calif.

Number of lfts. 5.

Esculenta, Pursh. Pomme Blanche. Hardy herbaceous perennial 4–18 in. high: fls. 5 and digitate, short-stalked, oval or obvate, entire, obtuse, narrowed at base, 1–2 in. long: fls. bluish; spikes ½–3 in. long; root large, often clustered, starry. June. Prairies, Man. and Dak. south. B.B. 2:384.—The following points, by Sprague, on the pomme blanche (also called prairie apple, prairie turnip, and Indian or Missouri bread-root) are taken from Goodale's 'Wild Flowers of America': "In the autumn the top of the plant dies and separates from the root, near the ground, and is blown about the prairies. After the top has gone the root cannot be readily found, and hence the Indians dig them in August for their winter use. The root lies deep in the ground and is about the size of a hen's egg. The outside is covered with a thick integument almost as tough as wood and of a dark brown color. The inside is whitish and not unlike a chestnut in appearance and taste, but not so sweet. The Indian women dig the roots with great facility by means of a pointed stick 2 or 3 feet long." The roots are spindle-shaped or turnip-shaped. If the Indians use them immediately, they generally roast them in ashes. They are also dried and stored for winter, and when wanted they are mashed between stones, mixed with water and baked into cakes over the coals. The root was frequently found in the canoes of the Indians by early travelers before the plant which produced it was known to white men. Nuttall wrote: "The taste is rather insipid, but not disagreeable either raw or boiled. Texture laminated, always tenacious, solid and never farinaceous." In 1846 the pomme blanche was proposed as a substitute for the potato. His claims to consideration were dis­cussed in several publications, with the result that it was thought to offer no possibilities of advance over the potato.

A. Plants tender.

B. Number of lfts. 3.

C. Habit herbaceous.

Bituminosa, Linn. Perennial herb, ½–5 ft. high, appressed hirsute: lfts. nearly entire; lower ones ovate, obtuse; upper ones much narrower, acute: peduncles longer than lvs.; fls. 5, the lobes dilated, in about 115 species common in the tropics and subtropics of both hemispheres, 20 species in N. Amer. The genus comprises both greenhouse and hardy plants, some annual, others biennial, and still others perennial. The shrubby kinds are prop. by cuttings of half-ripened shoots, the herbaceous species by divisions when the new growth begins. The S. African species thrive in well-drained sandy peat, the others in ordinary garden soil.
pinnata, Linn. Arborescent or shrubby, 6-12 ft., densely branched and leafy; lfts. 7-11, pinnate, linear or lanceolate-linear, acute, commonly 10-15 lines long by about 1 line wide; fls. axillary, solitary or clustered, sessile or pedicelled, blue with white wings. S. Afr. G.C. III. 5:683; 33:301. J.H. III. 33:591. G.M. 46:611.

3248. Psychotria undata. (×1½)

3249. Ptelea trifoliata, the hop tree, in fruit. (×1½)
exstipulate, 3-5-foliolate; lfts. entire or crenulate, punctate with punctellate dots; fls. small, polygamous, in terminal corymbs; lobes of the minute calyx, petals and stamens 4-5; ovary flattened, 2-celled, with short style; fr. a 2-seeded, indehiscent, small, flattened nut, furnished usually with a broad thin wing.—Usually 5 to 7 species distributed from Lake Ont. to Fla. and N.

Phytophila, Linn. HOP TREE. WAFER ASH. Fig. 3249. Shrub or small round-headed tree, attaining 25 ft.: lfts. 3-5 in. long: fls. 7-8 in. across; filaments villous beneath; fr. a 2-seeded, indehiscent, small, flattened nut, furnished usually with a broad thin wing.—Usually 5 to 7 species distributed from Lake Ont. to Fla. and N.

Pteris (Greek name for a fern, from a word meaning wing; alluding to the prevalence of pinnate forms). Polypodiaceae. A large genus (60 species) of widely distributed ferns with sporangia borne on a marginal line-like receptacle that connects the free ends of the veins, and with the more or less altered margin of the leaf rolled over to form a continuous indusium. Many of the forms are among the commonest species of ferns in the trade and are very generally used for table decoration, especially as small plants for fern-dishes. For culture, see Pteris.

The common brake, P. aquilina, Linn., is by some authors now referred to a separate genus; see Pteridium, above.

Pteris probably contains as many cultivated forms as Nephrolepis, but in America at least does not rank with this fern in importance in the trade. As pot-plants for the house, the species cretica and serrulata and their varieties will probably succeed as well as most of the nephrolepis forms, and better than some species of Polypodium. But it is generally of extremely uncommon, except as already noted, as small plants for fern-dishes. Apparently only one dealer in America makes a specialty of growing pteris. His list is given at the end of this article.

Pteridophyllum (Greek, fern leaf, referring to the pinnate lvs.). Poppyaceae. Perennial acaulescent herbs with a rather thick prismatic rhizome: roots fibrous: lvs. all radical, petiolate, pectinate-pinnatifid: scapes naked, longer than the lvs. with a simple or at base subramose many-flowered raceme; sepals 2, deciduous, very short; petals 4, deciduous, elliptic-concave; stamens 4, deciduous; ovary orbicular, 1-celled, 2-4-seeded: fr. unknown. One species, Japan, P. racemosum, Sieb. & Zucc. A small glabrous herb with narrowly oblanceolate lvs. 4-6 in. long, about 1 in. broad: segments oblong-linear, rounded at the apex: scape slender, 6-9 in. tall, bearing a loose raceme of small white fls. Intro. into botanic gardens abroad; probably not otherwise cult.

Ptelea exstipulate, 3-5-foliolate; lfts. entire or crenulate, punctate with punctellate dots; fls. small, polygamous, in terminal corymbs; lobes of the minute calyx, petals and stamens 4-5; ovary flattened, 2-celled, with short style; fr. a 2-seeded, indehiscent, small, flattened nut, furnished usually with a broad thin wing.—Usually 5 to 7 species distributed from Lake Ont. to Fla. and N.
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PTERIS

12. Wallichiana, Agardh. Lf.-blades tripinately, with the lateral divisions again forked, the central one reaching 2 ft. long, with numerous lanceolate sessile opposite pinnules, cut again into numerous narrow lobes 8½ in. wide. India, Japan, and the Philippine Isls. Known also as Campetra Wallisiana.

AAA. Veins uniting, forming conspicuous meshes.

13. leptophylla, Swartz. Lf.-blades triangular, 9-12 in. each way, on straw-colored stalks; upper pinna simple, those below pinnatifid to a winged rachis, the lowest similarly bipinnatifid at the base; veins fine; sori not reaching the tips of the segments. Brazil. Known also as Listrobolchis leptophylla.

PTEROCARYA

2853

PTEROCARYS (wing fruit). Caesalpin., Low caesalpin with somewhat slender round st.: fr. a caps.; seeds flat, winged. Three species described, all from Argentina, little cult. P. Klintzii, Schum. Branches several, of the like: branches glaucous, spines 9-12, minute, appressed: fls., yellow, terminal.

J. N. Roeb.

PTEROCARYS (Greek, wing fruit). The pods are girded by a broad wing). Lepiminus., Trees or woody climbers without prickles: lvs. alternate, uneven-pininate; fls. alternate or irregularly opposite, without stipules: fls. yellow, rarely mixed with violet and white, often showy, in axillary or terminal racemes; calyx tubarinate; standard orbicular or broad-ovate. About 45 species, natives of the tropics of both hemispheres. The following species may be in cult. in some greenhouses: P. Draco, Linn., growing 50 ft. high, native of Trop. Amer. P. Indicae; Wild., „Burman rosewood„ growing about as high, but a native of the E. Indies. P. Marazipium, Roxbg., a pale yellow-flld. tree reaching a height of 40 ft. Coromandel. P. Rohini, Vahl, from Trop. Amer., grows to be 20 ft. high.

PTEROCARYA (Greek, pteron, wing, and karya, nut; referring to the winged nuts). Juglandacee. Ornamental trees grown for their handsome pinnate foliage and the attractive pendulous racemes of winged fruits.

Deciduous: branches with lamellate pith; winter buds naked or scaly, more or less enclosed and usually several in each axil, one above the other: lvs. alternate, exstipulate, odd-pininate, with almost sessile fls.: fls. monocarps, in pendulous cacthms, appearing with the lvs.; staminate cacthms slender, the 1-celled ovary inclosed in a conuate involucre elongated into a 4-toothed beak; stigmata 2: fr. a small 1-seeded, winged nut, 4-celled at the base. In germination the 4-celled cotyledons are borne above the ground and become green, while in Juglans and Carya they remain inclosed in the nuts.—Eight species in China, 1 in Japan, and 1 in W. Asia.

The pterocaryas are hardy as far north as Massachusetts, but need some protection while young. P. stenoptera is more tender, and the other Chinese species have not yet been sufficiently tried. Propagation is by seeds sown in autumn or stratified, also by layers and suckers.

A. Winter buds naked, usually several in each axil.

B. Fr. with 2 distinct wings.

C. Wings of fr. suborbicular: rachis of fl. terete, glabrous.

hupehensis, Skan. Tree, to 60 ft.: branchlets glabrous or sparingly hairy; lfts. 5–9, oblong to oblanceolate, acuminate, rounded at the base, serrate, glabrous above, bearded in the axils of the veins beneath, 3–5 in. long; racemes to 18 in. long, glandular: fr. including the suborbicular wings 1–1 1/2 in. across. Cent. China.

Rehderiana, Schneid. (P. fraxinifolia x P. stenoptera). Fig. 3251. Tree, similar to P. fraxinifolia; rachis of fr. narrowly winged, the wings not serrate and often wanting between the lower lfts.; lfts. 11–25, oblong to oblanceolate, serrate, acute or acuminate, pubescent in the axis beneath, 2–4 in. long; frs. with oval or oval-oblong wings about 1/2 in. long. S.T.S. 2: 137.—Originated at the Arnold Arboretum and surpasses both parent species in vigor and hardiness.

stenoptera, DC. (P. sinensis, Hort. P. japonica, Hort.). Tree, to 60 ft.: young branchlets villous: lvs. 6–12 in. long, with the rachis distinctly winged and pubescent beneath; the wings often serrulate; lfts. 11–21, oblong, acute, serrate, pubescent beneath on the midrib, 2–4 in. long; stamens 6–10: fr. with oblong or oblong-lanceolate, acuminate, broadly cuneate at the base, irregularly and sharply serrate, 3-nerved at the base, glabrous, 1 1/2–3 1/2 in. long: fr. axillary, solitary, slender-stalked, suborbicular, often broader than high, and the wings usually emarginate at the apex.—Rare in cult. and without particular ornamental qualities.

PTEROCARYA (Greek, wing head, so named because the head appears covered with a lot of feathers after the frs. fall off). Dipsacaceae. Herbs, half-shrubs and shrubs, annual or perennial: bracteoles narrow: inflorescence short: calyx-subulate; calyx-limb 12–24 long bristles; corolla 5-fld; mostly without pales. About 20 species chiefly in the Medit. region but also in Asia. This genus was formerly included in Scabiosa but is now kept distinct. P. Paradisi, Spreng. (Scabiosa Pterocarya, Linn.). A densely tufted perennial with woody sts. and branches, procumbent: lvs. narrowed into the stout petiole, ovate, obtuse, deeply crenate-toothed or lyrate-pinnatifid; heads depressed-hemispherical; lvs. lilac-pink; corolla 2-lipped, upper 2-lobed, lobes short rounded; lower 3-lobed, lobes oval, obtuse. Greece. B.M. 6526. Perfectly hardy in England, used for carpeting in the herbaceous border or suitable for rockwork.


PTEROLOBIIUM (Greek, wing and pod; the pods are produced into a wing at the extremity). Leguminosae. Woody climbers having the habit of Cassia from which they differ only in the pod: lvs. bipinnate: lts. small, numerous; stipules small or inconspicuous; fls. small, white, racemose, in racemes or lax panicles at the tips of the branches; calyx deeply cleft, lobes imbricated; petals spreading, oblong and clawed; stamens free, compound; ovary sessile, 1-celled: pod indehiscent, with a large heavy oblique wing. About 7 species in the tropics of the Old World. P. indicum, A. Rich. (Cassia indica, Roxbg.). Branches slender, finely downy and with minute prickles: lvs. alternate with 5–16 pinnae, 12–16 lfts., pale green: racemes copiously pedicelled at the end of the branches; calyx with the lowest sepal longest; corolla yellow, not showy. Old World tropics.—Has been

3254. Pterocarya Rehderiana. (X 3/4)
PTEROLÖBIUM

intro. into England and is occasionally cult., the treat- ment being the same as that given Castalpinia. The species varies in the size of the lvs. and in the width and size of the wing of the pod.

PTERÖNIA (Greek, wing, referring to the chaffy receptacle). Comp. {Small dry or glutinous shrubs: lvs. opposite or rarely alternate, mostly entire, gland- bros or hairy, often ciliate; heads terminal, solitary or corymbose; involucral scales scarious, often shuning; fls. yellow, rarely purple. About 60 species, natives of S. Afr. P. vacina, DC., a scrubby divaricate branched bush with the twigs and lvs. thinly tomentose-canes- cent: lvs. opposite, sessile, linear-oblong, obtuse: heads sessile, 6-9-fld., golden yellow, involucral scales oblong, obtuse, at first greenish yellow then fulvous and finally the centers brown: achene top-shaped, densely and rigidly hairy. B.M. 830th.—Occasionally cult. abroad.

PTEROSPÉRMUM (Greek, wing seed; referring to the fact that the seeds are winged). Sclerostyrax. Scaly or stellate-tomentose trees or shrubs, suitable for the warmhouse and outdoors in the southern part of the country.

Leaves 2-ranked, leathery, simple or lobed: infl. 1-3 axillary and terminal peduncles, 1- or few-flld.; fls. often elongated; calyx tubular, 5 more or less connate sepals; petals 5, deciduous with the calyx; staminal column short, bearing opposite the sepals 3 linear 3-celled anthers between each part of 5 anti-petalous ligule staminate, ovary inserted within the top of the staminal column: caps. woody or coriaceous, terete or 5-angled.—About 25 species, confined to Trop. Asia. Pterospérmums are said to need considerable warmth, and perfect drainage is most essential. They grow best in a mixture of sandy, fibry loam and lumpy peat. Prop. by cuttings of half-ripened side shoots, cut close to the st.

acerifólium, Wild. Large tree: lvs. 10-14 x 6-12 in., roundish or oblong, often lobed, palmately 5-7-nerved; nerves prominent beneath: bractlets raceminate: fl.-buds 2-9 in. long, 5-celled; seeds hairy. B.M. 830th.—Occasionally cult. abroad.

PTEROSTYRAX (Greek, pteron, wing; alluding to the winged or ribbed fruit, by which it is distinguished from the allied genus Styraeax). Styraeaxaceae. Ornamental wooly plants grown chiefly for their drooping panicles of white flowers.

Deciduous trees or shrubs, stellate-pubescent: lvs. alternate, dentateulate: fls. in large panicles, terminal on short branchlets; calyx 5-toothed; corolla 5-parted almost to the base; stamina 10, somewhat longer than the corolla and slightly exceeded by the slender style; ovary 3-celled: fr. a ribbed or winged 1-2-seeded nut.—Three species in China and Japan. Sometimes united with Halesia, from which it is distinguished chiefly by the paniled drooping infl. and the 5-merous fls.

These are handsome trees or shrubs with rather large light green leaves and white flowers in showy pendulous panicles, followed by small rather inconspicuous fruits. They are only precariously hardy in sheltered positions as far north as Massachusetts. In June they are very attractive, with their graceful drooping panicles of numerous deutzia-like fragrant flowers. They thrive best in a moderately moist sandy loam and are propagated by seeds or layers and also by greenwood cuttings under glass.


ALFRED REHDER.
PTYCHOCOCUS (Greek, fold and grain, probably referring to folds on the fruit). Palmaeae. Separated from Ptychosperma by technical characters of the endocarp of the seed. Two species, New Guinea. P. paradoxa, Becc. (Ptychosperma paradoxa, Scheff.). St. simple, 9–12 ft. high, rather slender, covered with dense white arachnoid tomentum; lvs. at top of st. regularly pinnate-divided; segms. 6–15, in young plants sub-semi-rhomboid, later broad-lanceolate, contracted toward the base, tip oblique-truncate: fls. diocious; ovary ovate-conical, 1-celled; seed 5-sulcate.

PTYCHORAPHS (Greek, folded and rape). Palmaeae. Malay and Indian palms grown in warm greenhouses.

Stems slender, ringed: lvs. pinnate, the lfts. long-acumin- ate: spadix from between the lvs., much branched, the spirally arranged fls. usually staminate only toward the apex. Three species, one from Singapore, one from the Philippines and one from Nicobar. The genus is placed next to Rhoopaloides by Drude in Engler and Prantl’s Natürlich.Pflanzenfamilien and distinguished by the zone of the forked raphe and deep ruminate seed. While the raphe and the upper parts of the seed is flattish. Cult. as for any tropical palm, requiring abundance of moisture.

augusta, Becc. Trunk becoming 50–100 ft. high in the wild, much lower in cult., slender, smooth: lvs. 6–10 ft. long; pinnae 1–2 ft., linear, acuminate, bright green; spadix much branched, 2½–3 ft. long: fr. elliptic-oblong, red; seed grooved on one side. Nicobar.

Siebertiana, Hort. Sts. slender: lvs. copper-colored when young, afterward rich green; petioles colored with small brownish scales; lfts. 10 in. long, ¾ in. broad, when young, afterward rich green; petioles colored as freely under cult. as either of these popular palms. This rare palm has been offered in Amer., but is not known to be cult. at present.

Sieberiana, Hort. Sts. slender: lvs. copper-colored when young, afterward rich green; petioles colored with small brownish scales; lfts. 10 in. long, ¾ in. broad, when young, afterward rich green; petioles colored as freely under cult. as either of these popular palms. This rare palm has been offered in Amer., but is not known to be cult. at present.

ANcient species resembling a kestia. N. TAYLOR.

PTYCHOSPERMA (Greek words, probably referring to the ruminate albumen of the seed). Palmaeae. A small and unimportant group of palms little known in America.

Trunks smooth, ringed, crowned at the summit by a dense cluster of pinnately divided lvs.: lfts. acuminate, either entire or jagged at the apex: spadix stipe or sometimes branched, appearing below the lvs.: fls. monoeccious in the same spadix: fr. an ovoid drupe. For cult., see Archontophrenix, to which belong many of the plants in the trade under Ptychosperma. For P. elegans, consult Seafordia.

Macartihus, H. Wendel. Described as dwarf, and most cult. specimens are so; in nature 20–30 ft.: lvs. pinnate, the lfts. arching, from 3–9 in. long, usually obliquely cut at the apex: infl. unknown. Austral. G. Z. 23, p. 205.

Root tuberous, very large: st. shrubby: branches fine. A hardy vine remarkable for the great rapidity of its growth, and most useful for covering arbors and verandas. It is also used as a forage plant. From a well-established root, vines will grow 40–60 ft. in a single season, producing a profusion of very large lvs. In the N. the plant dies to the ground in the winter, but in the S. the top becomes woody. The large fleshy root, assumes most curious shapes, the main branches often being 4–5 ft. long. Georgeson writes of the plant in Japan: “The roots are fleshy and yield starch of excellent quality; the tough fiber of the inner bark is manufactured into a sort of cloth which combines fineness with remarkable strength; and in certain situations the vine is unparalleled for ornament and shade.” The fls. are borne on the old or woody sts., but these sts. usually do not persist north of Philadelphia, and even rarely there. With age, the tops are more likely to survive the winter. Prop. by division of the roots, or by seeds when they can he had; also by cuttings.

Root tuberous, very large: st. shrubby: branches finely grayish pubescent: stipules minute, decussate, ovate-cordate: lts. membranous, roundish, 6–12 in. long, glabrous above, below densely covered with a whitish appressed pubescence: fls. in slender, dense, often pani- cate racemes 6–9 in. long; pedicels very short, densely fasedated; calyx ¾–½ in. long, densely silky; teeth rather obtuse, shorter than the tube; fr. not twice as long as the calyx; limb of standard orbicular, distinctly spurred: pod 2–3 in. long, membranous, flat, 4–5 seeded, clothed with long, gray, silky bristly hairs. India. Wright, Icones, 412. Intro. into U. S. in 1891. Suitable as an ornamental for the southern parts of the United States. The root contains a saccharine matter, an easily oxidizable resin; and a resin acid.

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PULMONARIA (Latin, lung; the herb having been considered a remedy for diseases of the lungs). Boraginaceae. LUNGWORT. Perennial herbs with a creeping rootstock, used in flower-gardens and hardy borders. Leaves radical, often broad, cauleine few and alternate: fls. in terminal cymes, rather large, blue or purplish: stamens 5: filaments cylindrical: anthers broadly oval.-About 8-10 species in Eu. and 1 species said to extend into N. Asia. Mertensia, an allied genus, has a short open more deeply-lobed calyx, exerted, stamens, and slightly fleshy nectaries. 

Pulmonarias are of easy cultivation, preferring light soil, not very dry, in open or partially shaded positions. They are readily propagated by division. Divide the clumps every two or three years.

Pulmonaria angustifolia, Linn. Height 6-12 in.: st. setose-hairy, with articulate glands; radical lvs. linear-lanceolate, abruptly contracted to the middle only; corolla-tube straight, naked or ploose, limbs spreading, 5-lobed; stamens included in the tube: nuts smooth.-About 8-10 species in Eu. and 1 species said to extend into N. Asia. Mertensia, an allied genus, has a short open more deeply-lobed calyx, exerted, stamens, and slightly fleshy nectaries.

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A. Lvs. white-spotted.
B. Plant very glandular.

PULSATILLA: Anemone.

PULTEMÉA (probably named after Dr. Richard Pulteney, 1730-1801). Leguminosae. Shrubs suitable for the warmhouse, not commonly in cultivation, although many species have been occasionally grown. Leaves alternate: fls. in axillary or terminal clusters of 4-6 in the axils of the leaves: petals 5: stamens numerous: fruit a pod.-About 90 species in Austral. Pultenias grow best in a mixture of peat and silver sand in pots of 1-2 l. Lvs. linear-terete; stipules subulate-pointed: fls. pink, in terminal heads; calyx silky pubescent; pod acuminate. Austral. G.Z. 21:193.

PUMMELO (possibly confusion of Dutch pommele). A generic term including most of the varieties of Citrus grandis (see page 782, Vol. II), other names for forms of this species being grapefruit (page 1391, Vol. III) and shaddock (Vol. VI).

The grapefruits long grown in the West Indies and the United States are mostly a group of very juicy subglobose (not pear-shaped) thin-skinned varieties differing widely from the common pummelos of the East Indies which are usually more or less pear-shaped, thick-skinned, and have a firm pulp. These latter are called shaddocks in the West Indies and United States. These two extremes are well separated in the character of the fruit, and also show differences in the leaves and twigs, the pummelos having more or less hairy twigs, leaves downy on the upper surface and very broadly winged petioles, while the grapefruits have nearly smooth, slender twigs, leaves smooth on the upper surface, and narrower petioles.

In the Orient, however, there are a multitude of forms of pummelos, among which occur all the intermediates between the two extreme types noted above. Under these circumstances it seems advisable to retain the word pummelo in its usual East Indian sense, i.e., to include all varieties of Citrus grandis with the exception of the grapefruit group which is sufficiently distinct to merit a separate name. The attempt was made some years ago to apply the name pomelo to the grapefruit in this country but this name never attained any currency among growers, shippers, dealers, and consumers and was largely restricted to books and bulletins on descriptive horticulture. Pomelo is really a variant of pummelo, also written pummelew, pummele, pummelo, pomelo, and so on. In view of this confusing perplexity of similar names, it seems inadvisable to attempt to distinguish by the name pomelo the grapefruit of America from the pummelo of the East Indies.

As a result of a trip to Japan, China, and the Philippine Islands made by the writer in 1915, it was found that some varieties of pummelos were very resistant to citrus canker (caused by Pseudomonas citri), unlike the grapefruit which is very susceptible to this disease. Unless citrus canker can be wholly eradicated from the southeastern United States it will be necessary to hybridize the grapefruit with the most canker-resistant sorts of citrus fruits in the hope of securing new varieties combining the juiciness and high flavor of the grapefruit with the canker-resistance of the other parent.

In this work the canker-resistant varieties of the pummelo, some of them of excellent quality, promise to be of capital importance.

In view of this unforeseen importance of the pummelo, the following sketch of the more promising known varieties is given:

Malayan varieties.—Bandanavel, from Plo-ey, Banda Islands, Malaysia. Fruits very large, nearly round but bumpy, growing in clusters of five or six; peel an inch thick; pulp white, juicy and sweeter than the common pummelo, nearly or quite seedless; the fruits sometimes show an included navel, a smaller fruit the size of a peeled orange being formed near the top of the large fruit. Navel fruits are very rare in seedlings grown in Ambonaya from seed brought from Banda. This very interesting variety described by Rumphius about 200 years ago does not seem to have been noticed since.—Casomba. Rumphius describes this as a depressed globose variety as large as a man's head, and commonly grown on the island of Ambonaya. It has red vinous pulp as sweet as currants when ripe, often seedless.—Labuan, or Bali (?). A seedless pummelo of very superior quality is said to have been found by Sir Hugh Low from the island of Bali to Labuan Island off the coast of Borneo, from whence it was sent some fifteen years ago to the West Indies. The tree is said to be thornless.
Indian varieties.—Bombay Red. Fruit subglobose, 7 inches diameter; skin \( \frac{3}{4} \)-\( \frac{3}{2} \) inch thick; pulp very juicy, deep red (color of raw beef), pleasantly subacid, with a characteristic flavor. This is said by E. E. Bonavia to be "by far the finest variety of pummele" he had seen. He describes a number of other sorts varying in shape, size, color, and juiciness. The leaves and twigs of some varieties are smooth, of others downy or hairy. In 1904 a collection of thirteen sorts of Indian pummelos was received by the Department of Agriculture from the Botanic Garden at Calcutta. A number of these have fruited both in California and Florida. One of these Indian pummelos (shown in Fig. 3256) was grown at Gainsville, Florida, in 1915, and has pink flesh.

Siamese varieties.—The Siamese seedless pummelos, grown in the Nakon chaisri district, have long been famous and have recently been studied there by H. H. Boyle. (Phil. Ag. Rev. 7:65-9, pls. 3, 4, Feb., 1914. Journ. Heredity, 5:440-7, pls. 1-3, Oct., 1914.) Oval Nakon chaisri. The best variety is slightly oval, \( \frac{3}{4} \)-8 inches diameter, 4 inches high: skin pale yellow; flesh white, juicy, aromatic, not bitter; seeds few or none. Boyle considers this variety superior to any other pummele and to any grapefruit and says it is a good fruit for market purposes.—Flat Nakon chaisri. A very flat fruit, \( \frac{3}{4} \)-8 inches diameter, \( \frac{3}{4} \)-\( \frac{3}{2} \) inches high; skin bright yellow; flesh white, juicy, aromatic; seeds few or none. Boyle considers this an excellent fruit for market purposes. Two other seedless varieties, but of somewhat inferior quality, were found by Boyle.

Japanese varieties.—In Japan many varieties of pummelos, called Buntan, Uchimurasaki or Jabon are known, variously estimated from 75 to 200. The following are among some of the more promising studied by T. Tanaka in the course of a survey of the citrus fruits of Japan: Hirado. Large, depressed globose, about 4-5 inches in diameter and 3-4 inches high, with grapefruit-like smooth skin of lemon-yellow color; pulp juicy, red thin, segments regular, core rather small, very good flavor; seeds small but numerous. This variety originated at Hirado near Nagasaki, Japan, some seventy-five years ago as a seedling of a pummele brought from Java. The writer saw the bearing trees of this variety at the Nagasaki agricultural experiment station in 1915 and found the fruits to be juicy and of excellent quality and noted that the tree remained almost entirely exempt from citrus canker (caused by *Pseudomonas citri*) which was attacking seriously Washington navel orange trees grown only a few yards distant. On account of its superior quality and high degree of canker-resistance, hybrids were made in June, 1915, between it and American grapefruit by means of pollen shipped from Florida to Nagasaki in vacuum tubes (Science N.S. 42:375-377, Sept., 1915). It is hoped to secure in this way canker-resistant hybrids equal to the grapefruit in quality. Seedlings of the Hirado pummele are now being grown by the Department of Agriculture.—Ogami, vicinity of Kagoshima; rare; very large, very flat; rind smooth; thin, pinkish; core large, segments numerous, sometimes twenty-live, pulp pinkish, fine-grained, juicy, very good quality; seeds numerous.—Hata-jirushi, experiment farm of Count Tachibana, Fukuoka-ken; a very flat large pummele like the Ogami, very much like the latter in general characters but rind much thicker and pulp vesicles coarser, good-flavored; seeds numerous.—Yoko-jirushi, experiment farm of Count Tachibana, Yangawa, Fukuoka-ken. A large round variety with rough skin; oil glands remarkably large and prominent, not much rag, segments regular, pulp slightly pinkish, good quality, resembles living pear; seeds few.—Tanura. Shingum. Nakomichi, a round, smooth-skinned variety, with pale pink flesh, segments irregular, large, pulp coarse-grained and good quality; seeds very few.

Formosan varieties.—Mató, Matsao, Enashiko-chō, Formosa. Common; fruit small, conical; rough-skinned, rind very thin; core small, pulp similar to the Ogami, very high quality; practically seedless; very early ripening. Besides the Mató pummele, red (Te ya) and white (Pei ya) pummeles of fairly good quality are commonly grown in Formosa.

Chinese varieties. Canton varieties.—There are at least half a dozen varieties grown about Canton. The Sung-ma is one of the best for export. The sorts commonly exported are pear-shaped, with a fragrant thick peel and a very firm greenish yellow pulp of aromatic flavor. These pummeles are exported to all parts of the world where Cantonese Chinese live.—Amoy, a very large slightly pear-shaped pomelo with a thick skin and very firm white flesh, is produced near Amoy. In spite of its reputation it is of mediocre quality.

California seedlings.—There are many pummele trees in northern California grown from seeds planted years ago by the Cantonese Chinese immigrants. Until a few years ago Canton pummeles were regularly imported by Chinese merchants in San Francisco. G. P. Rixford has located two score or more seedling trees in California which show considerable variation in the size, color, shape, and quality of the fruit. Some are of fairly good quality. These seedlings are mostly old bearing trees and furnish excellent opportunity for crossing with grapefruit in the hope of securing canker-resistant hybrids.

Florida shaddocks.—In Florida, pummeles have been grown for a long time under the West Indian name shaddock. The grapefruit is so much better, however,
that the shaddocks have almost disappeared. H. H. Humé lists only two varieties, the *Mammoth*, oblate, 5-6 inches diameter, flesh firm, white, sweetish, bitter; and the *Pine*, oblate-pyramidal 3 x 6½ inches, flesh rough, pink, bitterish, subacid. Other forms are occasionally found but almost all are of very poor quality.

**Hybrids.**—Natural hybrids of the pummeo are common in Japan. They are mostly between the pumpelos and the *Cucurbita* species of orange. Some are of great promise, however, being large, juicy, and very good-flavored. The kamaza *Natsu mikan*, a very flat fruit 4-5 inches diameter, 2½-3 inches high, ripening very late in the season, is probably one of these hybrids. This group of hybrids is very similar to the *taigete*, obtained by crossing the grapefruit with oranges of the Mandarin type. In India there seem to be natural hybrids between pummeos and lemons or citrons; possibly the group of citrus fruits called Almehed by Bonavia is of this nature. After discovering that some varieties of pummeos are very resistant to citrus canker, the author inaugurated in 1915 in Japan a series of experiments in hybridizing the Florida grapefruit with different varieties of Japanese pummeos in the hope of securing canker-resistant grapefruit-like hybrids, as was noted above under Hirado pummeo.

**Sour pummeos.**—In India and other eastern countries very large, acid-fleshed pummeos occur which are said to yield up to a quart of juice. One such sour pummeo grown near Eustis, Florida, has been used in breeding new types of acid fruits by hybridizing.

WALTER T. SWINGLE.

**PUMPKIN AND SQUASH.** Fruits, and the plants that produce them, of species of *Cucurbita*, used for food when cooked and also for stock-feed. See *Cucurbita*.

In North America, the word pumpkin (colloquially but incorrectly pronounced *pumkin*) is applied to large late-maturing globular or oblong fruits of forms of *Cucurbita Pepo*, regarded as in the "field pumpkin" (Fig. 3257), from which pies are made and which is commonly fed to cattle and swine. The pumpkin is characterized by a five-angled stem which is not expanded where it joins the fruit (Fig. 1133, Vol. II), by rough vines and heritage, and by prominently lobed leaves. Sometimes the word is applied to some of the earlier forms of this species, as to the Sugar pumpkins that ripen late in summer or early in autumn and are used for pies. It is also applied to forms of *Cucurbita moschata*, which, in the form known as Canada Crookneck squash, is sometimes called "pie pumpkin."

The word squash is adapted from an American Indian word, and is applied in an indefinite way to various members of the genus *Cucurbita*. The application of the name does not conform to the specific lines of the plants. What are called summer squashes are mostly varieties of *Cucurbita Pepo*, of the Crookneck and Pattypan type. The winter squashes are either *C. maxima* or *C. moschata*, chiefly the former. If the name squash belongs to one species more than to another, this species is probably *C. maxima*. This species produces fruit with very firm or "solid" yellow flesh. The pictures on pages 909-911 in Vol. II, show some of the forms of these species. Fig. 3258 is the Winter or Canada Crookneck, one of the forms of *C. moschata*. Figs. 3259-3262 are forms of the multifarious *Cucurbita Pepo*. A further discussion of the application of the vernacular names will be found in Vol. II, page 909.

Culturally, the pumpkins and squashes comprise one group of warm-season frost-sensitive plants. They are very easy to grow, provided they are given a warm and quick soil. They are long-season plants (except the "pie squash"), and therefore in the North they are very likely to be caught by frosts before the full crop has matured, unless the plants are started early and make a rapid and continuous growth. In hard rough clay lands the plants do not get a foothold early enough to allow them to mature the crop. On such lands it is impossible, also, to plant the seeds early. As a consequence, nearly all squashes are grown on soils of a loose and relatively light character. Sandy loams or sandy loams are preferred in the northern limits, but an open clay loam is probably the best soil in general for these plants. On very rich bottom lands the plants often thrive remarkably well, but there is danger that they may run too much to vine, particularly when the soil has too much available fertilizer. In order that the plants shall start quickly, it is necessary that the soil be in excellent tilth. It is customary, with many large growers, to apply a little commercial fertilizer to the hills to give the plants a start. A fertilizer strong in nitrogen may answer this purpose very well; but care must be taken not to use nitrogen too late in the season, else the plants will continue to grow over-vigorously rather than to set fruit.

Pumpkins and squashes are of two general kinds, so far as culture is involved, the bush varieties and the long-running varieties. The bush types are usually early. The vines run very little, or not at all. The various summer squashes belong to this category, and most of them are varieties of *Cucurbita Pepo*. The hills of bush varieties are usually planted as close together as 4 by 4 feet. On high-priced land they are often planted 3 by 4 feet. The fruits are borne close to the center of the plant. The long-running varieties comprise the autumn and winter types; and to this category may also be referred, for cultural purposes, the common field pumpkins. There is much difference between the varieties as to length of vine. On strong soils, some varieties will run 15 to 20 feet, and sometimes even more, producing the fruit some feet from the hill or the root. These varieties are planted from 8 to 12 feet apart each way. Sometimes they are planted in corn-fields, and they are allowed to occupy the ground after tillage for the corn is completed, but with the introduction of corn-harvesting machinery this practice is falling away.

For general field conditions, the seeds of pumpkins and squashes are usually planted in hills where the plants are to stand. If the land is mellow and rich, these hills are nothing more than a bit of ground 12 to 18
inches across, that has been freshly hoed or spaded and leveled off. On this hill, from six to ten seeds are dropped, and they are covered an inch or less in depth. In order to provide the seeds with moisture, the earth is usually firmied with the hoe. When the very best results are desired, particularly for the home-garden, hills may be prepared by digging out a bushel of soil and filling the place with rich earth and fine manure.

3259. Summer Crookneck squash.—Cucurbita Pepo form.

It is expected that not more than three to five of the plants will finally be left to each hill; but there are many contingencies to be considered. The young plants may be taken off by cutworms or by other insects, or they may be caught by frost, and it is well not to remove the extra plants too soon.

If it is necessary to start the crop in advance of the season, the seeds may be planted in pots or boxes in a forcing-house or hotbed about three weeks before it is time to set them in the field. If the seeds are started much earlier than this, the plants are likely to get too large and to become stunted. When set in the field, the roots should fill the pot or box so that the earth is held in a compact ball, and the plant should be fresh, green, and stocky. Sometimes the seeds are planted on sections of inverted tough sod, and the entire piece is transferred directly to the field. Plants that become stunted and develop one or two flowers when they are in the box are usually of little use. Sometimes seeds are planted directly in the field in forcing hills, and when the plants are established and the season is settled the protecting box is removed and the plants stand in their permanent positions.

A good vine should produce two or three first-class fruits; if, however, one flower sets very early in the season, the vine may devote most of its energies to the perfection of that single fruit and not set many others, or may set them too late to allow them to mature. If it is desired, therefore, that the plants shall produce more than one fruit, it is advisable to pick off the first fruit, providing it sets long in advance of the appearance of other pistillate flowers. These remarks apply particularly to winter squashes in northern regions. With small varieties and under best conditions, as many as a half-dozen fruits may be secured from a single vine, and in some cases this number may be exceeded. Squash vines tend to root at the joints; but so far as general culture is concerned, this should be prevented, because it tends to prolong the growing season of the vine, although it may have to be encouraged if the borer is prevalent. It is usually well, therefore, to lift the joints occasionally when hoeing, although the vine should not be moved or disturbed. This precaution applies particularly in the short-season climates of the North, where every effort must be made to cause the plant to set its fruit early in the season and to complete its growth before cool weather.

Tillage is simple. It consists in light working of the surface until the plants begin to run strongly, after which the big weeds are pulled by hand. For early results with bush squashes, or when the land is of a cold or backward type, the plants may be grown in hills that are raised a few inches above the general level; this adds to the expense, and in most cases it is better to practise level culture.

The varieties of pumpkins and squashes are numerous, and it is difficult to keep them pure if various kinds are grown together. However, the true squashes (Cucurbita maxima) do not hybridize with the true pumpkin species (Cucurbita Pepo). There need be no fear, therefore, of mixing between the Crookneck or Scallop squashes on the one side and the varieties of Hubbard or Marrow types on the other. The summer or bush squashes are of three general classes: the Crooknecks, the Scallop or Pattypan varieties, and the Pineapple or oblong-conical varieties, all forms of C. Pepo. The autumn and winter varieties may be thrown into several groups: the true field pumpkin, of which the Connecticut Field (Fig. 3257) is the leading representative, being the one that is commonly used for stock and for pies; the Canada Crookneck or Cushaw types, which are varieties of C. moschata; the Marrow and Marblehead types, which are the leading winter squashes and are varieties of the C. maxima; the Turban squashes, which have a "squash within a squash" and are also varieties of C. maxima. The mammoth pumpkins or squashes which are sometimes grown for exhibition and which may weigh 200 or 300 pounds, are forms of C. maxima.

In Europe the vegetable marrow type is much prized. It is a form of Cucurbita Pepo. In this country it is little grown, although it thrives well, the various summer squashes of the Crookneck and Scallop types being more popular. The following English advice on this vegetable is from a contribution to Gardening Illustrated, from which Fig. 3263, representing Moore's vegetable marrow, is also reduced: "Vegetable marrows should be eaten young—say when about one-fourth or one-sixth their full size. Cut in this state, and boiled quickly until quite tender in plenty of water, carefully strained, and served with melted butter; they are second to no vegetable that comes to table, not even excepting green peas or asparagus. Early cutting, careful cooking, and serving are the chief points to which attention should be paid; but there are other points of the principal being rapid growth. Grow vegetable marrows quickly, and they are almost sure to be good; grow them slowly, and you will find them often tough and bitter. Hence the soil or place in which they are grown can hardly be too rich for them. Not but what they do fairly well in any
good garden soil, but the richer it is the better. On a
rush-hush-heap, for instance, vegetable marrows grow
with wonderful vigor, and fruit abundantly. For early
results, they are often started under glass in pots.
There are many kinds or varieties. The custard mar-
rows are fruits of the Scallop or Pattypan kind. The
summer Crookneck is little used abroad for food.
Insect enemies and diseases of pumpkins and squashes
are several. Perhaps the most serious is the striped
cucumber beetle, which destroys the tender young
plants. This insect is destroyed by the arsenicals
applied in flour, also with tobacco powder and some
other materials; but since it works on the under sides
of the leaves as well as on the upper, it is difficult
to make the application in such way as to afford a com-
plete protection. The insects also are likely to appear
in great numbers and to ruin the plants even whilst
they are getting their fill of arsenic. If the beetles are
abundant in the neighborhood, it is best to start a few
plants very early and to plant them about the field in
order to attract the early crop of beetles, thereby mak-
ing it possible to destroy them. From these early
plants the beetles may be hand-picked, or they may be
killed with very heavy applications of arsenicals —
applications so strong that they may even injure the
plants. Sometimes the hills of squashes are covered
with wire gauze or mosquito netting that is held above
the earth by means of hoops stuck into the ground.
This affords a good protection from insects that arrive
from the outside, providing the edges are thoroughly
covered with earth so that the insects cannot crawl
under; but if the insects should come through the ground
beneath the covers they will destroy the plants, not
being able to escape. The arsenicals should be applied
when the dew is on, or the plants may be sprayed with
bordeaux mixture to which the poison has been added.
The squash bug or stink-bug may be handled in the same
way as the striped cucumber beetle. This insect, how-
ever, remains throughout the season and, in many
cases, it is necessary to resort to hand-picking. The
insects crawl under chips or pieces of board at night,
and this fact may be utilized in catching them. The
young bugs can be killed by tobacco extract and soap,
and this fact may be utilized in catching them. The
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young bugs can be killed by tobacco extract and soap,
and this fact may be utilized in catching them.

The stem-borer attacks the vines later in the season,
boring into the main stalk near the root, and causing
the entire plant to lose vigor or to die. It is a soft white
larva. As a safeguard, it is well to cover the vines at the
joints with earth after they have begun to run, so that
roots will form at these places and sustain the plant
if the main stem is injured. The borers may also be cut
out with a thin-bladed knife. Tobacco dust is said to
keep the insect away. Infected


3262. The Negro squash. One of the

with the stem on, and much care should be exercised
to prevent any bruising or rough handling. In a rather
dry and somewhat dark cellar, with a temperature of
about 40°, such fruits may be kept all winter. Commer-
cial growers store them in above-ground houses built
for the purpose, placed only one layer deep on racks or
shelves. The house is well insulated to prevent fluctua-
tion, kept dry, and provided with a stove or other heat
for very cold weather, the temperature maintained at
about 40° to 45° F. The following advice on the storing
of squashes was written for the "Cyclopedia of American
Horticulture" by W. W. Rawson: "Cut the squashes
just before they are thoroughly ripe. Be careful not to
start the stem in the squash. Lay them on the ground
one deep and let them dry in the sun two or three
days before bringing to the building. Handle very care-
fully when putting in, and be sure that the wagon in
which they are carried has springs. Put them two deep
on shelves in a building. This should be done on a cool,
dry day. If the weather continues cool and dry, keep
them well aired by day; but, if damp weather comes,
build a small fire in the stove in order to dry out the
green stems. Keep the temperature above 50°, and air
well in dry weather. The squashes may need picking
over about Christmas if put in the building about
October 1; handle very carefully when picking over.
Fifty tons can be kept in a single building with a small
fire. Do not let them freeze, but if temperature goes
down to 40° at times it will do no harm; nor should it
be allowed to go as high as 70°. The Hubbard squash
keeps best and longest and does not shrink in weight as
much as other kinds; but any of them will shrink 20
per cent if kept until January 1."

L. H. B.

PUNICA (Punica, Carthaginian; hence Malum
puniceum, "apple of Carthage," an early name of the
pomegranate). Punicaceae. A small branched tree,
the branches rather terete and spiny. The common
pomegranate of cultivation.

Granatum, Linn. Pomegranate. A large deciduous
shrub or small tree, with oblong or obovate, obtuse,
entire, glabrous and more or less shining lvs.: fls.
orange-red, showy; calyx tubular, the short lobes per-
sistent on the top of the fr. (as on an apple); petals
inserted between the lobes; ovary imbedded in the
calyx-tube (or receptacle-tube), comprising several
locules or compartments in two series (one series above
the other), ripening into a large, juicy, many-seeded
pomegranate-like berry. Persia to N. W. India. G.W.19,
p. 610.—A handsome plant, with showy fls. 1 in. across

3263. Vegetable marrow.—Cucurbita Pepo.

PUMPKIN 3262. The Negro squash. One of the

3263. Vegetable marrow.—Cucurbita Pepo.
in summer. Hardy as far north as Washington and Baltimore. It is also grown as a conservatory plant, blooming in winter as well as summer. For ornament, the double-flowering kinds are the most popular (F.S. 13:1385, as *P. Granatum Lepidolea*). There are many varieties. The treatment of the fruit-bearing varieties is discussed under Pomegranate. Var. *sana*, Hort. (P. *sana*, Linn.). Seldom growing higher than a man, and usually treated as a pot-plant in the N. It is the best kind for greenhouse use. The double-flld. form is most common. B.M. 634. It is as hardy as the species, and is suitable for outdoor work where the climate is not too severe. On the Pacific Coast it is grown as a hedge-plant as far north as San Francisco. Both this and the species are easily grown by cuttings of dormant wood, as cuttings are, but the cuttings should be pushed indoors with some heat.

L. H. B.

**PURSHIA** (after F. T. Pursh, or Pusch, as is the original spelling of his name, 1774-1823; born at Groesbeckville, in Saxony; travelled in this country and wrote a flora of North America). Syn., *Kunzea Rosacea*. Low deciduous spreading shrub, allied to Cercocarpus, with alternate, mostly fasicled, small, cuneate and tridentate lvs.: fls. solitary, yellowish; calyx-tube tubular, lvs. bracteate, 5; stamens 5; disk almost sessile, 7-10-fid.; pedicels 1 or sometimes 2: fr. a pubescent leafy achene achieving the persistent calyx. Of little ornamental value with its sparse grayish or bluish green foliage and its rather inconspicuous fls. and frs., and but rarely cult. Probably hardy as far north as Mass., requiring sunny position and well-drained soil; an excess of moisture, especially during the winter, proves fatal to it. Prop. by seeds and probably by layers. The only species is *P. tridentata* (Kunzea *tridentata*, Spreng.). Dif- fusely branched shrub, attaining 5, rarely 10 ft.: lvs. cuneate-obovate, 3-lobed at the apex, whitish pubescent beneath, 5/ to 8-in. long: fls. solitary on short branchelets, almost sessile, yellowish, about 8-in. across: fr. ovate-oblong, acuminate. April-July. Ore. to Wyo., New Mex. and Calif. B.R. 1446. Var. *grandiflora*, Jones (P. *grandiflora*, Curran), is glabrous and has very small, almost glabrous lvs., sometimes pinnately 5-lobed.

ALFRED REHDER.


**PUSCHEKINIA** (named for Count M. Puschkin). *Lilium*. Hardy or half-hardy bulbous plants which may be used in the rock-garden or border.

Leaves radicale, few, the first often oblong, the others linear or lin, a simple leafless scape; fls. few, blue, boreel, racemose; perianth campanulate, of 6 subequal lobes; stamens 6; ovary sessile, 3-lobed: caps. membranaceous, dehiscent.—Two species, Asia Minor, the Caucasus and Afghanistan. These attractive spring-flowering bulbs have clusters of small 6-lobed white fls., each narrow lobe being pretty lined with blue. A good specimen may have as many as 10 fls., each 5/ in. across. The peculiar feature of the genus is the crown on which the stamens are borne. This is a white body of petal-like texture, having 6 lobes, each of which is variously colored. The genus is allied to *Seilla* and *Chionodoxa*. Height 2-12 in.: bulb globular, about %; in. thick: lvs. slender, erect; perianth usually bluish white; divisions elliptic-oblong, three times as long as the tube; crown one-third as long as divisions, eell to middle into truncate or retuse teeth. April, May. Var. *labiata*, Boiss. (P. *labiata*, Zucc.), differs from the type in having divisions of perianth 3/ in. long, and the teeth of the crown more acute and bifid. G.C. Ill. 32, p. 5; 54, p. 219. B.M. 2244. F.S. 21:2220 (as *P. sicula*).

F. TRACY HUBBARD.

**PUTRANJIVA** (Indian name). *Euphorbiiaceae*. Evergreen trees, cult. for ornament in the tropics: lvs. alternate, simple; fls. small, axillary, single or in small clusters, apetalous; calyx imbricate; stamens 1-10; disk absent; styles broad, spreading; ovary 2-3-celled, 2 ovules in each cell. fr. a 2-celled drupe.—Two or more species in Trop. Asia. Related to Drypetes.

**PÚYA** (Chilean name). *Bromeliaceae*. Large terrestrial serpentine South American bromeliads. Commonly sold to Puyrava (differing in having a fully superior rather than partially superior ovary).—Forty-four species, according to Mez (DC. Monogr. Phaner. 9). For culture, see also *Bilbergia*. Puya also includes the plants known in trade as Fourretia.

Puyas and puyaequines are generally found in collections of bromeliads and are usually grown in moist tropical houses. The native home of the puyas is on the steep rocky slopes of the Cordilleras at high altitudes with little other vegetation for company except other bromeliads. This would indicate that this plant would require the same conditions as do these puyas, and cooler conditions, or such as are given caleti and succulents, would suit them best, yet they thrive equally well in the tropical house. Indeed, the writer has found most of the family Bromeliaceae very accommodating not only to temperature and moisture conditions, but to soils and methods of growing them; for example many of the tiplantillas may be grown on blocks of wood as epiphytes, yet they do equally well grown in pots. But what perhaps is more remarkable is the fact that several of the stronger-growing bromeliads appear to grow equally well either in a strong loamy mixture, or a mixture of chopped fern root and charcoal. The writer has puyas growing in both mixtures with equal success. But the most irrational treatment is to give all the bromeliads conditions and soil similar to the environment in which they are found in their native habitat, yet according to the experience of the writer few plants possess such remarkable adaptability to changed conditions as do these plants. (E. J. Canning.)

**A. Fls. yellow.**

chilensis, Molina (*Pitcairnia caoctácea*, Pers., and *P. chilénsis*, Loddi.). Becoming 4-5 ft. or more high, sometimes branching; lvs. in tufts, 2-4 ft. long, very narrow, often recurved, the margins armed with strong recurved spines or thorns, glaucescent: blossoms in a branching, hoary, bracted inf. rising 3-5 ft. from the top of the caudex, the fls. large (2 in. across), sessile or nearly so, the 3 lanceolate sepals greenish and the obovate-oblong much-exserted petals yellow or greenish yellow, the 6 erect stamens shorter than the petals, the stigma 3-branched. Chile. B.M. 4715. F.S. 9:889, 870. J.F. 4:392. J.H. II. 52:533. G.C. III. 7:685; 48:390; 54:3.—A striking and mammouth bromeliad, making a yucca-like mass of foliage and projecting above it a very showy inflo.

**AA. Fls. white or rose-color.**

gigas, André. Still larger than the latter, sending its gigantic spikes 20-30 ft. into the air, from a rosette of hard and thick spiny-toothed agave-like lvs.: inf. simple, dense, club-shaped, terminating the tail, erect, bracted scape: fls. green above and white beneath, the spines black and hooked: fruit a 3-celled drupe. Colombia, 10,000 ft. R.H. 1881, p. 315, and Gn. 21, p. 300.—Can probably be handled like agaves.

**AAA. Fls. blue.**

cerifera, Lindli. (*Pitcairnia carioca*, Bentli. & Hook.). Foliage pineapple-like, with linear very acute
serrate: ffs many, crowded, in short spikes; branchward pyramidal habit; lvs. narrowly lanceolate, urticiferous, densely pubescent; spikes very dense, 2-3 in. long; more or less frequent in gardens in England. P. virgineum, Dur. & Jacks. A stout herb, 4-6 ft. high and loosely clustered much branched or panicled, with bracts more serrate than in P. coccinea: fls. very large and showy, with a flaring mouth, dull metallic blue. Chile. B.M. 5732. A plant that in bloom has the habit of a yucca. This and P. coccinea will probably stand considerable frost.

P. spathulata, Mees (Pitcairnia spathulata, Gleichen.). Lvs. up to 20 in. long and 1 in. broad, the spines incurved; panicled about 2 ft. long; sepals ovate, acuminate, pale rose; petals dull blue.Argentina. B.M. 7966.—P. robbins, Mees. Lvs. up to 20 in. long, linear, stiff, spiny in margin; petals 12-20 in. long; sepals green, lanceolate, 1-1½ in. long, acute; petals deep violet. Chile. B.M. 8194.

L. H. B. GEORGE V. NARB.†

**PYCNAZIUM** (Greek, dense, and Blossom; referring to compact flower-heads). *Labatiæ*. MOUNTAIN Mint. Baslä. Hardy aromatic perennial herbs suitable for the flower-garden.

Stems corymbose branched above: lvs. entire, glabrous or pubescent, nearly sessile; infl. dense, many-flowered; whorls, crowded with bracts and usually forming terminal heads or close cymes; fls. whitish or purplish, late summer and early autumn; calyx about 13-nerved, naked in the throat; corolla short, more or less 2-lipped; stamens 4, lower pair rather longer than the upper, which are sometimes abortive.—About 18 species, N. Amer. The oldest generic name of this is Koellia, which is used by many, but Pycnantheum is maintained in the list of "nomina conservanda" as accepted by the Vienna Congress. The genus differs from *Monarda* in having smaller and canescent fl-heads. Pycnanthems are mint-like plants of easy cult., in any good soil. The following grow 1-3 ft. high, and bear fl-heads ½ in. across or less.

A. *Lvs.* lanceolate or linear-lanceolate: calyx-teeth ovate-triangular.

*virginianum*, Dur. & J. (P. lanceolatum, Pursh.). St. rather stout: lvs. fragrant, firm, acuminate at apex, rounded or narrowed at base, 1-2 in. long, 2-5 lines wide. Dry fields, Canada to Ga., west to Minn. B.B. 3:112.

AA. *Lvs.* linear: calyx-teeth subulate, bristles-lipped.


P. *Monardella*, Michx. is properly Monarda ciliolata, Linna. A perennial herb with slender, usually simple at 1-3 ft. high; lvs. lanceolate to ovate, membranaceous, bright green, slender-petioled, 2-4 in. long; fl-heads solitary, terminal; corolla yellowish, 1 in. long or less. June-July. Florida, Ohio, Ga. B.R. 3:162.

F. W. BARCLAY.

F. TRACY HUBBARD.†

**PYCNOSTACHYS** (Greek, thick spike, referring to the heavy spikes of fls.). *Labatiæ*. Erect perennial herbs; lvs. opposite, broad or narrow, sessile or petiolate; whorls condensed into a dense terminal spike; fls. bright blue or violet; calyx slightly accrescent, 5-toothed; corolla-tube longer than the calyx, upper lip short, 4-toothed, longer lower, deeply concave; stamens 4: nutlets subglobose, smooth.—About 40 species, natives of Trop. and S. Afr., 1 in Madagascar. *P. urticijblum*, Hook. A much-branched perennial herb, 5-7 ft. high: lvs. ovate-acute, deeply cut, crenate, densely pubescent; spikes very dense, 2-3 in. long; corolla bright blue. Trop. and S. Afr. B.M. 3385. More or less frequent in gardens in England. *P. doweii*, N.E. Br. A stout herb, 4-6 ft. high and loosely branched pyramidal habit; lvs. narrowly lanceolate, acuminate, serrate: fls. many, crowded, in short spikes terminating all the branches, cobalt-blue; calyx-teeth needle-like. Trop. Afr. Intro. into England. B.M. 8450. *P. coccinea*, Hook., with 4-sided st., about 1 ft. high, bright blue fls. and sessile oblong or linear-lanceolate lvs., a native of Madagascar, has also been cult. in England.

**PYRACANTHA** (Greek, pyr, fire, and alantes, thorn; alluding to the bright red fruits). *Roserae*. Fire thorn. Ornamental shrubs, grown chiefly for their bright red berry-like fruits and also for their white flowers and firm foliage.

Thorny half-evergreen shrubs: lvs. alternate, short-petioled, narrow, crenulate or sometimes entire, stipitate; fls. in corymb; stamens short, 4-toothed, lower longer, deeply concave; sta­mens 20, with yellow anthers; carpels 5, free on their ventral side, on their dorsal side connate with the calyx-tube about half or less: fr. a small pome with persistent calyx, red or orange, with 5 stones.—Three species, from S. E. Eu. to Cent. China and the Himal­ayas. The genus is closely allied to *Cotoneaster* but is easily distin­guished by the ovate lvs. and the thorny branches, also by the more con­spicuous stipules. From *Crataegus* it is chiefly distin­guished by the structure of the ovary, which contains 2 equal ovules in each cell, while in *Cotoneaster* one cell contains only 1 fertile ovule and a second imperfect and smaller one. The pyracanthas are usually small shrubs with rather small and narrow leaves and with white flowers in small coryms followed by bright red or orange fruits. *P. coccineæ*, Roem. & Schult. is hardy as far north as Massachusetts in sheltered positions. It is a handsome low evergreen shrub, especially when loaded with its bright red fruits, these remaining on the branches all winter if not eaten by birds, which are fond of them; it is also pretty in spring with its numerous corymbs of white flowers. It is well adapted for planting on rocky slopes or sunny rockeries or for borders of shrubberies; it may also be used for low ornamental hedges or for covering walls, as it stands pruning well and is easily trained into any desired shape. It thrives in almost any kind of well­drained soil, including limestone, and prefers sunny positions. Propagation by seeds or by cuttings of ripened wood in fall under glass, kept during the winter in a temperate greenhouse; also by layers and sometimes by grafting on hawthorn or cotoneaster.

A. *Lvs.* beneath and calyx glabrous.

*coccineæ*, Roem. (Cotoneaster *Pyracanthæ*, Spach. *Crataegus Pyracanthæ* Berckh. *Melanocarpus Pyracanthæ*, Linn.). Fiery thorn. Fiery thorn. Everlasting thorn. Fig. 3264. Shrub, attaining 6 ft., rarely 20 ft., with numerous short spines; young branchlets and petals grayish pubescent; lvs. ovate-oblong to oblongate, acute, crenate, glabrous or slightly pubescent when young; ½-3/4 in. long; corymb pubescent, many-fl., about 1½ in. broad; fls. small, white; fr. numerous, bright red, about ½ in. across. May, June. Italy to W. Asia. Gr. 360. P. 464. Var. Latifoliis, Dipp. (Cotoneaster crenulatus, Hort., not Wenzig), is of more vigorous growth, with slender branches; lvs. less deeply crenate; corollas larger; fr. bright orange-red. Well suited for covering walls and said to be harder than

Pyrostepho (Greek, grain, thorn; the inner surface of the husk of the fruit is covered with many blunt prickle-like). Climbing shrubs with alternate, hairy, 3-5-nerved, entire, or toothed or lobed lvs. and fls. in spikes: fls. dienceous; perianth 4- or rarely 3-5-lobed; ovary superior, 1-celled, 2-ovuled: drupe compressed, with the mesocarp spinulose-verrucose within. About 15 species from Trop. and S. Afr. P. malefica, Engl. A succulent plant with a fleshy subglobose root, resembling a stone from a distance: branches short or long and scandent: lvs. kidney-shaped, irregularly 3-5-lobed, pilose: frs. small, in spikes: perianth 4-lobed. E. Afr. G. W. 10, p. 334.

Pyracantho (a name used from the time of Dioscorides, the derivation from the Greek, much fire, referring to the acrid roots). Composite. This name is still commonly derived from the garden, the "burning daisy," to a section of Chrysanthemum, almost every nursery catalogue offers P. roseum and its numerous varieties, which is referred to botanists to Chrysanthemum coccineum; also P. perthenioides var. aureum, the golden feather, and P. uliginosus. (See Vol. II, p. 753.) All three of these are rather common in gardens and they are known to be most loved by hardy perennials. More recent introductions under the name Pyrethrum are P. Tchihatchewii, also called "flying daisy," (see Chrysanthemum Tchihatchewii, Vol. II, p. 759), and P. leucopetala, Hausskn., a subalpine perennial with silvery white leaves and large yellow flower-heads. Aus. Minor. Suitable for the rockery. This last species is not mentioned under Chrysanthemum.

Pyrula (a diminutive of Pyrus, the pear tree, from some fancied resemblance in the foliage). Pyroleaceae. Wintergreen. Shin Leaf. Low and smooth perennials, with creeping subterranean shoots and stolons for the native garden though not commonly cultivated. Acanthaceous or caulescent, with a cluster of roundish or elliptical evergreen basal lvs. and a simple raceme of nodding white, greenish or purplish fls. on an upright more or less scaly-bracted scape: calyx 5-parted, persistent; petals 5, concave, deciduous; stamens 10: caps. depressed-globose, 5-lobed, 5-valved.—Ten to 15 species, Great Britain to N. Asia and N. Amer. south to Mex. Formerly referred to Ericaceae, but now placed in Pyrolaceae together with Chamaedaphne and Moneses. The name wintergreen is usually applied to Gaultheria.

Pyrola grows naturally in rather poor sandy uplands and in bogs. Like many members of the heath family, wintergreens are difficult to cultivate and will not succeed in garden soil. In removing them from the woods, care should be taken to secure a large ball of earth. They may then succeed in the shade of evergreens and upon rockeries in peaty soil. The species are scarcely in general cult.; they are offered by dealers in native plants. P. americana is probably more cultivated than the others.


P. floribunda white; style curved downward.

Pyrus, Schneid. (Coluteaster cinerata, Reg.) Shrubs with long and slender, spreading and often nearly prostrate branches; young branches yellowish tomentose: lvs. subcoriaceous, narrow-oblong, obtuse and mucronulate, recurved at the margin, entire or sparingly glandular-serrulate, glabrous, grayish green, bright green and glossy above, 1-2 in. long: fls. purple; anther-cells with beaked tips. Lab. to Pa., Rocky Mts., north to subarctic regions. June and July.

Pyrenacantho (Greek, grain, thorn; the inner surface of the husk of the fruit is covered with many blunt prickles). Leucocentra. Climbing shrubs with alternate, hairy, 3-5-nerved, entire, or toothed or lobed lvs. and fls. in spikes: fls. dienceous; perianth 4- or rarely 3-5-lobed; ovary superior, 1-celled, 2-ovuled: drupe compressed, with the mesocarp spinulose-verrucose within. About 15 species from Trop. and S. Afr. P. malefica, Engl. A succulent plant with a fleshy subglobose root, resembling a stone from a distance: branches short or long and scandent: lvs. kidney-shaped, irregularly 3-5-lobed, pilose: fls. small, in spikes: perianth 4-lobed. E. Afr. G. W. 10, p. 334.

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PYRUS (Latin name of pear tree). Sometimes spelled Pyrus. Rosaceae. The Pome-Fruits, as all the kinds of pears, apples, and crab-apples; also many small trees and bushes grown for the very handsome early flowers and sometimes for the attractive habit, foliage, and little fruits.

Woody plants, bearing mostly on spurs, with simple but sometimes lobed alternate lvs. (pinnatifid sometimes in P. heterophylla) fls. usually perfect, but rarely polygonous, regular, in spring; torus urn-shaped and attached to the carpels and finally closing over them, and with them becoming fleshy in fr.; calyx-lobes 5 and persistent upon the top of the young fr., or in some cases falling away at maturity or before; petals 5, white or red, perigynous; stamens 15-20 or more; styles 2-5, crowning a 2-5-loculed inferior ovary in which the locules are usually 2-seeded. (Figs. 3266, 3267).

PYRUS was held to include not only the pears and apples, but the mountain-ashes or sorbuses, the medlar or quinces, the chokeberries and other groups (Bentham & Hooker, Genera Plantarum, 1867). As late as 1894, Focke (Engler & Prantl, Pflanzenfamilien) holds Pyrus intact except for the separation of Cydonia and Mespilus. While many botanists still hold most or all of these groups in Pyrus, the present tendency to segregate all groups for which separate definitions can be found results in the dismemberment of Pyrus. As the old rather gross assemblage, resulting from the effort to find agreements, can hardly be expected to hold, so the present disunion, resulting from the effort to find differences, may be expected to pass, and the practicable and convenient grouping may be found somewhere between the two extremes. There seems to be good justification for the separation of Cydonia and Mespilus, and perhaps also for Sorbus and Aronia, but it is yet to be determined whether the separation of Malus (the apples) will meet with continuing favor. See Malus, p. 1973, Vol. IV.

PYRUS (diminutive of Pyrus; alluding to the shape of the fr.). Santalaceae. Oil-Nut. Buffalo-Nut. A shrub in E. N. Amer. and 2 trees in the Himalayas with alternate, deciduous, entire lvs. and greenish fls. in spikes or racemes: fls. subdioecious, apetalous; sepals and stamens 4-5; filaments short; ovary inferior, 1-celled, with 2-3 ovules: fr. a 1-seeded drupe. The species in cult. is P. pahare, Michx. (P. oleifera, Gray). A straggling shrub, to 12 ft., puberulous while young; lvs. short-petioled, obovate-oblong, acuminate; fls. in clusters of showy white or blush fls. with the lvs. or in drooping panicles; calyx campanulate, 1-2 in. long; petals 5, obtuse, reflexing lobes. B.B. (ed. 2) 5:181. H.U. 5, p. 1.—One of the best rarer plants for warm greenhouses; blooms profusely in early winter.

ALFRED REHDER.

PYRUS, the pears and apples, once included a vast assemblage of nearly 200 species and subspecies in 6 sections: Pyrus, Malus, Mespilus, Cydonia, Sorbus, and Aronia. It was not until 1894 that the species in the section Pyrus were moved to separate genera by Hooker, for reasons stated above. The present classification, based on the work of many botanists, distinguishes about 80 species of Asia and North America, including some 30 species in the section Pyrus (Pyrus, Malus, Mespilus, Cydonia, Sorbus, and Aronia). The separation of these genera from Pyrus has been based on the presence or absence of certain characters, such as the number of petals, the length of the pedicels, and the shape of the fr. The species are mostly small trees, bearing clusters of showy white or blush fls. with the lvs. or in drooping panicles; calyx campanulate, 1-2 in. long; petals 5, obtuse, reflexing lobes. B.B. (ed. 2) 5:181. H.U. 5, p. 1.—One of the best rarer plants for warm greenhouses; blooms profusely in early winter.

ALFRED REHDER.

PYRULARIA (diminutive of Pyrus; alluding to the shape of the fr.). Santalaceae. Oil-Nut. Buffalo-Nut. A shrub in E. N. Amer. and 2 trees in the Himalayas with alternate, deciduous, entire lvs. and greenish fls. in spikes or racemes: fls. subdioecious, apetalous; sepals and stamens 4-5; filaments short; ovary inferior, 1-celled, with 2-3 ovules: fr. a 1-seeded drupe. The species in cult. is P. pahare, Michx. (P. oleifera, Gray). A straggling shrub, to 12 ft., puberulous while young; lvs. short-petioled, obovate-oblong, acuminate; fls. in clusters of showy white or blush fls. with the lvs. or in drooping panicles; calyx campanulate, 1-2 in. long; petals 5, obtuse, reflexing lobes. B.B. (ed. 2) 5:181. H.U. 5, p. 1.—One of the best rarer plants for warm greenhouses; blooms profusely in early winter.

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ALFRED REHDER.
and the absence of fr-stalk (Fig. 3270) afford good structural characters, as well as the fl-bearing habit and other characters. Many of the species that have been named under Pyrus will be found in Sorbus.

The genus is held to comprise the pears and apples and no order (Pyrophorum and Malus), there are probably fifty or sixty species.

Under Pyrus, the names are P. arbutifolia, Linn., the red chokeberry; P. atropurpurea, Bailey, the purple chokeberry, sometimes regarded as a variety of the former; P. melanocarpa, Willd., the black chokeberry; P. floribunda, Lindl. (not Hort.), or barberry. The fruit of Pyrus is of the kind known to botanists as a pome. The morphology of the pome is still perhaps a subject of disagreement, although most botanists now consider it to be a hollow torus (receptacle), or hypanthium, or cupula, in which the ovary is imbedded. Fig. 3271 illustrates the theoretical structure. The ovary is at b, wholly enclosed in the fleshy torus a. Most of the edible part of the apple or pear, therefore, is considered to be torus, whereas the core is ovary. This ovary, in common apples and pears, is of five carpels or cells, as shown in the cross-section (Fig. 3272). It was formerly held that the edible part is largely calyx-tube, but various morphological considerations have inclined students to regard it as stem rather than calyx; the term calyx-tube is still retained, however, in descriptive writings.

One of these considerations is the fact that apples sometimes bear a rudimentary leaf (as in Fig. 3272), an organ which is commonly borne only by stem.

Apples sometimes take on most unusual and grotesque shapes, and two or more fruits may coalesce into one. The native American crabs, described in numbers 37 to 45 in this list, are yet little known to planters, but they comprise much promising material, and they should yield horticultural subjects for the entire area of the United States, outside the semi-tropical regions, and for good parts of Canada. As a class they bloom later than the Asiatic species. As yet, only P. iberica appears to have yielded a good double-flowered form. With the recent botanical discrimination in this interesting group, attention will probably be called to a closer study of the forms by collectors. They are easy of culture, and may be readily increased by grafting.

Hybridizing will probably play an important part in the horticultural development of the ornamental crabs, as they cross freely. It is probably due to this cause that the Asiatic forms are so difficult to distinguish botanically. The pears and apples appear not to intercross, although the curious P. auricularia is generally considered to be a hybrid between the pear and the crab-tree (Sorbus Aria).

The pear may be made to grow for a time when grafted on the apple, but it is usually impossible to graft the pear species permanently on the apple species with any degree of success; yet pears thrive on quinces and also on hawthorns, which are well-marked genera. In nursery practice when pear stocks are not at hand, long pear cions may be worked on apple pieces and roots may form from the cion and the pear become own-rooted on the failure of the apple stock. Apples appear not to be successful on pears.

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3272. Section of a pome (apple). Showing the interior or ovary part and the exterior or torus part.

3273. A pome bearing a rudimentary leaf (at A).
INDEX CONTINUED.

Plants of the genus Pyrus, including species, varieties, and hybrids are described in detail. The two groups are distinguished based on their characteristics.

THE TWO GROUPS.

1. Pears (Pyrophorum).—Fr. either with a conical base or possessing a cavity like an apple, the flesh bearing grit-cells (unless the flesh is smooth and without grit-cells); styles usually free or not united at the base: calyx-tube or hypanthium generally closed by a cushion-like formation, in figs. white. Species 1-18. Of these plants there are perhaps 15-20 species, native to S-Cent. Eu. and Asia, where it has been cultivated since the earliest times. There are no representatives indigenous, so far as known, in S. Amer. or Japan.

2. Apples (Malus).—Fr. usually with a distinct depression at either end, the flesh without grit-cells; styles more or less united below: calyx-tube or hypanthium open; figs. white, tinged red, sometimes clear white. Species 20-45. There are probably 40 good species of this subgenus, of wide distribution. The common apple, P. Malus, is probably indigenous in S. W. Asia. In

iberia, China, and Japan, several species are native, of which the best known are the smooth-growing crab trees with small frs. that yield their caloric value. In N. Amer. is another set, represented by the Oregon crab, P. ursina, the Prairie States crab, P. ursina, and the far western crab, P. Fusca. The American forms have recently been re-defined into several species, the actual limitations of which are yet to be determined. It has been difficult to find good characters to separate the small-fruited apples, particularly the Asiatic forms. The recent study of the Asiatic material, however, has resolved it into a number of well-marked species-forms.

I. PYROPHORUM, OR PYRUS PROPER. The Pears.

A. The occidental or Eurasian pears, being the common pomological pears of this country: lvs. appressed or crenate-serrate or entire (at least not exscisse-serrate), mostly abruptly pointed: calyx usually persistent at apex of fr. 

orgenus, Linn. Common Pear. Figs. 3275; also Figs. 2805 and others, p. 2505 and following. Strong upright tree, living to a great age and sometimes attaining a height of 75 ft. and a girth of 15 ft. and more, the lvs. on short spurs as well as on the main growths, the pedicles and sometimes the young growth pubescent, but all parts becoming glabrous; lvs. mostly obovate or ovate, with a prominent point, hard in texture and veiny, bright green, the serrations small and much appressed and obtuse, or sometimes the lvs. are almost entire; lvs. 4-12 in umbel-like clusters on slender (2-3-in.) pedicels, white, appearing with the lvs.; calyx persistent, or rarely deciduous; stamens 15-20; fr. very various under cult., usually tapering to the st., the flesh generally with gritty concretions. Native to S. Eu. and Asia, where it has been cultivated from the earliest times.—Probably indigenous as far east as Kashmir. In the Syrio-Persian region are several very distinct pyruses of the pear group, a number of which may be outlying forms of P. communis. In the wild in Eu., various thorny and small-fruited forms are known.

Var. Pyraster, Linn. Much like the type of P. communis, but the fr. globose: lvs. more rounded, strongly serrate, glabrous when young; usually thorny. Probably a wilding form.

Var. sativa, DC. The cult. pear, in many pomological forms, the tree large and free-growing and without thorns: lvs. large.

Var. cordata, Hook. f. (P. cordata, Desv.). A spiny shrub, wild in England and France: lvs. smaller than in the type (about 1 in. broad), ovate or nearly orbicu-
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was discovered about 1650 at Bollweiler, in Alsace; it bears very strongly, and apparently does not come true to seed to 50 ft., with buds and branchlets tomentose; lvs. 3-4 in. long, elliptic, unequal and rounded at base, short-acuminate, irregularly and coarsely sharp-serrate or double-serrate, lower surface pubescent or glabrous, 8 or more in tomentose clusters, on slender pedicels; calyx-tube and lobes tomentose; styles 2-3 in. diam., pyriform, red, silky-tomentose, the base mostly cup-shaped, the apex obtuse-acuminate or short-acuminate; fls. small, on densely tomentose pedicels; frs. globose to obovoid, slightly pubescent, the calyx persistent. Caucasus, S. Russia. The specific name was first written, by Pallas, elaegriofolia (not elaeagnuloida), because he considered elaegnus to be the proper spelling of the name of the oleaster genus, it having been spelled that way by Dodoens. Var. Kotzschiana, Boiss. (P. Kotzschiana, Boiss. P. ariolus var. Kotzschiana, Schneid., is usually spineless, the lvs. larger (about 1 in. long), the fr. globose and larger (about 1 diam.).

6. P. heterophylla, Regel & Schmalh. Small thorny glabrous tree, with very variable foliage, some plants having lvs. that are entire at the margin, others are all and almost of thread-like form, but the greater number with forms intermediate between these two extremes, usually ovate in outline, the lower surface pubescent, mostly pinnatifid and the segments unequal and rounded at base, short-acuminate, irregularly and coarsely sharp-serrate or double-serrate, lower surface pubescent or glabrous, 8 or more in tomentose clusters, on slender pedicels; calyx-tube and lobes tomentose; styles 2-3 in. diam., pyriform, red, silky-tomentose, the base mostly cup-shaped, the apex obtuse-acuminate or short-acuminate; fls. small, on densely tomentose pedicels; frs. globose to obovoid, slightly pubescent, the calyx persistent. Caucasus, S. Russia. The specific name was first written, by Pallas, elaegriofolia (not elaeagnuloida), because he considered elaegnus to be the proper spelling of the name of the oleaster genus, it having been spelled that way by Dodoens. Var. Kotzschiana, Boiss. (P. Kotzschiana, Boiss. P. ariolus var. Kotzschiana, Schneid., is usually spineless, the lvs. larger (about 1 in. long), the fr. globose and larger (about 1 diam.).

7. P. Korshinskyi, Litw. Tree, to 20 ft. or more, or a shrub, with branchlets and buds gray-tomentose; lvs. coriaceous, about 3 in. long, lanceolate or ovate-oblong, somewhat tomentose above and beneath, the margins with coarse crenate or double-crenate incurved gland-tipped serratures, the petiole long and tomentose; fr. nearly globose, stout-peduncled, nearly 1 in. diam., with persistent calyx. Kohkura, Turkestan.

8. P. salicifolia, Pall. Small tree, often splay, becoming 30 ft. tall, with gray-tomentose branchlets; lvs. willow-like, 2-3 in. long, (whence the name), linear-lanceolate or lanceolate, mostly tapering toward both ends, entire or very nearly so, hoary beneath; fls. white, in corymbs, short-peduncled; fr. round-pyramid, short stamened, yellow or greenish, about ½ in. diam., the calyx persistent. Caucasus, Armenia. G.C. III. 14: 115, G. 34: 365.—A showy spring-flowering small tree, Hardy in the northern states, and worthy of being better known. Var. pendula, Hort., has drooping branches. G. 32: 648. P. canescens, Spach, is perhaps a form or hybrid of P. salicifolia; lvs. lanceolate or narrow-elliptic, about 2½ in. long, at apex acute or mucronate, minutely crenulate, sometimes twisted, tomentose.

AA. The oriental or China-Japanese pears, grown in this country to some extent for ornament and fr., and producing hybrids with P. communis: lvs. mostly markedly acuminate and very sharp- or obtuse-serrate; calyx usually falling from the apex of the fr. in the cult. forms (not so in P. ussuriensis and P. ovoidea). (See Rehder, Synopsis of the Chinese Species of Pears, Proc. Amer. Acad. Arts and Sci. 50: 225-40; also Plantae Wilsonianae, 2: 263-6.)

9. serotina, Rehd. Fig. 3276. Tree, 20-50 ft., the branchlets glabrous or becoming so: fls. ovate-oblong or seldom ovate, 3-5 in. long, rounded at base and rarely subulate or cuneate, long-acuminate, strongly and sharply obtuse-serrate, with partially appressed serratures, when young villos or beneath cobwebby but becoming glabrous: inf. umbellate-racemose: fls. 5-6-fl.; glabrous or somewhat tomentose, the pedicels slender: fls. white; sepals or

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lar, subcordate: fls. smaller: fr. globose to slightly turbinate, about ½ in. diam.; calyx persistent.

There are garden forms of P. communis, differing in foliage, as var. trilobata, Hort., lvs. lobed; var. heterophylla, Hort., lvs. cut; var. variagata, Hort., lvs. variegated. In Algeria is var. longipes, Henry (P. longipes, Cos. & Dur.), a small tree with few spines: lvs. with long slender petiole, ovate, acuminate, subcordate, about 2 in. long and 1 in. broad; fr. globose, about ½ in. diam., the calyx deciduous. In Spain is var. mariana, Willk., a small tree, with ovate lvs. about 1 in. long, rounded at base, on very long slender petiole: fr. globose, about ½ in. diam., the calyx persistent.

2. nivalis, Jacq. Snow Pear. Tree, without thorns, the shoots grayish pubescent: lvs. 2-3 in. long, elliptic to oval to ovate-oval, obtuse or short-acute, cuneate at base, entire or toward apex minutely crenulate, gray-pubescent; fls. large, white, showy; fr. small, roundish pyriform, late-ripening, acid, becoming sweet when overripe. Austria, and wild in France and elsewhere, but probably as an escape.—The snow pear is a small tree, with thick shoots that are white-or gray-tomentose: fls. white; sepals or bracteoles orbiculate, about ½ in. diam., the calyx persistent.

Pyrus serotina. (X¼)

3276. Pyrus serotina. (X¼) 3277. Pyrus ussuriensis. (X¼)

Pyrus serotina, and by others to be a hybrid race of P. communis and P. anguinaulera; Schneider, however, places it as a good species with which he associates other names as synonyms and varieties, and according to his view P. salsifolia, DC. (sage-ivd., pear of the French), is P. nivalis X P. communis. It is not known to be in cult. in this country, but it is to be looked for in arboreta and other collections. Said to be called "snow pear" because the frs. are fit for eating after snow falls.

The following related species may be expected to appear now and then in trade-lists or in special collections:

3. P. anguinaulera, Vill. (P. portorica, Desf. P. canesilla, Guss. Prob. P. sincado, Diam.). Shrub or small tree (to 30 ft.), spiny, with light tomentose buds and young branchlets; lvs. thick and coriaceous, 1½-2 in. long, narrow-elliptic, oblong-lanceolate or oblong-acuminate; fr. globose, about ½ in. diam.; calyx-tube and lobes tomentose, fr. nearly globose, ½ in. diam., green and hard. France to Anacapa islands. Lvs. petiolaris, B. R. 1894 (as P. microcarpa, G. W. 14, p. 286.—The names P. Michauxia, Boiss., P. pteroceras, Pers., and P. salsifolia, Spach, probably represent hybrids of this species with P. nivalis.

XCIV. The bloom of Pyrus pulcherrima (P. floribunda).
calyx-lobes triangular-ovate and long-acuminate, 1/2 to about 3/4 in., long, glandulose-denticate; petals oval, short-clawed, nearly 3/4 in. long; stamens about 20; styles 4 or 5, glabrous; fr. subglobose, brown, slender-stalked, the calyx deciduous. Cent. and W. Chins. B.M. 8226 represents a form named by Rehd var. Staphiana, differing in pyriform fr., less appressed serratures on the lvs., and petals attenuate-clawed. P. serotina or its forms is recommended on the Pacific Coast as a more or less blight-resistant stock for the European types.

Var. culta, Rehd. (P. sinensis, Hort.), not Lindl. nor Poir. P. sinensis var. culta, Makino). Sand Pear. Fig. 2808, p. 2507, the details of if.-margins not showing. JAPANESE AND CHINESE PEAR of pomologists. Differs from the type of the species in its large pyriform or apple-form fr., larger and broader lvs. (which are often 6 in. long and 3-4 in. broad). JAPAN.—A very rapid-growing tree, with strong, thick shoots: fr. broadly ovate and long-pointed, very dark green, the margins thickly furnished with very sharp, sometimes almost bristle-like teeth: frs. large, appearing rather in advance of the foliage: fr. hard and usually roughish, commonly with a depression or “cavity” about the st., the flesh tough and gritty and poor in flavor, the calyx usually falling before maturity. R.H. 1879:170, 1880:110 (as P. Sieboldii).—Known in this country in a number of varieties, as Chinese Sand, Japanese Sand, California, Madame von Siebold (which pomological variety Rehd writes, “may be considered as representing the type” of var. culta), Mikado, Diasmo, Gold Dust. The frs. are often remarkably apple-like, especially in the russet varieties, but they are distinguished by the long st. and pear-like flesh. The Japanese pear is little prized for its fr. although the pears are useful for preserving and some of the varieties are showy and the frs. are good keepers, it is used for stocks upon which to work the common pear, and it has given good results in hybridizing. It is an excellent ornamental tree, being a clean grower of great vigor. Kieffer, Le Conte, and others are hybrids of P. communis and P. serotina var. culta (Figs. 2809-2810). This type has a stronger growth than the common pears, the lvs. are usually broader and darker green, with closely and mostly obtusely serrate edges, the fr. is more or less pyriform and the better flavor of than that of the oriental parent, and the calyx is either persistent or deciduous. Seedlings of Kieffer often produce the sharply toothed lvs. of P. serotina var. culta.

Other oriental pears are likely to appear in cult., and it is necessary to distinguish them briefly.


b. Lvs. coarsely and sharply serrate.

c. Fr. globose or subglobose, short-stalked: lvs. orbicular-ovate or ovate, these and if. glabrous from the first.

10. P. ussuriensis, Maxim. Fig. 3277. Differs from its allies, according to Rehd, chiefly in the short stalk of the fr. which is globose and has a persistent calyx, more abruptly orbicular strongly setose-serrate lvs., and in the lighter yellowish brown color of the branches; fr.-clusters rather dense and hemispherical, owing to the short stalks; petals obvate and rather gradually narrowed toward base; styles distinctly pilose near the base. Manchuria, Amoorland, Manchuria, Amoorland. R.H. 1872, p. 28 (as P. Simoni, Carr.).—Sometimes again, branches often yellow-gray.
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17. P. Pashia, Buch-Ham. (P. saroldes, Wall.). Tree, mostly gny, when young with 3-lobed and doubly serrate lvs., like those of Crataegus, the young growths woolly: lvs. ovate or ovate-lanceolate, acuminate, crenate or serrate, becoming glabrous: 9s, 1 in. diam., mostly in woolly corymbose short-peduncled clusters; calyx-lobes acute, deciduous; stems about 30, Himalayas to W. China. Var. kumaon.”

18. P. Pashia, Buch-Ham. (P. saroldes, Wall.). Tree, mostly gny, when young with 3-lobed and doubly serrate lvs., like those of Crataegus, the young growths woolly: lvs. ovate or ovate-lanceolate, acuminate, crenate or serrate, becoming glabrous: 9s, 1 in. diam., mostly in woolly corymbose short-peduncled clusters; calyx-lobes acute, deciduous; stems about 30, Himalayas to W. China. Var. kumaon.”

19. Malus, Linn. (Malus communis, DC. Malus Malus, Brit.) Apple. Fig. 3283; also under 3283. Pyrus Malus, D.C. Mostly a wild or run-wild nearly or quite glabrous form, to which not many of the cult. pomological varieties can be referred. Young branchlets glabrous or soon becoming so: lvs. glabrous above, shining and only scattered-pubescent beneath, the petiole and pedicels only slightly pubescent; calyx-tube and outside of calyx-lobes glabrous but the latter pubescent inside. W. and Cent. Eu.

Var. pumila, Henry (Malus pumila, Mill. Pyrus pumila, Koch). The pubescent type, the source of nearly all the pomological apples, and kept specifically separate by some writers: small or large tree, or bush-like: young branches prominently tomentose, as well as the pedicels, calyx-tube, and both surfaces of the calyx-lobes: lvs. ovate or oval, dull and more or less tomentose beneath. Thought to be native only in S. E. Eu. and in Asia, although run wild elsewhere. A very dwarf form is the Paradise apple (P. Malus var. paradisiaca, Linn.), used as a stock on which to dwarf the pomological varities.

Var. astracanica, Loud. (Malus astracanica, Dum. Pyrus astracanica, DC.). Distinguished by large coarse serrate or doubly serrate lvs. which are tomen-

PYRUS

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tose beneath, and by the long pedicels. Probably Asian.


Var. apetala, Asch. & Graebn. (Pyrus apetala, Muenchh. P. dioica, Moench). Figs. 3284, 3285. Fls. with no colored petals, these organs being represented by very small green bract-like or sepal-like bodies, the sepals appearing, therefore, to be in 2 rows; stamens absent; styles 10-15; ovary 6- or 7-celled, perhaps more: fr. (apparently produced by pollination with other apples) much as in common apples except for a deep not closed cavity at the apex, there being one “core” above the other due probably to the crowding of the many cells as the pistil grows; as the apple grows, some or all the cores split open, and cause the hole in the top of the fr.; in Fig. 3285, b and c represent the persistent points of ruptured core-walls, and a marks a thickened petal or bract that stood in the fl. This monstrosity has been long known, and now and then recurs.

There are horticultural forms of *P. Malus* distinguished as: Var. aurea, Hort., with yellow-variegated lvs.; var. plena, Hort., with more or less double fls.; var. pendula, Hort., of weeping or drooping habit.

20. Soulardii, Bailey (Malus Soulardii, Brit.). SOULARD CRAB. Figs. 3286, 3287. Apparently natural hybrids of *P. Malus* and *P. soemosa*: a small tree, with much the look of an apple tree, and woody: lvs. large, round-ovate to elliptic-ovate or oblong-ovate, either rounded or tapering at the base, often very blunt or even rounded at the top, mostly bluntly or coarsely serrate or dentate when young, irregularly crenate-dentate at maturity, with a tendency to become lobed, on short pubescent petioles, thick and often rugose and woolly beneath: fls. bluish, in close woolly clusters like those of the apple: fr. often 2 in. or even more in diam., flattish lengthwise, yellow and often with a tinted cheek, the basin shallow, flesh fairly edible. Wild in the Mississippi Valley from Minn. to Texas, but always local and in different forms of fr.—Named for James G. Soulard, Galena, Ill., who intro. the first variety to cult. In some forms the lvs. become nearly smooth late in the season and there is little tendency toward an irregular notching or lobing of the margins. The tree is hardy and the fr. keeps well and is useful for culinary purposes. A few named varieties are grown in the upper Mississippi Valley, where trees of great hardiness are demanded. For accounts of the pomological offshoots of our native apples, see Bailey, “Evolution of Our Native Fruits,” and Craig & Hume, “Native Crab Apples and Their Cultivated Varieties,” Iowa Acad. Sci., 1899.

21. baccata, Linn. (Malus baccata, Borkh. Malus microcarpa var. baccata, Carr. M. baccata var. sibirica, Schneid.). SIBERIAN CRAB. Fig. 3288. Small round-headed tree, with a compact crown, smooth in all its parts as maturity; growth hard and wiry: lvs. ovate to ovato-lanceolate or ovate-acuminate, thin and glabrous, on slender petioles, finely and nearly evenly serrate, bright green: fls. appearing with the lvs. on long and very slender (2-3 in.) greenish pedicels, white, handsome: style mostly longer than the stamens, lightly hairy or glabrous: fr. from the size of a pea to ¼ in. diam., on long, hard sts., yellow or red and firm and often translucent in texture, never becoming mellow, the calyx falling away before maturity. Siberia to Manchuria and N. China. B.M. 6112. M.D.G. 1899:454. Gt. II:202. —Difficult to distinguish from *P. pulcherrima*: larger, becoming a distinct tree, sometimes as large as a large apple tree: lvs. with blunter teeth, and usually much longer, very slender, hard, glabrous petioles: fls. lighter colored, usually white; vernation convolute (lvs. rolled in the bud). It runs into many forms, particularly in fr. Var. mandshurica, Maxim. (Malus baccata var. mandshurica, Schneid.). Low densely branched tree when growing in the open but tall and wide-spreading in forests: lvs. broader, elliptic or round-elliptic, mostly entire, the petiole, rib, and nerves, as well as inf., more or less hairy: style scarcely as long as the stamens, mostly longer, very slender, hard, glabrous: fr. from the size of a pea to ¼ in. diam. Amur region, Korea, Cent. China, Japan. Var. himalaiica, Maxim. (Malus baccata var. himalaiica, Schneid.). Lvs. very broad-oval, coarsely serrate, more or less hairy underneath, particularly on midrib. W. Himalayas. A handsome form from Korea with pure white large lvs., large dark green lvs. and large dark red fr., is distinguished by Rehder as forma Jackie: var. mandshurica it differs in being glabrous.—The Siberian crab of pomologists belong to *P. baccata*, but to which of the several botanical forms (if to any of them) is not clearly determined; the species is also used in cold countries as a stock on which to graft the common apple. It is a species of great hardiness, withstanding the climate in the Canadian N.W. provinces. It is much subject to blight (pear-blight) and for this reason its usefulness is much limited. Hybrids with *P. Malus* promise a valuable type of apple for cold regions. See Fig. 648, Vol. I, and pp. 569.
and 570. The large-fruited pomological crab-apples of the Hyslop and Transcendent type are supposed to be hybrids between *P. baccata* and *P. Malus*, and to these forms the name *P. prunifolia* has been applied but probably erroneously. The *P. cerasifera*, Spach, is of the *P. baccata* group, and is probably a hybrid. It makes a large tree with spreading head, and bears very large pure white fls.: the fr. is variable in size, shape, and color, and either retains or drops the calyx.

22. *Halliana*, Voss (*Malus Halliana*, Koehne). Fig. 3289. Bush or small tree, 6-15 ft. tall, with a loose open crown: lvs. long-ovate, glabrous, leathery, crenate-serrate, the petioles short: fls. rose-colored, more or less polygamous, hanging on slender reddish pedicels, the calyx-lobes often more or less obtuse, the styles usually 4: fr. size of a pea or somewhat larger (3/4-1/2 in. diam.), abruptly contracted into a thickened pedicel, brownish red, ripening late in autumn and containing very large seeds. W. China; cult. in Japan. M.D.G. 1890: 457. One of the handsomest of the flowering apples. Var. *rosea*, Bailey, has rose-colored fls. and is very beautiful.

23. *theifera*, Bailey (*Malus theifera*, Rehd.). A small tree with stiff spreading branches, hardy at Boston, resembling a cherry tree when in bloom, the fls. white or light pink (there is a rose-colored form) with purple calyx and the unfolding lvs. purplish: distinguished from *P. Halliana*, its nearest ally, by larger and broader ovate or ovate-oblong or elliptic-ovate sharply glandular-serrate thinner lvs., longer pedicels and less slender pedicels, acute or acuminate calyx-lobes, mostly 3 styles, white or blush fls., and larger frs. China to Assam.—The fr. is globose, light greenish yellow with reddish cheek, ripening in Mass. in Oct.: fls. fragrant. Not yet grown outside botanical collections, but a handsome free-flowering species. Var. *rosea*, Bailey, has rose-colored fls. and is very beautiful.

24. *sikkimensis*, Hook. f. Small tree, with tomentose branches: lvs. ovate to ovate-oblong, 2-3 in. long, not lobed, the apex long-acuminate, abruptly narrowed at base, tomentose beneath, with fine and close sharp-pointed serratures, the petiole much shorter than the blade: fls. 1 in. across, 5-8 in a corymbose cluster, appearing with the lvs., white but pinkish outside, the buds rose-colored; pedicels very slender, 1/2-2 in. long; calyx-tube obovate, the lobes lanceolate and recurved; petals orbicular, claw very short, tomentose; stamens many; styles slender and glabrous, connate below: fr. turbinate, not depressed at base, 2/3 in. diam., dark red speckled white, the calyx wholly wanting. Himalaya. B.M. 7430.
PYRUS

cc. Calyx persistent on the fr.
l. Style glabrous at base; fr. punctate: lvs. sharply and mostly doubly serrate.

25. Pratti, Hemsl. (Malus Pratti, Schneid.). Young growths whitish hairy but becoming glabrescent: lvs. 3-4 in. long, the long petiole extra, ovate-lanceolate to ovate or elliptic, acuminate-acute, the base usually rounded, finely somewhat double-serrate with cally serrations: fls. medium size, in many-fl. terminal sub-sessile clusters, slender-pedicelled; calyx-lobes acuminate, white-silky inside; petals ½ in. long, short-clawed, rounded at apex, conspicuously veined; styles 5, glabrous: fr. about ½ in. long, oval, smooth, the calyx persistent.

China.

Style villous at base: fr. smooth and not punctate: lvs. simply serrate or crenato-serrate.

e. Lvs. membranaceous or thin in texture, dull above: calyx-lobes acuminate and longer than the tube.

20. rufifolia, Wild. (Malus rufifolia, Borkh. M. hybrida, Loisel.). For years considered to be a hybrid of P. baccata and P. Malus or other species, but a plant which he considers to be a variety of it (var. hindo) having been found wild in China leads Rehder to the conclusion that it is a good natural species; P. rufifolia itself is yet known only as a cult. plant: tree.

V. Rinki, Bailey (Malus pumila var. Rinki, Koidz. M. prunifolia var. Rinki, Rehd. M. prunifolia, Koidz. M. matsumurae, Koidz. M. rufifolia, Carr. Pyrus Rinko, Wenz. P. prunifolia, Miq.). Chinese Apple. Figs. 3290, 3291. Wide-spreading small tree, to 15 or 18 ft. high, more pubescent than the type (P. prunifolia) and representing a more southern range, the petioles shorter and the fls. pink or pinkish rather than white. China. B.M. 6265.—This tree yields an edible apple, sometimes as much as 1½ in. diam., of a greenish or yellowish color and with a bitter-sweet flavor; it was formerly grown in Japan for its fr., but its cult. has been discontinued since the intro. of the European apple, yet is now used as stocks for the imported kinds. In China it is still sparingly cult. In botanical characters the plant is much like P. Malus, but is distinguished by the much longer fr.-stalk, more sharply serrate and usually less tomentose lvs., the apex of the fr. not sunken but with a raised calyx which is thickened and fleshy at the base.

f. Lvs. paper-like in texture, shining above: calyx-lobes shorter than the tube or only equaling it.

27. spectabilis, Ait. (Malus spectabilis, Borkh. M. sinensis, D. M.). Chinese Flowering Apple. Fig. 3292. Small tree, with darker-colored fls. than those of the apple (the opening fl.-buds almost coral-red), and blooming earlier, making an erect vase-like head: lvs. narrower, oval to ovate-oblong, slender-stalked, nearly glabrous on both surfaces or becoming so, usually more closely serrate than those of the apple: pedicels and calyx-tube nearly or quite glabrous: fr. roundish or round-oval, without a cavity at the base, reddish yellow, sour. Probably China and Japan, although unknown wild and very little grown in those countries, although well known in cult. in Eu.; the plant called by this name in Japan is probably P. Halliana or P. micromalus. B.M. 267. L.B.C. 18:1729. Gn. 21, p. 46. Gmg. 3:273. G.F.1:272.—A very handsome early-blooming tree, of which the double-fl. and semi-double forms are most prized. P. Malus itself has been disseminated under the name of P. spectabilis. Harvy in the northern states. Var. Riversii, Booth, has very large half-double bright rose-red fls.

28. micromalus, Bailey (Malus micromalus, Makino- M. spectabilis var. micromalus, Koidz. Pyrus Kaida- Moull. Malus microcarpa var. Kaido, Carr. M. spec­ tabilis var. Kaido, Sieb.). Fig. 3293. Apparently a hybrid, P. spectabilis being undoubtedly one of the parents, and probably P. baccata or P. floribunda the other. From P. spectabilis it is distinguished by the narrower lvs. which are gradually narrowed at the base into a slender petiole, by tomentose pedicels and calyx, and the subglobose fr. which has a depression at base and apex, the calyx sometimes deciduous. Cult. in Japan, and said to have been intro. from China.
unknown in the wild. — A useful and showy plant, bearing profusely of bright red fls., with red calices and pedicels, and holding its many little fls. well into winter or even all winter.

**BB. Lvs. conduplicate (folded together lengthwise face to face in the bud), those on the strong shoots often lobed.**

**c. Calyx persistent.**

30. Tschonoskii, Maxim. (Malus Tschonoskii, Schneid.). Fig. 3294. Tree, 30-40 ft. with erect and open habit: lvs. ovate-acuminate, coarsely serrate, with sharp teeth, shining and pilose above although tomentose when young, somewhat tomentose beneath: fls. 2-5 together, white tinged rose, on whitish hairy pedicels about ½ in. long; calyx-tube whitish hairy, the lobes or sepals ovate-acute, spreading in ft.; petals about ½ in. long; fr. obovoid, about 1 in. diam.; calyx-lobes persistent, erect or nearly so, white-tomentose, 1 in. or less diam., yellow with a rosy check. Japan. B.M. 8179. G. F. 7:55 (reduced in Fig. 3294).

**cc. Calyx deciduous.**

31. Toringoides, Bailey. (Malus Toringoides, Rehd.). Distinguished from P. Tschonoskii by its smaller fls. in many-fl.d. clusters, much smaller frs. which are red and with reflexed calyx-lobes, and by the lvs. which are more distinctly lobed and sharply close-serrate: a handsome tree with spreading branches: lvs. simple, broadly ovate, with closely or finely toothed lobes; fr. small, ½ in. or less long, produced abundantly. China. G.M. 56:397.

**dd. Styles villous at base; fr. obvolute.**

32. kunsuensis, Batal. (Malus kunsuensis, Schneid. Eriobotryus kunsuensis, Schneid.). A distinct species, marked by the usually broad-ovate 3-5-lobed and sharp-serrate glabrous or glabrescent lvs. which are 3-nerved at base, and by the ovoid red fr. from which the calyx is deciduous: young twigs glabrous, red-brown; buds of the same elongate, acute; scales only finely ciliate: lvs. green dark above, somewhat glaucous on the nerves, somewhat paler beneath, glabrous or slightly hairy on the nerves, suborbund in outline, upper half palmately 3-lobed, lobes triangular, acute, margin serrate, the side lobes somewhat shorter; petiole 1½ in. or less long: infl. a false umbel; calyx acute, equaling the corolla; petals round, short-clawed, more or less hairy inside; stamens 20; styles 3, hairy and grown together at base: fr. purple, 3-celled, about ½ in. long. China.

**EE. Fls. white, the petals nearly orbicular and at base contracted into a claw.**

33. Sargentii, Bean (Malus Sargentii, Rehd.). A low bush, much branched, the branches rigid and often spinescent: lvs. ovate to elliptic-oblong or ovate-oblong, about 2-3 in. long, sharply and unequally serrate, slender-petioled, those on the vigorous branches mostly ovate and 5-lobed: fls. pure white, 1 in. across, in 5- or 6-fl.d. clusters, on glabrous pedicels about 1 in. long; calyx-tube and lobes glabrous outside and villous inside, the lobes ovate-lanceolate and acuminate; petals about twice as long as calyx-lobes, oval, short-clawed, glabrous; stamens 15-20; styles usually 4 (rarely 3 or 5), connate and villous below the middle: fr. subglobose, ½ in. or less diam., dark red with a slight bloom. Japan. S.T.S. 1:37. G.C. III. 57:291 (as P. Sargentii); 58:309 (fr.). G.M. 58:278.

**FF. Fls. reddish (carying to nearly white), the petals cuneate or rounded at base, obvolute or oblong.**

34. Sieboldii, Regel (Malus Sieboldii, Rehd. Pyrus Toringo, Sieb. M. Toringo, Sieb. P. Mengo, Sieb. M. microcarpa var. Toringo, Carr.) Fig. 3295. Shrub: lvs. ovate or oblong-ovate in outline, pubescent, becoming colored in autumn, strongly notched or lobed on either side at or below the middle, the middle lobe often notched again near the top, the remaining margins sharply dentate: fls. small, bluish, on slender sts.; styles 3-4, connate at base; sepals triangular-ovate or lanceolate, about equaling the tube: fr. the size of a pea, shedding its calyx, yellow or red. Japan. R.H. 1870:451; 1881, p. 296. Gn. 34, p. 206. M.D.G. 1899:456.—Grown mostly for ornament, but lately recommended as a hardy stock upon which to dwarf the apple. In Japan, the little frs. are gathered after frost and preserved. Upon the fr.-spurs, the lvs. are sometimes only toothed, but upon barren or strong shoots they are prominently lobed and suggest the lvs. of hawthorns. Var. arboreascens, Bailey (Malus Siebdlit var. arboreascens, Rehd.), which is widely distributed in Japan, differs from the type in its more tree-like habit (to 30 ft.), less pubescent, lvs. somewhat larger and usually less deeply divided and often lobed only on the ends of strong shoots, fls. often nearly white, frs. yellow or red. Var. calocephala, Bailey (M. Sieboldii var. calocephala, Rehd.), has large handsome bright red fr. and large fls.: lvs. on fruiting branches

**3294. Pyrus Tschonoskii (× 3¾). No. 29.**
mostly ovate-oblong and crenate-serrulate, those on the vigorous shoots mostly 3-lobed with the lateral lobes short and broad: distinguished from _P. Zabel_ by the 9-4 rather than 4-5 styles and by the lobed ivs.

35. _Zabel_, Mat. (M. _Zabel_, Rebh.). Low and much-branched tree, to 20 ft., with rounded head and twiggy growth, sometimes 40 ft. tall and with more ascending branches: lvs. long-petioled, oblong to ovate-oblong or elliptic-oblong, 1½—3 in. long, acute at apex, rounded or narrowed at base, entire or somewhat crenate-serrate, yellowish green above and light green beneath, soon glabrous, those on the ends of vigorous branches lanceolate and usually coarsely dentate: fls. white or slightly pinkish, borne in profusion, about 1 in. across, on loosely villous or glabrous pedicels about 1 in. long; calyx-lobes lanceolate, villous inside and less so outside; petals elliptic, obtuse, rounded at base but short-clawed, opening pink but becoming pure white; stamens about 25; styles 4 or 5, connate for one-third their length, densely villous: fr. 1½ in. or less diam., globose, red, the calyx deciduous. Mountains of Cent. Japan. S.T. S. 1:91.—Diffrers from both _P. Sargentii_ and _P. Sieboldii_ in the oblong lvs. which are not at all or only slightly lobed, and slender petioles; from _P. Sargentii_ also in longer petals rounded at base, glabrous lvs., longer petioles, and erect branches; from _P. Sieboldii_ also in differences in foliage, larger fls., larger broader petals rounded at base.

36. _pulcherrima_, Aschers. & Graebn. (P. _floribunda_, Kirchn., not Lindl. _M. floribunda_, Hort. _M. floribunda_, Sieb. _M. microcarpa_ var. _floribunda_, Carr.). _FLOWERING CRAB_. Unknown in the wild but long in cult., and perhaps a hybrid of _P. baccata_ and _P. Sieboldii_; intro. from Japan, where it seems not to be recognized, Rehder finding that what the Japanese botanists know under this name is _P. Halliana_: shrub or sometimes a small tree, often thorny: young growths glabrous or very soon becoming so: lvs. ovate and usually acuminate, the petals rather thick and redish and usually not much if any more than 1 in. long on the leading young shoots, the margins very sharply serrate or incised-serrate, not lobed, usually thick and shining above and glabrous (or soon becoming so) beneath: fls. rose or rose-red, appearing with the lvs., produced in great abundance and very showy; styles nearly always 4, very rarely 3 or 5, connate to the middle: fr. usually about the size of a pea, on long, slender stalks, red, not persisting till winter. China. R.H. 1866:311; 1871:391; 1881, p. 296. F.S. 15:1555. G.F. 1:152; 2:285. A.G. 13:437; 18:437. F.E. 9:573. G.M. 44:274; 53:1529 and p. 418. The name of this species is somewhat in confusion. It has been known as _P. floribunda_, but Lindley earlier gave this name to a very different plant, of the section or genus _Aronia_ (see p. 396, Vol. I), and the present species must take a new name. _P. pulcherrima_ is one of the best of all early spring-flowering bushes or small trees, and is now common in gardens. The semi-double forms improperly receive the names _Halliana_ and _Portenst._. It makes a broad round-headed great bush, with handsome rose-colored buds and whitish expanded fls. _P. aistrosanguinea_, Späth, is a handsome floriferous species of doubtful origin. It is probably _P. Halliana_ x _P. Sieboldii_ (Koehne supposes it to be _P. Halliana_ x _P. fusca_; resembles in general _P. pulcherrima_, but differs in its deep carmine fls. not fading to white, rather narrower petals, shorter ovate and somewhat obtuse calyx-lobes, more shining and finally glabrous lvs., those lvs. at the end of vigorous shoots sometimes slightly 3-lobed: fr. dark red. Gt. 47:1448.


Var. _Arnoldiana_, Bailey (M. _floribunda_ var. _Arnoldiana_, Rehb.). Originated at the Arnold Arboretum, Boston, as a seedling of _P. pulcherrima_ fls. more than one-half larger than in the type, pale rose: fr. much larger, yellow: of bushy habit.
Small tree, to 20 ft., with spreading unarmed branches, *E. angustijolia* villous pedicels. *Pyrula*, Bailey *tijolia*, form is sometimes described and figured as differs mostly in its pointed lvs., which are lightly obovate, slender-clawed; styles tomentose below: fro cuneate at base: fis. 1 in. across, fragrant, in few-lId. with rigid points and tomentose inside; petals narrow-pubescent outside, the lobes narrow-acuminate and so, thick and partially evergreen, rounded at apex, umbels, slender-pedicelled; calyx-tube glabrous or

Small tree, to 20 or 30 ft.: lvs. lance-oblong, crenate-serrate or almost entire, not lobed or only slightly virens, *Malus* *gustijOlia*, *virens*, *Dawsonidna*, *M. rivuldris* and *levipes*, *Malus* *gustijOlia*, *angustijolia*, Ait. *DD.* Apex of lvs. acute or acuminate. *BB.* Calyx persistent: eastern.

c. Foliate glabrous at maturity.

d. Apex of lvs. rounded and obtuse; margin crenate-serrate.


30. *platycarpa*, Bailey (Malus platycarpa, Rehd.), Small tree, to 20 ft., with spreading unarmed branches, young growths thin-tomentose but becoming glabrous: lvs. ovate to elliptic, rounded at base, the apex rounded but with short acute end, sharply and mostly doubly serrate, those on vigorous shoots broad-ovate and usually with several pairs of very broad triangular lobes: fis. 3–6 in race-me-like umbels, about sin. diam., on glabrous pedicels 1–1½ in. long; calyx-tube obovate and glabrous, the lobes or sepals lanceolate-acuminate and longer than the tube and densely tomentose within though glabrous without; petals orbicular-ovate, usually dentate; styles 5, villous below the middle and connate for one-third their length: fr. depressed-globose with deep depressions at both ends, broader than long (2 in. diam.), with persistent calyx, sometimes used for preserves. N. C. to Ga. in fertile bottoms. S.T.S. 2:189.—Mostly closely related to *P. coronaria*, but easily distinguished from this as well as from other species by the broad and large lvs. which are rounded and abruptly acuminate at apex, and never lobed, and by its very large fr.

Var. *Hoopesii*, Bailey (Malus coroneária var. *Hoopesii*, Rehd. *P. platycarpa* var. *Hoopesii*, Rehd.). Differs in calyx, oval to elliptic lvs. only slightly or not at all lobed, and by the larger fr. Known only in cult.

40. *lancifolia*, Bailey (Malus lancifolia, Rehd.). Fig. 3296. Small tree, to 25 ft., with spreading spiny branches, the branchlets slightly pubescent or nearly glabrous: lvs. ovate-lanceolate to oblange-lanceolate, 1½–3 in. long, at the apex acute or short-acuminate, at the base rounded or broad-cuneate, either finely or coarsely serrate and frequently doubly serrate with the short teeth pointing forward, those on vigorous shoots ovate or oblange-ovate and often slightly lobed: fis. 3–6, in umbel-like racemes, white or rose, something over 1 in. across, on slender glabrous pedicels 1 in. or more long; calyx-tube obovate and on the outside glabrous, the lobes or sepals oblange-lanceolate and exceeding the tube and villous-tomentose within but glabrous without; petals oval, long-clawed; styles 5, densely villous below the middle: fr. subglobose, about 1 in. diam., on slender drooping pedicels, green and waxy, Pa. and Va. to Mo. S.T.S. 2:188 (a sprig of which is reduced in Fig. 3296).—Distinguished from *P. coronaria* by the shape of the lvs., which are acuminate and less coriaceous, by the narrower and longer calyx-lobes, styles villous to middle, and by the different fr.

EE. Lvs. distinctly lobed, particularly on the strong shoots and sometimes on the flowering branchlets.

41. *glaucescens*, Bailey (Malus glaucescens, Rehd.). Fig. 3297–3299. Small tree or large shrub, with twiggy spiny head, the branchlets glabrous or at first slightly pubescent: lvs. triangular-oval or oval, 2–3½ in. long, at the apex acute or short-acuminate or even rounded, at base truncate villous-tomentose when young but becoming glabrous, glaucescent beneath, more or less triangular-lobed, coarsely serrate with abruptly acuminate teeth, the lowest pair of veins arising some distance above the base of the blade; petioles slender, soon becoming glabrous: fis. white or pink, 5–7 in umbel-like racemes, appear when lvs. are nearly full-grown, on slender glabrous pedicels 1 in. or so long; calyx-tube thinly villous outside, the lobes obleng-
lanceolate-acuminate and densely tomentose within; petals oval, rounded at top, more or less gradually narrowed into a claw; styles slightly shorter than the stamens: fr. flattened and concave at both ends, broader than long, not angled, yellow and waxy at maturity, fragrant. N. Y., and southward in the Appalachian region to N. C.; early-flowering. S.T.S. 2:187. This species is often confused with the following, but is easily distinguished by its distinctly lobed cratagus-like lvs. whitish on their under side.

42. coronaria, Linn. (Malus frangrans, Rehd. Malus coronaria, Mill.). Closely related to P. glaucescens, but differing in less deeply lobed more elongated lvs. which are green and not glaucous beneath at maturity, glabrous calyx-tube, and the fr. being strongly ribbed at the deeply sunken apex. N. Y. to Ala. B.M. 2009. B.R. 651. S.S. 4:167 (all as P. coronaria). R.H. 1884, p. 104 (as P. microcarpa coronaria), On. 29, p. 395; 34, p. 206. — The fr., which is produced in abundance, was often buried by the early settlers for use in the spring, when its acerbity was largely extracted; and it was sometimes used for cider. It is also useful for jellies and preserves. The species was probably never intro. into cult. for its frs., although it is native from Minn. and Wis. to Neb., Kans., and Mo. B.M. 8488. S.S. 4:168 (frs. too flat). — Frs. appraised by the settlers, but the species is probably not in cult. for its frs., although a late-blooming double-flowered variety has been lately intro., —Beechey's crab, sometimes referred to P. angustifolia. G.C. III. 25:397. R.B. 38:165. R.H. 1910:90. P. ioensis is a variable species, in some of its forms difficult to separate from P. coronaria, P. angustifolia, and other species. Var. Palmeri, Bailey (M. ioensis var. Palmeri, Rehd.). Small and slender tree, to 18 ft., differing from the type chiefly in the smaller oblong more thinly pubescent lvs. which are rounded at apex, and those on the flowering shoots not lobed and crenate-serrate. Mo. Var. spinoda, Bailey (M. ioensis var. spinosa, Rehd.). Dense bushy shrub, 6-8 ft., with slender spiny branches: differs from var. Palmeri in a shrubby habit, smaller lvs. and frs., and glabrescent calyx: from P. coro­naria (P. angustifolia) in the pubescence of the lvs., serrate or serrulate fl.-margins and lobed ovate lvs. of the strong shoots. Mo. Var. Búshii, Bailey (M. ioensis var. Búshii, Rehd.). Differ in bearing less deeply lobed lvs. than the type, which are glabrous: from var. Pal­meri it differs in having oblong-lanceolate acute glabrescent lvs. Mo. Var. creniserrata, Bailey (M. ioen­sis var. creniserrata, Rehd.), is a slender spineless tree with branches villous when young, and crenate-serrate or entire elliptic-ovate to oblong-ovate lvs., or those on the vigorous shoots somewhat doubly serrate: calyx

44. ioensis, Bailey (P. coronaria var. ioensis, Wood. Malus ioensis, Brit. Malus coronaria var. ioensis, Schneid. P. ioensis, Carruth?). Prairie or

3290. Pyrus glaucescens. (X ¼)
2878 PYRUS
tomentose. La. Var. texana, Bailey (M. ioeensis var. texana, Rehd.). Small much-branched tree, to 18 ft., or sometimes a shrub forming thickets, with densely tomentose branchlets which become glabrescent the first or second year, differing from the type in having smaller and much broader lvs. that are not at all or only slightly lobed and densely villous at maturity. Texas, representing the southwestern extension of the species.

45. bracteata, Bailey (Malus bracteata, Rehd.). Tree, to 30 ft. or more tall, forming a broad head: a glabrescent form: lvs. elliptic-ovate to oblong-ovate, serrate or incisely serrate and less deeply so than in P. ioensis and with less deep lobing, sometimes slightly lobed near the base, those on the vigorous shoots usually ovate and with recurved very short lobes on either side and the margins commonly only slightly serrate, the foliage glabrous or glabrescent except the slightly pubescent lvs. at the end of strong shoots; racemes 3-5-fld., the pedicels about ½-in. long, glabrous or nearly so and bearing subulate bractlets 1/4-½-in. long which persist during flowering. Mo.


PYXIDANTHERA (Greek, a small box and anther; the anthers opening transversely like the lid of a box). Diapensiaceae. PYXIE. FLOWERING Moss. PINE-BARREN BEAUTY. An evergreen creeping plant found in cushion-like masses in the sandy pine lands of N. J. to N. C. When it flowers in early April to early May, its white starry blossoms dot the light green or brownish green fl. and st. cushions. It grows best in moist sandy soil in the full sunlight and sometimes on gravel slopes of slight inclination. When growing among fallen lvs., its st. become longer and the whole plant more open in character. The plant is rarely cult., although adapted to rock-gardens in sandy or gravelly pockets. Related to Diapensia, an alpine plant, and slightly to Galax. The only species is P. barbuláta, Michx. An evergreen herb with depressed prostrate nearly glabrous stl., much branched at the base and creeping: lvs. numerous, blades leathery, linear-oblancoceolate, or linear-elliptic, imbricated, small, ± long: calyx campanulate, lobes 5, oblong, obtuse; corolla white, tube oblong-campanulate, petals 5, spatulate to obovate, spreading; anthers of 5 stamens yellow, opening transversely; ovary 3-celled: caps. 3-valved, few-seeded. B.M. 4592. Mn. 8:33. B.B. 2:583. Gn. 27, p. 209. G. 36:649. J.F. 2:150.

JOHN W. HARSHBERGER.

3300. Prairie States crab.—Pyrus icenasis (X 1/2). No. 44.
QUAMASIA (quasak, the Indian name). Liliaceae. A name given by Rafinesque in 1818 to the plants that Lindley, in 1832, called Camassia. On the principle of fifty years of accepted usage, the name Camassia is retained in the "nomina conservanda" of the International Botanical Congress (Vienna), and under that name the plants are treated in Vol. II. One species, variously known as Camassia esculenta, Quamassia esculenta and Quamassia hyacinthina, is native in the eastern United States, but the most showy species are from the Pacific side of the continent.

QUAMOCIT (Greek, a dwarf kidney bean). Including Caloba and Mina. Convolvulaceae. Annual, or in tropical regions some perennial twining vines; most of them of easy culture, of rapid growth, and with a profusion of small flowers.

The genus differs from all other Convolvulaceae by its axillary often 2-forked clusters of fls., the thickened pedicels of some species, the slender corolla-tube not expanding at the base, the limb of the corolla salverform or cup-shaped, stamens and style extended, and often decinate.—About 10 species. Q. pinanata is the best-known species, often used to advantage upon arbors, verandas, walls, or on screens in the conservatory.

A. Sepals without awns; pedicels thickened: lvs. pinnately divided.

pinnata, Bojer (Ipomoea Quamocit, Linn. Q. vulgaris, Choisy. Q. Quadracit, Brit.). CYPRRESS-VINE. INDIAN PINK. Fig. 3301. St. smooth, slender, twining to a height of 10-20 ft.: lvs. short-petioled or sessile: pedicels few-fl., commonly much longer than the pedioles: corolla 1-1½ in. long, scarlet, the tube narrowly funnelform, inflated above; the limb nearly flat, 5-lobed. July-Oct. Naturalized from Trop. Amer., Va. to Fla., west to Kans. and Texas; sparingly escaped from cult. farther north. B.M. 188 (as Convolvula Nid); 244. Gn. 39, p. 33.—Beautiful in fl. and foliage but usually does not succeed well in the N. unless started early in the hot-house and transplanted. Var. albata, Hort., has white fls.

AA. Sepals awned: lvs. entire or lobed.

b. Corolla-limb expanding abruptly from a slender tube, cup-shaped, ½-3 in. broad or broader.

ccines, Moench (Ipomoea coccinea, Linn.). STAR IPOMEA. Fig. 3302. St. freely twining for 10 ft.: lvs. slender-petioled, entire or angulate, acuminate: pedicel 2-6 in. long, to 7-fl.; corolla ½-2½ in. wide, salverform; limb obscurely lobed, scarlet with yellow throat. Aug.-Oct. Apparently naturalized from Trop. Amer., on river banks in the Middle and South Atlantic states; probably indigenous to N. Mex. and Ariz. B.M. 221.—Fls. are produced in abundance, but are very small.

Var. hederifolia, House (Ipomoea hederifolia, Linn. Ipomoea coccinea var. hederifolia, Gray. Mina sandwicensis, Hort.). Fig. 3303. This Plains form of the species has angulate, 3-lobed or even 3-5-parted lvs., and fls. usually larger. B.R. 9. B.M. 1769. I.H. 41, p. 159.—It is superior to the type for ornamental purposes.

Var. luteola, House (Ipomoea luteola, Jacq. Ipomoea coccinea var. lutea, Hort.). Fls. yellow, an inch long. Varies to orange in color.

nn. Corolla-limb expanding funnel form from a slender bent tube: lvs. 3-lobed.

c. Tube of corolla nearly 2 in. long, the limb 5-angled, scarlet.

grandiflora, Don (Ipomoea Puntia, Cham. & Schlecht.). A perennial vine with cordate-hastate, 3-lobed lvs., finely pubescent: pedicels elongated, bearing 3-9 scarlet fls.; corolla about 2 in. long, slender, bent, expanding into a 5-angled limb less than an inch broad. S. Mex.

cc. Tube of corolla scarcely 1 in. long, yellowish, with a purplish, deeply 5-lobed limb.

vitifolia, Don (Caloba vititofia, Cav.). A perennial twining glandous vine: lvs. entire or 3-lobed. the middle lobe constricted below: pedicels elongated, several-fl.: corolla about 1 in. long, the yellowish tube expanding above into a scarlet, deeply 5-lobed limb, the exerted stamens elongated and decinate. S. Mex.

bbb. Corolla-limb cylindrical and bent, longer than the limb, yellow tinged with red.

QUAMOCLIT

3303. Quamoclit coccinea var. hederifolia. (X ½)

QUERCUS

3304. Annual-fruited oak—Quercus alba. The mature acorn is borne on the wood of the season. (X 10)

—Distinguished from all other ipomoeas by its bag-shaped corolla and scorpioid infl. It is a very free bloomer, and deservedly popular. H. D. HOUSE.

QUÁSSIA (from an aboriginal name). Simaroubaceae. Trees, sometimes cultivated in the greenhouse.

Leaves alternate, pinnate; lfts. alternate, entire, orioraceous: panicles axillary and terminal, elongated, branched; lfts. suberymose-diclinous; calyx small, 5-lobed; petals 5; stamens 10 in the male, rudimentary in the female lfts.; ovary sunken in the disk, deeply 5-parted: fr. 1-5 spreading sessile drupes.—About 3 species. Trop. Amer. and Trop. Afr.

amara, Linn. Shrubby tree; lfts. opposite, odd-pinnate, dark green with bright pink veins; lfts. 5, elliptical-oblong, pointed, entire, tapering toward the base, subsessile at the petiolar structures; petiole articulate, winged; lfts. crimson, in racemes; corolla never fully expanded, the petals having a spiral twist and curling round one another: drupes biglandular ovoid, black with a pale spot at the base. Trop. Amer. B.M. 497.—It furnishes the bitter quassia wood and its medicinal extract is used as a tonic. Now cult. in the tropics of both hemispheres. F. TRACY HUBBARD.


QUEKÁTIA (in honor of E. J. Queckett). Orchidaceae. Small epiphytic plants: lfts. terete, fleshy: scape filiform, branched: lfts. small, in sepals and petals similar, linear; lpp. erect from foot of column, about as long as sepals, entire, hollowed at base; column erect, with 2 recurved appendages at apex; anther terminal, incumbent; pollinia 2, waxy, ovoid, upon linear stalks.—About 6 species known, all Brazilian. Related to Ada; little known horticulturally. GEORGE V. NASH.

QUÉRÚC (ancient Latin name). Fagaceae. Oak. Ornamental trees, rarely shrubs, grown chiefly for their handsome foliage and interesting habit; many species are important timber trees. See Oak.

Deciduous or evergreen trees, rarely shrubby: winter buds with usually many imbricate scales: lvs. alternate, short-petioled, with deciduous stipules, pendulous catkins with 4-7-parted calyx and 4-12, usually 6, stamens; pistillate in 1- to many-fld. spikes in the axil of the young lvs., each fl. consisting of an incompletely 3-, or rarely 4-5-seeded ovary, surrounded by imbricate bracts; style short or elongated, dilated above and stigmatic on the inner face; fr. a 1-seeded subglobulous to oblong nut, surrounded at the base or sometime almost inclosed by a cup-like involucre.—More than 200 species are known, distributed through the colder and temperate regions of the northern hemisphere and in the mountains of the tropics. The numerous species are usually divided into 3 subgenera. The species of the subgenus Cyclobalanopsis which has the scales of the cup connate into concentric rings are all Asiatic. The American species belong to Lepidobalanus (balanus is Greek for acorn) and to Erythrodalbanus. In the former, comprising the white oak tribe, the acorns mature the first year (Fig. 3304). In the latter, comprising the black oaks, the acorns mature the second year (Fig. 3305). Besides the 200 species, about 40 hybrids have been recorded. Pasania, often included under Quercus, is now usually considered a distinct genus, which see. The latest monograph of the whole genus is by A. DeCandolle in "Prodromus," vol. 16, 2, pp. 1-108 (1864-1865). Important illustrated works on American oaks are A. Michaux, "Histoire des Chênes de l'Amérique" (1801), with 36 plates; Kellogg and Greene, "Illustrations of West American Oaks" (1889), with 37 plates; Sargent, "Silva of North America," vol. 8 (1895), with 82 plates, and Liebmann, "Chênes de l'Amérique Tropicale" (1869), with 47 plates. Most of the European and west Asian oaks are figured in Kotschy "Eichen Europas und des Orients" (1862), with 40 colored plates. For comparative illustrations of lvs. see M.D. 1889, p. 32; A. B. 27, p. 61; G.W., 7, pp. 570, 571, 573; for those of frs. see M.D. 1900, p. 40; R.B. 27, p. 106.

The oaks are mostly trees, often tall with massive trunk and stout spreading limbs, with medium-sized, short-petioled leaves, usually more or less lobed, dentate or serrate, rarely entire, with inconspicuous flowers, the staminate ones in slender pendulous catkins and with fruits or "acorns" consisting of a globular to oblong nut inclosed at the base only, rarely wholly or nearly wholly, by a cup-like involucre. The oaks comprise some of the most important forest trees of the northern hemisphere. The wood of most species is strong, tough, hard, durable, and highly valued for many purposes, especially ship-building, construction, for furniture, and in the manufacture of wagons, tools and many other articles. The bark of some species, in America that of Q. velutina and Q. Prinus, is used for tanning leather. Cork is obtained from the bark of Q. Suber and Q. occidentalis in southern Europe. The bark of a few species has also been employed in medicine. The acorns of several species are edible, in America especially those of Q. Prinus, Q. Emoryi and Q. lobata; in Europe those of Q. Itez var. Ballota and Q. Aegilops; in Japan those of Q. glauca; in many European countries the acorns of all species are an important food for hogs. In eastern Asia a silkworm feeds on the leaves of different species. A parasitic insect living on Q. coccifera in...
southern Europe and northern Africa yields a scarlet dye. Galls caused by the puncture of certain insects are used for tanning and dying and are now chiefly obtained from Q. ilex var. infectoria in western Asia. Some of the above-mentioned species are described only in the supplementary list, page 292.

The deciduous species are mostly hardy North, while of the evergreen ones none seems to be hardy farther north than Washington, D.C.; some half-evergreen, as Q. alba, Q. elaeagnus, and Q. coccifera, form symmetrical broad pyramids. A very few hardy species are shrubs, generally called scrub oaks, as Q. prinoides and Q. ilicifolia. Oaks rank among our most valuable park and avenue trees, and are as beautiful when grown as single trees as they are when grouped together and forming groves and woods. As avenue trees, Q. palustris, Q. rubra, Q. coccinea, Q. imbricaria and Q. Phellos are among the best, the last-named when medium-sized trees are desired; in the southern states, Q. laurifolia, Q. nigra, and the evergreen Q. virginiana are preferred. The shrubby species, like Q. prinoides and Q. ilicifolia, may be used for covering rocky hillsides and dry ridges.

Oak leaves are always beautiful. They have many shades of green; especially attractive are some with leaves of contrasting colors, the under side being silvery white, the upper one dark green, as in Q. Muhlenbergii, Q. macrocarpa, Q. Prinus, and some foreign evergreen species. In many oaks the leaves show a handsome pink or crimson color when unfolding, and some species assume brilliant autumnal tints. Especially beautiful in autumn are Q. occidentalis and Q. palustris, with the foliage turning brilliant scarlet; Q. rubra, Q. imbricaria, and Q. Prinus, which turn bright or dark red; Q. alba, violet or vinous purple; Q. lyrata, scarlet or orange; Q. Phellos, pale yellow; Q. montana, orange or orange-brown; Q. falcata and Q. ilicifolia, orange-brown or yellow; Q. stellata and Q. nigra, brown or dull orange. Some of the foreign species, like Q. sessiliflora and also Q. Robur, Q. Carris, Q. lasiusina, Q. glandulifera, and others, retain the green color until late in fall. Besides our native evergreen species, Q. ilex, Q. myrtifolia, and Q. glauca are among the best evergreen oaks for cultivation in the South; the European Q. ilex and Q. Suber are also handsome evergreen trees.

Generally the oak grows best in a moderately moist, rich soil, including heavy clay; some, as Q. bicolor, Q. nigra, Q. alba, Q. Phellos, Q. falcata, and Q. virginiana, prefer moister situations and grow naturally in low and often even in swampy ground; while others, especially the red oaks, like Q. rubra, Q. coccinea, Q. imbricaria, Q. miliariflora, Q. montana, and Q. stellata, grow well in drier, rocky or sandy soil, and the scrub oaks on dry and barren soil. The black and red oaks, especially the pin oak, are usually easily transplanted and large trees are moved successfully while the white oaks are more particular and only younger nursery-grown trees can be safely transplanted.

Oaks are propagated usually by seeds sown immediately after gathering in fall; this is especially necessary with Q. alba, Q. New York, and some other white oaks which sprout as soon as they are ripe; but only the root is produced in fall, while the stem does not appear until the following spring. The seeds of red and black oaks, and also of Q. Robur, if not sown soon, should be stratified and sown early in spring. Acorns should be packed in earthen, moss, or sawdust when shipped for a great distance. Varieties are usually grafted on potted stock in the greenhouse in early spring or sometimes in August. As a stock Q. Robur is preferred, but Q. rubra, Q. velutina, and Q. montana are also employed. It is probably safer to graft various white of and red oak each on stock of the same group. The evergreen species are sometimes increased by layers and also by cuttings.

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QUERCUS 2881

southern Europe and northern Africa yields a scarlet dye. Galls caused by the puncture of certain insects are used for tanning and dyeing and are now chiefly obtained from Q. ilex var. infectoria in western Asia. Some of the above-mentioned species are described only in the supplementary list, page 292.

The deciduous species are mostly hardy North, while of the evergreen ones none seems to be hardy farther north than Washington, D.C.; some half-evergreen, as Q. Pseudoburnetii and Q. masdoniana, will probably prove hardy in the proximity of New York, and some other white oaks which sprout as soon as they are ripe; but only the root is produced in fall, while the stem does not appear until the following spring. The seeds of red and black oaks, and also of Q. Robur, if not sown soon, should be stratified and sown early in spring. Acorns should be packed in earthen, moss, or sawdust when shipped for a great distance. Varieties are usually grafted on potted stock in the greenhouse in early spring or sometimes in August. As a stock Q. Robur is preferred, but Q. rubra, Q. velutina, and Q. montana are also employed. It is probably safer to graft various white of and red oak each on stock of the same group. The evergreen species are sometimes increased by layers and also by cuttings.

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QUERCUS

2888

1. rubra

2. palustris

3. coccinea

4. Schnect.ii

5. elipsoidalis

6. Kelloggii

7. velutina

8. falcata

9. pagodaefolia

10. ilicifolia

11. nigra

12. miliariana

13. Phellos

14. Laurifolia

15. imbricaris

16. variabilis

17. dentata

18. mongolica

19. glandulifera

20. aliena

21. Muhlenbergii

22. prinoides

23. Prinus

24. montana

25. macrocarpa

26. stellata

27. lyra

28. stellata

29. Garryana

30. Lobata

31. Alba

32. Robur

33. sessiliflora

34. lanuginosa

35. Tosa

36. conferta
ALBA; 3, Q. velutina; 4, Q. rubra; 5, Q. MARIANTA; 6, Q. macro-

Cups deeper and somewhat turbinate; acorn usually

round head, the foliage turning dark red in fall. Hybrids are known with the following species, with Q. velutina, Q. FACATA, Q. Phellos and Q. imbricaria. Var. ambiguus, Fern. (Q. ambiguus, Michx. 1, not H.B.K. Q. boREALIS, Michx. f. Q. coccinea var. ambiguus, Gray.) Cups deeper and somewhat turbinated; acorn usually smaller. The northern form. See also note under No. 8.
one-half by the turbinate or deeply saucer-shaped cup gradually narrowed at the base, with closely appressed, brown-pubescent scales. S. Mich. to Man. and Iowa. S.S. 14:771.

6. Kelloggi, Newb. (Q. californica, Coop.). CALIFORNIA BLACK OAK. Fig. 3311. Tree, occasionally to 100 ft., with stout spreading branches forming an open, round-topped head; lvs. divided about to the middle by wide sinuses into usually 7 oblong, toothed lobes, pubescent when young, at length glabrous and glossy above, yellowish green and glabrous or floccose beneath, 3-6 in. long: fr. short-stalked; acorn ovoid or oblong, mostly rounded at the top, 1-1½ in. long, embraced about one-third or one-half by the deep hemispherical glabrous cup. Ore. to Calif. S.S. 8:416. G.F. 9:145.

7. velutina, Lam. (Q. tinctoria, Bartram). BLACK OAK. Fig. 3305, 3306, 3309. Tree, to 80, sometimes to 150 ft., with rather slender branches, spreading gradually into a narrow, open head: bark very dark brown, inner bark orange: lvs. pinnatifid, with 7-9 broad toothed lobes; dark and dull green above, brownish pubescent beneath at first, glabrous at length, except in the axils of the veins, 4-10 in. long: fr. short-stalked; acorn ovoid, ½-1 in. long, embraced about one-half by the hemispherical densely pubescent cup. Maine to Va., west to Ohio and Ky. S.S. 8:420. Em. 1:170. G.F. 5:55. 

—This species hybridizes with Q. coccinea, Q. rubra, Q. imbricaria and Q. Phellos (Q. heterophylla, Michx.).

8. falcata, Michx. (Q. digitata, Sudw. Q. cumulta, Auth., not Wang.). SPANISH OAK. Tree, to 70, rarely to 100 ft., with stout spreading branches forming an open, round-topped head: lvs. deeply pinnatifid, with 5-7 entire, acute and often falcate lobes gradually narrowed from a broad base and spreading at nearly right angles, separated by broad sinuses, drooping, dark green and glabrous above, tawny or grayish pubescent beneath, 3-8 in. long: fr. short-stalked; acorn subglobose, ½ in. high, embraced about one-half by the turbinate cup. N. J. to Fla., west to Mo. and Texas. S.S. 8:420. G.F. 8:104. P.E. 20:943. —Handsome, with peculiarly distinct foliage, but not quite hardy N. It appears that the original description of Q. rubra, Linn., applies to the Spanish oak (see Sargent in Rhodora 17:39); therefore, under a strict application of the rule of priority, Q. falcata, Michx. ought to be called Q. rubra and the tree heretofore known as Q. rubra ought to be known as Q. borealis, if var. ambiguus is not considered specifically distinct; otherwise it ought to receive a new name. The name Q. borealis applies more strictly to the northern form (Q. rubra var. ambiguus), while the more southern form becomes Q. borealis var. maxima, Sarg.

9. pagodefolia, Ashe (Q. falcata var. pagodefolia, Ell.). SWAMP SPANISH OAK. Tall tree, sometimes 120 ft. high, with wide-spread branches forming a broad open head, but narrow in the forest; branchlets tomentose: lvs. deeply pinnatifid, with 5-11 entire, acute, spreading leaves narrowed from a broad base and often falcate, dark green and lustrous above, white-tomentose beneath, 5-8 in. long: fr. short-stalked or nearly sessile; acorn ovate to subglobose, little over ½ in. across, inclined about one-half by the turbinate cup; scales loosely imbricate, pubescent except on the margin. Va. to Fla., west to S. Ill. and Ark. S.S. 14:772. —Handsome and valuable timber tree; about as hardy as the preceding species.

10. ilicifolia, Wang. (Q. Båntiæri, Michx. Q. rana, Sarg.). BEAR or SCRUB OAK. Intricately branched, spreading shrub to 10 ft. high, rarely small tree to 20 ft.: lvs. pinnately lobed, with usually 2 broad triangular lobes on each side, dark green and glabrous above, white-tomentose beneath, 3-8 in. long: fr. short-stalked or nearly sessile; acorn ovate, with the prickles set well back from the central peck, ½ in. long, embraced about one-third by the turbinate cup; scales loosely imbricate, pubescent except on the margin. Va. to Fla., west to S. Ill. and Ark. S.S. 14:777. —Handsome and valuable timber tree; about as hardy as the preceding species.

3308. Leaves of Quercus coccinea (X1g). No. 3.

3309. Acorns of Quercus coccinea (on left) and Quercus velutina. (Natural size.) Nos. 3 and 7.

3310. Quercus Schneckii. No. 4.
**Quercus lobata** (Michx.) Round-topped or often irregular head: lvs. short-petioled, oblong or subglobose, about one-half from the saucer-shaped cup. Figs. 3306, 3307. Tree, to 80 ft.: lvs. slender-petioled, oblong to oblong-lanceolate, acuminate, crenately serrate, with bristle-like teeth, dark green and glabrous above, whitish tomentulose below, 3½-6 in. long; fr. almost sessile; acorn subglobose, not much exceeding the large cup; scales thick, lanceolate, recurved. N. China. S.L.F. 1:28. Handsome tree with distinct foliage almost like that of *Castanea crenata*; has proved hardy in Mass. and W. N. Y.

**Quercus virgiliana** (Michx.) Michx. Handsome tree with large glossy foliage; hardy N. Tree, to 50 ft., with broad, round-topped head: lvs. short-petioled, obovate, sinuously toothed, with 3-6 rounded broad teeth on each side, dark green and usually glabrous above at length, light green and pubescent beneath, firm and leathery, to 12 in. long; fr. almost sessile; acorn ovate, ½-3½ in. long, embraced one-half by the large cup; scales lanceolate, thin, spreading and recurved. Japan, W. China. S.I.F. 1:27. F.E. 14:542 (pl. 29).—Remarkable for its large lvs., on young plants to 1 ft. long and 8 in. broad; hardy N. Var. pinnatifida, Matsum. (Q. pinnatifida, Franch. & Sav.). Lvs. divided almost to the midrib into linear lobes with crisp irregular margins, interesting form.

**Quercus sitchensis** (Bong.) Engelm. has obovate-lanceolate lvs. entire or coarsely toothed, with bristly teeth, soon glabrous, 4-6 in. long; cup turbinate.

**Subgenus Lepidobalanus. White Oaks.**

16. *variabilis*, Blume (Q. chinensis, Bunge, not Abel. Q. Bungeana, Forbes. Q. serrata, Carruth., not Thunb.). Tree, to 80 ft.: lvs. slender-petioled, oblong-lanceolate, acuminate, crenately serrate, with bristle-like teeth, dark green and glabrous above, whitish tomentulose below, 3¼-6 in. long; fr. almost sessile; acorn subglobose, not much exceeding the large cup; scales thick, lanceolate, recurved. N. China, Japan. S.I.F. 1:28.—Handsome tree with distinct foliage almost like that of *Castanea crenata*; has proved hardy in Mass. and W. N. Y.

17. *dentata*, Thunb. (Q. Dalmio, Hort. Q. oboead, Bunge). Tree, to 80 ft., with broad, round-topped head: lvs. short-petioled, obovate, sinuously toothed, with 3-6 rounded broad teeth on each side, dark green and usually glabrous above at length, light green and pubescent beneath, firm and leathery, to 12 in. long; fr. almost sessile; acorn ovate, ½-3½ in. long, embraced one-half by the large cup; scales lanceolate, thin, spreading and recurved. Japan, W. China. S.I.F. 1:27. F.E. 14:542 (pl. 29).—Remarkable for its large lvs., on young plants to 1 ft. long and 8 in. broad; hardy N. Var. pinnatifida, Matsum. (Q. pinnatifida, Franch. & Sav.). Lvs. divided almost to the midrib into linear lobes with crisp irregular margins, interesting form.

**Quercus sessiliflora**, Fisch. Tree, to 100 ft.: branches glabrous: lvs. on very short petioles less than ¾ in. long, obovate to obovate-oblong, obtuse at the apex, narrowed toward the rounded or auriculate base, coarsely toothed or sinuously lobed, with short and broad usually obtuse or obtusate teeth, dark green above and glabrous, paler green and glabrous beneath or pilose on the veins only, 4-8 in. long; fr. several or solitary on a short stalk or nearly sessile; acorn ovoid or ellipsoid, about ¾ in. long, embraced about one-third by the cup which is grayish tomentulose with thickened tuberculate scales, thinner and acuminate at the slightly fringed margin. E. Siberia, N. China, Korea, N. Japan. Var. grosseserrata, Rehd. & Wilson (Q. grosseserrata, Blume. Q. crispula, Blume). Lvs. somewhat usually acutish at the apex with acute or acutish sometimes dentate teeth: cup with thin closely appressed scales, not fringed at the margin. Japan. Som. Japanese botanists distinguish *Q. crispula* as a species by the hemispherical cup inclosing the acorn about one-half from *Q. grosseserrata* which has a saucer-shaped cup inclosing the acorn one-fourth or one-third, but many specimens are intermediate in this character, and, as the lvs. of the two forms are exactly alike, it seems hardly possible to distinguish these two

**Quercus kelloggi**, Regel. & Wilson. (X7ii) Round-topped or often irregular head: lvs. short-petioled, oblong or subglobose, about one-fourth to one-third by the saucer-shaped cup. N. Y. to Fla., west to Mo. and Del. to Fla., west to Neb. and Tex. S.S. 8:426, 427. There are hybrids with *Q. ilicifolia* and *Q. Phellos*, and *Q. imbricaria*. Handsome tree, with large glossy foliage; hardy N. Better known as *Q. nigra*, but this name really belongs to the preceding species.

18. *Phellos*, Linn. Willow Oak. Figs. 3306, 3307. Tree, to 30 ft., sometimes becoming to 50 ft., with slender branches forming a conical, round-topped head, lvs. short-petioled, linear-oblong, bright green above, pubescent below when young, glabrous and light green at length, 2-4 in. long: frs. almost sessile, acorn subglobose, ½-¾ in. high, embraced about one-fourth by the saucer-shaped cup. F.E. 18:592 (pl. 62).—Handsome medium-sized tree with handsome foliage turning pale yellow in fall; prefers moist or almost swampy soil.

19. *laurifolia*, Michx. Laurel Oak. Tree, to 60, occasionally to 100 ft., with comparatively slender branches forming a dense, round-topped head; lvs. oblong or oblong-obovate, sometimes slightly lobed, acute or rarely obtusish, dark green and shining above, light green and puberulous at first, glabrous at length, 2-6 in. long; fr. short-stalked; acorn ovoid or subglobose, about ¼ in. long, embraced one-fourth by the saucer-shaped cup. Var. pinnatifida, Matsum. (Q. pinnatifida, Franch. & Sav.). Lvs. divided almost to the midrib into linear lobes with crisp irregular margins, interesting form.

20. *mongolica*, Fisch. Tree, to 100 ft.: branches glabrous: lvs. on very short petioles less than ¾ in. long, obovate to obovate-oblong, obtuse at the apex, narrowed toward the rounded or auriculate base, coarsely toothed or sinuously lobed, with short and broad usually obtuse or obtusate teeth, dark green above and glabrous, paler green and glabrous beneath or pilose on the veins only, 4-8 in. long; fr. several or solitary on a short stalk or nearly sessile; acorn ovoid or ellipsoid, about ¾ in. long, embraced about one-third by the cup which is grayish tomentulose with thickened tuberculate scales, thinner and acuminate at the slightly fringed margin. E. Siberia, N. China, Korea, N. Japan. Var. grosseserrata, Rehd. & Wilson (Q. grosseserrata, Blume. Q. crispula, Blume). Lvs. somewhat usually acutish at the apex with acute or acutish sometimes dentate teeth: cup with thin closely appressed scales, not fringed at the margin. Japan. Som. Japanese botanists distinguish *Q. crispula* as a species by the hemispherical cup inclosing the acorn about one-half from *Q. grosseserrata* which has a saucer-shaped cup inclosing the acorn one-fourth or one-third, but many specimens are intermediate in this character, and, as the lvs. of the two forms are exactly alike, it seems hardly possible to distinguish these two...
forms as varieties. Var. grosseserrata has proved perfectly hardy at the Arnold Arboretum and forms handsome trees of vigorous growth.

19. *glandulifera*, Blume. Tree, to 40 ft., rarely to 70 ft., shrub in cult.; lvs. cuneate or rounded at the base, oblong-ovate to oblong-elliptic, acute with 7-12 glandular-tipped, acute teeth on each side, light green above, glabrous, whitish or grayish green beneath, pressed silky at first, almost half-evergreen, 2½-5 in. long; fr. peduncled, usually several; acorn ovate, about ½ in. high, embraced one-third to one-half by the cup. Maine to Ala., west to Minn. and Texas. S.S. 8:378. Em. 1:158.—Pretty shrub for covering dry and rocky ridges. In trade sometimes under the misleading name of *Q. humilis*, for which see suppl. list.

23. *Prinus*, Linn. (Q. *Prinus var. palustris*, Michx. *Q. Micahouri, Nutt.*). BASKET OAK. Cow Oak. Tree, to 100 ft., with round-topped, rather dense head; bark light gray, scaly; lvs. oblong or ovate-oblong, acute, deeply crenulate-toothed, with obtuse, mucronulate teeth, bright green and shining above, grayish tomentulose beneath, 4-7 in. long; fr. short-peduncled; acorn ovoid, 1-1½ in. high, embraced about one-third by the tomentose cup. Del. to Fla., west to Ind. and Texas. S.S. 8:382, 383.—The *Q. Prinus* of most recent authors is the following species. One of the most beautiful of the chestnut oaks; prefers moist soil.

24. *montana*, Wild. (Q. *Prinus var. monticola*, Michx. *Q. Prinus, Engelm., not Linn.*). CHESTNUT OAK. Rock CHESTNUT OAK. Fig. 3306. Tree, to 70, or occasionally to 100 ft., with broad, irregular head and dark brown, ridged bark; lvs. slender-stalked, oblong to oblong-lanceolate, coarsely crenulate-toothed, bright or yellowish green above, paler beneath, tomentulose when young, often almost glabrous at length, 5-8 in. long; fr. solitary or in pairs, on peduncles about 1 in. long; acorn ovoid, 1-1½ in. high, embraced about one-third by the cup. Maine and Ont. to Ala. S.S. 8:375, 376. Em. 1:155 (as *Q. Castanea*) and 156. G.C. III. 14:617. G.F. 1:510.—Handsome oak, growing well in rather dry soil. A hybrid of this...
oblong, 1-1 1/2 in. high, embraced one-third by the cup. Que. to Ga., west to Mich. and Ark. S.S. 8:380, 381. Em. 1:153. G.F. 4:296.-It is less desirable as an ornamental tree than many other species, but the wood is valuable. By the light gray bark separating in large thin scales and the numerous small branches which appear on the larger limbs and often on the trunk, it is easily distinguished from allied species.

36. macrocarpa, Michx. BUR OAK. MOSBY CUP OAK. Fig. 3306. Tree, to 80, sometimes 160 ft., with large spreading branches, forming a broad, round head; bark light brown, deeply furrowed; younger branches sometimes with corky wings; leaves obovate or oblong-obovate, lyrate-pinnatifid, with 4-10 pairs of lobes, the lower ones smaller, separated by wide and deep sinuses, the upper ones much narrower, sinuately dentate above the middle, bright green and shining above, grayish or whitish tomentose beneath, 4-8 in. long; fr. sessile or short-stalked; acorn broadly ovate or ovate, ¾-1 ½ in. high, embraced about one-half by the large 5/4-three-in.-wide cup, with the upper scales awned and forming a fringe-like border. Nova Scotia to Pa., west to Man. and Texas. S.S. 8:371, 372. Em. 1:149. G.F. 2:900:2: 907. Mn. 2:153. G.F. 4:242.

Var. olivariiformis, Gray (Q. olivariformis, Michx.). Leaves deeply pinnatifid, lobes almost as narrow and separated by wide sinuses: cup usually elongated, much higher than broad. S.S. 8:373. M.D.G. 1901:167.—The bur oak is of vigorous growth and becomes a stately tree and is of picturesque appearance in winter with its corky branches. The crown is often fan-shaped until tree is mature.

27. lyrata, Wall. OBERCUP OAK. SWAMP, or SWAMP POST OAK. Tree, to 100 ft., with rather small, often pendulous branches forming a symmetrical, round-topped head; leaves obovate to oblong-obovate, deeply lyrate-pinnatifid, with 3-5 pairs of oblong or lanceolate lobes, the lower ones much smaller, separated by a wide sinus from the upper ones, dark green and shining above, whitish tomentulose beneath or sometimes light green and pubescent: fr. short-stalked; acorn globose, ½-1 in. high, almost entirely inclosed by the large saucer-shaped cup; lower scales tuberculate, upper one subulate. Calif. S.S. 8:382. G.F. 3:611; 10:55, 202, 205. C.L.A. 1:83.—Graceful wide-spreading tree; has not been cult. successfully outside of Calif.

31. albita, Nees (Q. Hindel, Bentham). VALLEY or WEEPING OAK (WHITE OAK of the Pacific States). Tree, to 100 ft., with stout spreading branches forming a broad, open head; bark light gray; leaves obovate or oblong-obovate, narrowed at the base, with 3-8 pairs of rather narrow obtuse and sometimes toothed lobes, pubescent when young, soon glabrous, bright green above, glaucous beneath: fr. short- or long-stalked; acorn oblong-ovate, 1 in. high, embraced about one-third by the cup; scales closely pubescent. Maine to Fla., west to Minn. and Texas. S.S. 8:356, 357. Em. 1:145. G.F. 3:91:4:6, 7; 5:259, 450. F.E. 20:650 (pl. 110); 32:489.—The white oak is one of the noblest trees of the northern states and a beautiful park tree, where space can be allowed for its full development; the foliage assumes a beautiful deep vinous red or violet-purple color in fall. Var. repanda, Michx., is a form in which the leaves have rather shallow sinuses and the frs. are usually short-stalked. Var. pinnatifida, Michx., has the leaves deeply pinnatifid with narrow often deeply toothed lobes and the frs. usually

Fig. 3312. Tree, to 100 ft., with great, wide-spreading limbs and slender drooping branches; leaves oblong or oblong-obovate, narrowed at the base, with 3-8 pairs of rather narrow obtuse and sometimes toothed lobes, pubescent when young, soon glabrous, bright green above, glaucous beneath: fr. short- or long-stalked; acorn oblong-ovate, 1 in. high, embraced about one-third by the cup; scales closely pubescent. Maine to Fla., west to Minn. and Texas. S.S. 8:356, 357. Em. 1:145. G.F. 3:91; 4:6, 7; 5:259, 450. F.E. 20:650 (pl. 110); 32:489.—The white oak is one of the noblest trees of the northern states and a beautiful park tree, where space can be allowed for its full development; the foliage assumes a beautiful deep vinous red or violet-purple color in fall. Var. repanda, Michx., is a form in which the leaves have rather shallow sinuses and the frs. are usually short-stalked. Var. pinnatifida, Michx., has the leaves deeply pinnatifid with narrow often deeply toothed lobes and the frs. usually
slender-stalked. S.S. 8:358. Hybrids of this species with *Quercus macrocarpa*, *Q. montana*, and *Q. stellata* are known. S.S. 8:359-61. The hybrid with *Q. montana* was found in the nursery of John Saul, near Washington, D.C., and has been distributed as Saul's oak (*Q. Sauliti*, Schneid.).


34. lanuginosa, Thuill. (Q. *pubescens*, Willd.). Tree, to 40 ft., but sometimes remaining shrubby; branches tomentose when young; lvs. pinnately lobed or pinnatifid, with 4-8 pairs of obtuse or acute lobes, glabrous above, pubescent or tomentose and grayish green beneath, 2-4 in. long; fr. almost sessile; acorn ovoid, ½-1 in. long, inelosed about one-half by the tomentose cup; scales closely appressed. Cent. and S. Eu., W. Asia. H.W. 2:22, pp. 69-71. A very variable species, often shrubby, growing mostly on dry, rocky, and often on limestone soil; the more southern forms are tender. Var. *Hartwissiana*, Dipp. *Q. Hartwissiana*, Hort.). Lvs. small, rather acutely lobed, yellowish tomentose beneath. Var. *pinatifida*, Schneid. (*Q. pubescens* var. *pinatifida*, A. Braun). Lvs. deeply lobed. Var. *cristata*, Beck, is similar but margin more crisp and under side more tomentose. Var. *pendula*, Jacq. (*Q. Zeliana*, var. *pendula* and *Q. pseudoliriontis pendula*, Hort.), with pendulous branches

3318. Variation in the leaves of live oak.—*Quercus virginiana* (Nearly natural size). No. 40.
and densely tomentose lvs., resembles the following species and is supposed by some authors to be a hybrid between the two.

35. T. záta, Bose (Q. pyrenáica, Willd. Q. camáta and Q. crínita, Hort.). Tree, to 40 ft., with slender branches; branchlets yellowish tomentose; lvs. pinnatifid half-way to the middle or more, with rather narrow and acute lobes, pubescent above, yellowish or grayish tomentose beneath, 3-5 in. long; fr. short- or long-peduncled; acorn oblong, embraced one-third to one-half by the tomentose cup; scales loosely appressed, nut large. Spain, S. France. Var. pendulá, Dipp., with pendulous branches.—Somewhat tender N.

36. conferta, Kit. (Q. pannonáica, Hort. Q. húngárica, Hubény). Tree, to 120 ft., with gradually spreading branches forming a round-topped, open head; bark rather light brown; lvs. very short-petioled, acuminate at the base, obovate, deeply pinnatifid, with 5-7 pairs of often toothed lobes, dark green and almost glabrous at length, pale and tomentose beneath, 4-7 in. long; fr. short-peduncled; acorn ovoid-oblong, embraced about one-third by the cup; scales rather large, loosely appressed. Italy, S. E. Eu. Q.C. Ill. 5:85. F.E. 19-236 (pl. 99). H.W. 2:24, pp. 72, 73.—Handsome oak with dark green foliage; hardy in Mass., but seems not reliable farther north.

37. Cérris, Linn. Terrýy Oak. Tree, to 120 ft., with rather short spreading branches forming a broad pyramidal, at length often irregular open head; lvs. oblong or obovate-oblong, pinnatifid, with 3-8 pairs of entire or few-toothed lobes, dark green and somewhat rough above, grayish pubescent or almost glabrous beneath at length: fr. short-stalked, ripening the second year; acorn oblong-ovate, to 1½ in. long, embraced about one-half by the large mossy cup. S.E. Eu. W. Asia. Mn. 3:166. Gm. 27, pp. 476, 477. H.W. 2:25, pp. 74-6. G.W. 8, p. 181. F.E. 14:1264 (pl. 41).—Handsome oak with dark green foliage and of pyramidal habit when young, but not quite hardy N. Easily recognized even in winter by the slender subulate scales surrounding and exceeding the winter buds.

3320. Quercus chrysolepis. (×3) 

úta, Loud. Lvs. deeply pinnatifid, often almost to the midrib divided into narrow oblong acute lobes. Var. ambryóyána, Aschers & Graebn. (Q. ambryóyána, Simonka). Lvs. half-evergreen, smaller, subcoriaceous, glabrous above, with bristly teeth; stipules smaller, caducous. Hungary.—There are hybrids with Q. Suber, for which see Q. Lucombeana, in suppl. list. Var. laciníata, Loud., Lvs. long-petiolate, less deeply lobed, or almost sinuately dentate with short, acute entire lobes. For Q. australiaca sempervirens, see Q. Pseudotaurinera in suppl. list. Var. laciníata, Loud., Lvs. deeply pinnatifid, often almost to the midrib divided into narrow oblong acute lobes. Var. ambryóyána, Aschers & Graebn. (Q. ambryóyána, Simonka). Lvs. half-evergreen, smaller, subcoriaceous, glabrous above, with bristly teeth; stipules smaller, caducous. Hungary.—There are hybrids with Q. Suber, for which see Q. Lucombeana, in suppl. list.

38. Sûber, Linn. Córk Oak. Evergreen tree, to 50 ft., with broad round-topped head and thick, deeply furrowed, spongy, elastic bark; lvs. oblong to oblong-rounded or subcordate at the base, remotely serrate glabrous above, whitish tomentose or sometimes glabrescent beneath, 1-3 in. long; fr. short-stalked; acorn ovate or oblong-ovate, ½-1½ in. high, embraced about one-third by the cup; scales thick, usually with short and often recurred tips. S. Eu. N. Afr. H.W. 2, pp. 80, 81. G.W. 8, p. 182.—From this species cork is obtained; it is much cult. for this purpose in E. India and recently also in Calif., where it seems to thrive well. Q. ocrédens, Gay, differs chiefly in the fr. ripening the second year, in the less persistent lvs., the old one mostly falling in spring, in the shorter scales of the cup and in its greater hardness; its bark is not distinguished commercially from that of the true cork oak.

39. Íls, Linn. Holly or Holm Oak. Evergreen tree, to 60 ft., with large, round-topped head; bark not corky; lvs. very variable, ovate to lanceolate, remotely serrate or almost entire and with revolute margin, dark green above, yellowish or whitish tomentose or sometimes glabrescent beneath, 1-3 in. long; fr. 1-3, usually peduncled; acorn ovate, embraced about one-half by the cup; scales thin, appressed, rarely slightly spreading. S. Eu. M. D.G. 1898:275. H.W. 2:25, pp. 77-79. G.M. 54:805. Gm. 65, p. 320. Var. Ballota, DC. (Q. Ballota, Dips.). Lvs. smaller, orbicular or broadly ovate; the sweet acorn is often gathered for food. Var. Fordii, Nichols. (Q. Fordii, Carr.). Of pyramidal habit with narrower and smaller lvs. R.H. 1861, pp. 114, 115; 1885, pp. 352, 353. Not to be confused with Q. Fordiana, Hemsl., a Chinese species with chestnut-like lvs.

40. virginiana, Mill. (Q. virginiana, Ait.). Live Oak. Figs. 3317-3319. Evergreen tree, to 50 or rarely to 70 ft., with almost horizontal limbs, forming a widespread head; sometimes shrubby; lvs. elliptic or oblong, usually entire, with revolute margin, rarely with a few spiny teeth above the middle, dark green and glossy above, whitish tomentulose beneath, 1-3 in. long; fr. peduncled; acorn ovate, about 1 in. long, embraced about one-third by the cup; scales thin, appressed. Va. to Fla., west to Mex. S.S. 8:394, 395. G.F. 1:476; 5:486, 487; 6:7; 8:235. F.R. 1:643. G.E. 8:1. G.W. 9, p. 505.—One of the most beautiful of the American oaks and much planted as a shade and avenue tree in the southern states; easily transplanted and of rapid growth; also very beautiful as a timber tree.

41. chrysolepis, Liebm. Calóríñía Live Oak. Maui Oak. Fig. 3320. Evergreen tree, to 50, rarely to 100 ft., with wide-spread head and often pendulous branches; lvs. short-petioled, oval to oblong-ovate, acute and spiny-toothed or entire, bluish or yellowish above, glaucous beneath; covered with fulvous tomentum when young, 1-4 in. long; fr. short-stalked, ripening the second year; acorn ovoid, ½-1½ in. high, embraced about one-fourth by the shallow cup which is often very thick and densely fulvous-tomentose. Ore. to Calif. S.S. 8:368, 369. G.F. 8:127.—The most beautiful of the Californian oaks.

42. agrífolia, Née. Figs. 3321, 3322 (adapted from Pacific R. R. Report). Similar in habit to the former, sometimes shrubby; lvs. broadly ovate to oblong, sinuately spiny-toothed, usually convex, dull green above, light green below, pubescent at first, 1½-3 in. long; fr. usually sessile; acorn conic-ovate, often elongated, to 1½ in. long, embraced one-fourth to one-third by the cup; scales thin, slightly puberulous. Calif. S.S. 8:403. F.S. 7, p. 138.

Subgenus Cyclobalanopsis.

43. glauca, Thunb. (Cyclobalânóspis glauca, Oerst.). Evergreen tree, to 45 ft.; branchlets glabrous or nearly
so: lvs. on slender petioles 1½-1 in. long, elliptic-oblong to ovate-oblong, acuminate, broadly cuneate or nearly rounded at the base, dentate along the margin, lustrous above, glaucous beneath and silky, at least while young, 3½-5½ in. long: fr. short-stalked, 1½ in. cup subcircular-shaped, silky-pubescent outside, with 5-7 concentric rings; nut elliptoid, 2½ in. long. Japan. S.F. 150. 8:

44. myrsinefolia, Blume (Q. Vibriagyana, Franch. & Sav. Q. bimisiaeformis, Fort., not Hance). Cyclobalanopsis vibragyna, Schott.) Everett ree, to 50 ft.: lvs. lanceolate or oblong-lanceolate, acuminate, cuneate at the base, glabrous or pubescent from the beginning, shining green above, 3½-5 in. long, ½-1½ in. wide: fr. in short spines; nut oblong-ovoid, 1½-2½ in. long, emarginate about one-third by the glabrous cup, consisting of about 6 concentric rings. Japan. 150. 8:

19. p. 285; 79, p. 388.—Handsome tree, rare in cult. The species in the following list are not hardy North except when planted in the South or the Southern states. In the American trade confused with Q. acuta and in European gardens with Q. glauca.

45. acuta, Thunb. (Q. Buergeri, Blume. Cyclobalanopsis acuta, Oerst.) Everett small tree: lvs. oblong-ovate to ovate-lanceolate, acuminate, rounded at the base, cuneate or truncate on the margins at the base: pubescent on the margin: glossy green above, yellowish green beneath, glabrous, only when unfolding covered with a brownish quickly disappearing film, 3½-5½ in. long: fr. in nearly sessile clusters: lvs. oblong-elliptic, about ½ in. long, emarginate about one-fourth by the pubescent cup, consisting of about 6 concentric rings. Japan. Korea. S.F. 1:32. G.L. 19, p. 388.—Handsome tree, rare in cult.

Var. Acuta, Michx. BLUE LEAFED.-Q. acuta, var. aurea, Torrey=Q. Acuta aurea, Torrey. Lvs. on slender petioles; ½ in. long, elliptic-oblong, usually glabrous, at least when young, 2½-3½ in. long: fr. almost sessile. Garden origin. Q. acuta, var. aurea, Torrey. Lvs. on slender petioles; ½ in. long, elliptic-oblong, usually glabrous, at least when young, 2½-3½ in. long: fr. almost sessile. Garden origin.

Var. Atkinsoniana, var. aurea, Torrey=Q. Atkinsoniana aurea, Torrey. Lvs. oblong-elliptic, with 5-7 ribs, faintly pubescent outside, with 5-7 concentric rings; nut ovoid-elliptic, about ½ in. long, embraced about one-half by the cup. Japan. S.I.F. 1:32. G.L. 19, p. 388.—Handsome tree, rare in cult.
Iv. eliptica—oblong to lanceolate, acuminate, serrate above the middle, thinly and bordering by a broad, irregular, creamy white margin.

4 or 5 wavy concentric long and divided near the base, serrate, glaucous, 4-5 in. long; fr. in short spikes; acorns ovate, about 5 in., cup with concentric crenate rings, gray tomentulose. Cent. Chile, A. var. Fargesii, Rehd. & Wilson. Lvs. smaller; rings of cup entire.

Q. mongolica, Hort., not Q. mongolica, Willd. Evergreen small tree, to 30 ft., with spreading, often contorted branches; allied to Q. undulata. Lvs. ovate-oblong, acute, serrate, veins prominent, close and meeting in the midrib, wide, armed with stout upturned spines; spike dense, up to 8 in. long, many-flowered, the bracts rounded at apex, usually entire; frs. up to 2 in. long; sepals webby below; petals blue above; stamens much shorter than petals. Brazil. B.H. 1882:48 (as Q. refa). F.S. 10:1028. Gt. 1875:324.

GEORGE V. NASH.

QUILLALA (from Quillata, the Chilean name, which comes from guilltun, to wash: the bark of the tree contains saponin, an antimony compound, which when cleaned or washed makes it useful as soap). Rosaceae. Glabrous evergreen trees, whose bark is sometimes saponaceous, occasionally grown in the greenhouse and hardy outdoors in the southern United States.

Leaves sparse, petioled, simple, thick-coriaceous, rather entire; stipules small, deciduous; peduncles axillary and terminal, 3-5-flowered; fls. polygamous-dioecious, rather large, tomentose, the lateral male, the central female; petals, calyx, leaves, persistent, lobes 5, broadly ovate, valvate; petals 5, small, sessile, spathulate; disk thick, fleshy, 5-lobed; stamens 10; carpels 5; follicles 5, oblong, obtuse, leathery, cohering at their base, many-seeded. About 3 or 4 species, natives of S. Brazil, Chile, and Peru.

Saponaria, Molina. Soap-bark Tree. A large tree; lvs. 1½-2 in. long, ovate, shining, dentate, short-petioled; fls. white, about 5 in. across, usually terminal, solitary, or in clusters of 3 or 5 on the same peduncle. Chile. B.M. 1765-66. Cult. in S. Calif. F. TRACY HUBBARD.
farm. In a few cases, when its merits are recognized, it is given drier richer ground and cultivated with judicious care. Naturally, the quince is adapted to deep rich warm soils. The fertility of the soil should be strongly emphasized, as the root, instead of penetrating deeply, spreads out extensively and consequently is near the surface. It is slow-growing on any soil but responds very quickly to good fertility. On cold damp soils the fruit is inclined to be woody and it may possibly be for this reason that the quince is not more popular for preserving purposes. On the richer drier soils the quality is much improved. The idea is very prevalent that the tree is adapted to low ground. The lower grounds, generally speaking, are richer, but in this respect only may the trees be said to be adapted to it. Excessive moisture is harmful to the quince as to other fruits. Cultivation must be judicious. In many respects it should resemble that given the dwarf pear. The roots being near the surface, cultivation and especially plowing must be shallow. It is common practice to ridge well up to the trees not only to protect the roots but to permit easy drainage; also the tree being very subject to fire blight, it does not permit of thorough cultivation with the consequent succulent wood-growth. Moderate cultivation in spring and early summer followed at once by a cover-crop or a good sod-mulch is considered good practice.

The quince tree is small, twisted and dwarf in its habit. It seldom reaches a height of more than 12 or 15 feet, although some grow higher. The larger number are much lower. Being dwarf in its habit, the quince tree can be planted as close as 13 to 15 feet in an orchard, the latter distance being the more popular. Planted too close, it is forced upright, like other trees. The fruiting habit is distinct and peculiar, resembling no other orchard fruit, but is similar to the hickory and the walnut. The blossoms are produced on the current season's growth (Fig. 3323). A short growth starts from the terminal winter bud and on the end of this the flower and fruit are produced (Figs. 3324, 3325). There is no proper stem or peduncle to the fruit, but the quince sits close or sessile on a short leafy branch. The wood-growth is continued by an axillary bud of the previous season. This peculiar habit of growth gives the tree its crooked bunchy appearance. (Fig. 3326.)

Pruning should receive careful attention, otherwise the quince tree will soon become too thick and also more or less unshapely. When set in orchard, the young tree may be pruned to a short whip, as shown in Fig. 3327. The trunk is kept very short; some growers prefer to start the top as low as shown in Fig. 3328, but the former and probably still the prevailing practice is to grow a trunk like those seen in Fig. 3329. These longer trunks are convenient if one is to use the curculio catcher, as shown in Fig. 3330. The pruning consists in keeping the top open and well spread (Fig. 3328). To cause the top to spread and to keep it low and within bounds, more or less heading-in may be practised; but as the fruit-shoots spring from the ends of the branches, clipping-in of all the tree would remove practically all the fruit.

The questions of cultivation and fertilizers are largely inter-related. Thorough tillage makes available a large amount of plant-food, and consequently less fertilizer is necessary. However, too thorough cultivation and consequent succulent growth increases blight. The question of fertilizers comes down to one of producing moderate growth of a hardy resistant nature. This means that in cultivated orchards, heavy applications of nitrates or nitrogenous manures must be withheld. Phosphate and potash on the other hand can be applied in quantity, especially on the lighter soils. The cover-crops will probably supply the necessary nitrogen. If growth is very slow, a light application of farmyard manure may be made. Lime and land-plaster can also be applied in quantity. The fruit is sold in eleven-quart baskets, bushels, and barrels, and ranges from 75 cents to $1.25 a bushel, depending on the market and the demand. In Ontario the demand is very limited and there are scarcely any orchards on a commercial basis. In the eastern states and especially New York State, there are some orchards of considerable size (Fig. 3329). The fruit, though apparently hard and long-keeping, is comparatively easily bruised or marked and must be handled with care.
The trees begin to bear a few fruits the second and third years after planting but can not generally be said to bear a profitable crop until ten to twelve years of age. The fruit is very subject to limb-rub and disease, and must be carefully grown to look well. The ordinary practice is to spray the tree with dormant-strength lime-sulfur at the same time that the apples and peaches are sprayed and then again just after the fruit is nicely set with bordeaux mixture, to each forty gallons of which has been added three pounds of lead arsenate. Summer-strength lime-sulfur with the above amount of poison would give the same results for the summer spray. Judicious pruning also tends to thin the fruit and improve the quality. Seedling stocks—Quince of Angers—are largely imported from Europe for roots. These roots are used also for dwarfing the pear. The trees are grown much the same as other nursery trees. The seedlings are set in the nursery row in early spring and budded in August. By a year from the following spring, that is two years from the setting of the seeding, the trees are ready for the planter. The quince can also be propagated by cuttings, mound-layering and root-grafting, but the above-named method is the common one in practice. Trees received from the nursery should be given the same care as other nursery trees. Heel them in carefully if the soil is not ready for planting. Plant about 2 inches deeper than the bud. Head at 15 to 20 inches. If budded trees are used and planted the proper depth, there is little or no danger from suckering. The most damaging diseases are fire-blight, affecting the wood and especially the new growth; leaf-blight, affecting branches, fruit and foliage; and black-rot and bitter-rot, affecting the fruit. For the fire-blight, the worst disease, there is no direct remedy, but trees should not be allowed to over-grow, wild hawthorns and wild apples and pears near the plantation should be destroyed, and all affected parts should be removed promptly. The most serious insect attacking the quince is the quince curculio (Conotrachelus crategi). This may be controlled by spraying with six to eight pounds of lead arsenate to one hundred gallons of water, or in the place of water bordeaux mixture at the proper season. This must be done when the beetles first make their appearance and again about ten days later. This insect is found on the quince in Ontario. The same insects as attack the apple generally attack the quince and the treatments are similar. Sometimes the jarring method is employed, as shown in Fig. 3330, as for the plum, the beetles being knocked off by hitting the tree with a padded mallet. Orange (Fig. 3325) and Champion are the leading varieties of quince. The former is the variety most largely grown in Ontario and previous to 1870 was the only variety. It is large in size, skin golden yellow with greemish or russet color around stem. The flesh is tender and the flavor good. The season is late September and October. Its origin was southern Europe. The latter variety, of American origin, is large, pear-shaped and on the tree has a distinctly greenish yellow color. The tree is larger and taller-growing than Orange. The fruit is very late ripening. Other commonly grown varieties are Bentley, Fuller, Rea, Meech, and Van Deman. F. M. CLEMENT.

QUISQUALIS (Latin, who, what kind). Combretaceae. Rambling subscandent large shrubs, including the rangoon creeper which is hardy in the extreme south of the United States and is also sometimes grown in the warmhouse. Leaves opposite, oblong or obovate, acuminate, entire; fls. in short spikes, axillary and terminal, white or red; calyx-tube prolonged, long and slender above the ovary, deciduous; petals 5; stamens 10; short; ovary 1-celled: fr. dry, coriaceous, 5-angled or 5-winged,
1-seeded.—About 4 species, chiefly Indian, 1 in Trop. and S. Afr. The name *quisqualis* means literally *who? what?* and is said to have been given by Rumphius in astonishment at the plant’s behavior, for it is said to grow erect and shrub-like to a height of 3 ft., when it throws out from the base a new growth that climbs up the neighboring trees, after which the original shrub perishes. Many other interesting statements about this plant are made in B.M. 2033.

*Quisqualis indica* is cultivated in northern hothouses. For best results it should be planted in beds of soil composed of fibrous loam, peat, and sand. The flowers appear from June to September, and last well when cut. After flowering the plant should be cut back severely and water applied less frequently until the wood is ripened. New growth starts the following spring. If the plant is kept in a very hot and humid atmosphere, it makes a rampant growth. It is remarkably free from insect pests and fungous diseases. Propagation is by softwood cuttings inserted in sand with bottom heat. (Emil Mische.)

*indica*, Linn. (*Celtis nütans*, Hort. Reasoner, not Roxbg.). RANGOON CREEPER. Lvs. 4 in. long, nearly glabrous; calyx-tube extremely long (2–3 in.), slender, green; calyx-teeth triangular, acute, not acuminate; petals rose or scarlet; fr. with very sharp angles but hardly winged. Malaya. Widely cult. in tropics. B.M. 2033. B.R. 492. R.H. 1898:50 (as *Q. pubescens*).

F. Tracy Hubbard.†
RADERMÀCHIA (after J. C. M. Radermacher, 1757-83, a Dutch resident of Java, published a list of Javanese plants). Also spelled Radermachera. Bignoniaceae. Ornamental trees. Plants with large opposite, pinnate or bipinnate lvs. and large fls. in terminal panicles: calyx campanulate, truncate or dentate; corolla campanulate, with 4 or 5 incised sepals: caps. linear, loculicidal; septum thick spongy with the seeds in shallow impressions.—Only two species seem to be in cult.; they can be grown in warm temperate regions only, and are prop. by seeds, also by air-layering and by cuttings.—Species 8, in S. E. Asia.

R. sinica seems to revel in the light sandy soil of the Florida gardens. Its abundant, large, fern-like, crimped bipinnate foliage and its luxuriant symmetrical growth combine to make it an object of great beauty. It grows to a height of 10 to 12 ft. in one season, and if not cut down by a severe freeze it attains a height of 20 ft. in two years, provided the soil is made rich by a good fertilizer. Planted out in a conservatory in the North it soon reaches stately dimensions. It is easily raised from cuttings placed in sand. (R. Nehrling.)

pentandra, Hemsl. (Orozamia flavum, Rehd.). Evergreen tree, to 20 ft., glabrous: lvs. bipinnate, with the stout petiole 2-3 ft. long; lfts. oblong to oblong-lanceolate, entire, 3-7 in. long; panicule about 1 ft. long; calyx with 5 short toothed: fls. white and yellow; tube 2 in. long; limb spreading, about 3 in. across; stamens 5: caps. linear-cylindric, to 3 ft. long. S. E. China. Typical Chinese only. I. 1928. S. T. S. 1: 92.—Handsome tree with bold foliage and showy yellow fls. exhaling a heavy rather disagreeable odor; intro. by the Arnold Arboretum, and flowered in the greenhouse in 1903.

sativa, Hemsl. (Stereospermum sinicum, Haner). Evergreen tree: lvs. bipinnate; pinnae 8, each with about 7 stalked, ovate-lanceolate entire lfts. obtusely acuminate, glabrous, about 2 in. long; panicule large, terminal; calyx campanulate, with 5 short triangular teeth; corolla pale sulfur-yellow, with funneliform tube about 3 in. long and spreading roundish lobes about 1 in. long with crisped margin: caps. subterete, 16 in. long and rather showy. Numerous, the style short: pods seldom seen, globular, on ascending pedicels. Eu.; escaped in N. Amer. in moist places and along water-courses.—The long tough roots furnish the horse-radish of gardens. See Horse-Radish.

RÁDICA (litter radish or root). Syn., Roripa, Nasturtium. Cruciferae. Herbs, not cultivated except water-cress, horse-radish, and one or two others.

Plants mostly small, perennial, biennial, and annual, with small white or yellow fls. mostly in racemes: lvs. (or at least the lowermost) usually pinnate or pinnatifid, commonly glabrous: fr. a silicle or short siliquid, globaral to cylindrical, with strongly convex nerveless valves; seeds usually many, small and numerous, in most species in a double row in each locale, the cotyledons accumbent.—Species more than 50, widely spread in eastern and western hemispheres, inhabiting low grounds, swamps, and pools or streams, mostly weedy in character. These plants formerly appeared under the name Nasturtium, which, however, dates only from 1756 whereas Radicula dates from 1757. These plants probably should bear the name Roripa, which ec. The nasturtiums of gardens and are prop. by seeds, also more than 50, widely spread in eastern and western hemispheres, inhabiting low grounds, swamps, and pools or streams, mostly weedy in character. These plants formerly appeared under the name Nasturtium, which, however, dates only from 1756 whereas Radicula dates from 1757. These plants probably should bear the name Roripa, which ec.
much used for garnishing and for salads. See Cress. In the tropics Nasturtium indicum, DC. (see Koripa), is a desirable cress. This is an erect annual, with yellow, flat, and deeply pinnatifid (rarely entire) radial lvs. It is said to have been cult. in Europe, but it is probably useless or at least unnecessary outside the tropics.

L. H. B.

RADISH (Latin, radix, a root). A name applied to certain forms or species of Raphanus (of the family Cruciferae), particularly to the kinds that produce thickened edible roots; these roots are eaten raw, except some persons cook the large summer and winter kinds. See Raphanus.

The radish is variable in size, shape, color, and consistency of root and in season of maturity. Varieties may be classified as spring, summer, and winter radishes; or as globular, half-long, and long radishes; or as red, white, gray, and black radishes. Figs. 3331-3333 show some of the forms.

The origin and nativity of the radish are questions of dispute. For geographical reasons, it is supposed that the radish is wild in temperate Asia, probably in the oriental part, although truly indigenous radishes are doubtfully known. Not infrequently the radish runs wild about gardens, and in that case the root soon deteriorates into a small slender woody and more or less fibrous member. It has been thought by some that the radish is only a modified form of the wild charlock, or Raphanus Raphanistrum. In fact, experiments were made on the charlock by Carriere, who was able in a few years to produce edible radishes from the wild plant (cf. Cyclo. Amer. Hort. IV:1467). While these investigations seem to be conclusive that the radish can be produced from the charlock, they nevertheless do not prove that such was the actual origin of the garden radish. DeCandolle, whilst accepting Carriere's experiments, was unable to understand how the radishes of India, China, and Japan could have originated from the charlock, since that plant is unknown in those countries and the radish has been grown there for centuries. It is possible that the radishes of the Orient are a different species from those in Europe, although they are generally regarded as the same species. Recent experiments in France (Yvonne Trouard-Riolle, "Recherches morphologiques et biologiques sur les radis cultivés," Nancy, 1915) indicate that the cultivated radish has not been derived from R. Raphanistrum by cultivation, but that R. sativus is specifically distinct although little known as a wild plant. It is supposed that the Japanese radish is derived from one aboriginal form of R. sativus which is native of China and Japan, and that the European radishes have come from another aboriginal form.

The summer and winter radishes are not popular in this country unless among those of recent foreign origin. The winter radishes in particular are little grown. These are late-maturing kinds, requiring more of the season for growth and of such large size and firm flesh that they keep well, as turnips are kept. The summer and winter radishes require no special treatment, except that plans must be made to allow them a longer period. In eastern Asia are singular kinds of radish that are little known here. In North America, the small spring radishes comprise practically the range of general cultivation.

The rat-tail radish, Fig. 3346, is grown for its much-developed soft pods, which may be used as are radishes and in the making of pickles. It is rarely grown in American gardens, although it is well worth raising as a curiosity. It is annual, and its cultivation presents no difficulties. There is also a fleshy podded radish of parts of India, with the edible pods short and soft.

The radish is one of the most popular of garden vegetables. It is of quick growth, and the product is secured at the time of the year when fresh vegetables are in demand. In order that radishes may be of the best quality, they should have made rapid growth. The soil should be rich, light and loose,—one that drains readily and does not bake with heavy rains. Radishes fit for the table may be had in three to six weeks from the sowing, depending on the variety and season of maturity. Varieties may be classified as spring, summer, and winter radishes, depending on the time they mature. The radishes are divided into three classes, namely: (1) The small spring radishes comprise practically the radish that are little known here. In North America, the small spring radishes comprise practically the range of general cultivation.

Aside from the root-maggot, the radish is relatively free from insects and diseases. When the root-maggot appears in any place, it is usually best to discontinue the growing of radishes in that area for two or three years, until the insects have been starved out. The maggots may be killed by an injection of bisulfide of carbon into the earth about the plants; but this is usually more expensive than the product is worth. Carbolic acid emulsion may also be used. Early radishes may be grown in hotbeds or coldframes with the greatest ease, and in these places they are usually less subject to the attacks of the cabbage maggot, since the crop is matured in advance of the maggot season.

Radishes are readily forced in the winter months. It is necessary that the house be light. The soil should be a sandy loam, free from silt and clay. It is best to grow radishes in solid beds rather than on benches. They thrive best in a low temperature. The temperature during the day should not exceed 65° to 75° in the shade, and at night it may drop to 45° to 50°. If the temperature is too high, and particularly if the beds are given bottom heat, the plants tend to run to top rather than to root. The seed is usually sown in rows from 5 to 8 inches apart, and they are thinned in the row until they stand 2 or 3 inches apart. In order that the crop shall be uniform and mature simultaneously, it is advisable either to sift the seed or to transplant the young radishes. Galloway has found, by experiment, that radish seeds of inch in diameter are too small to give a satisfactory and uniform crop. He therefore advises that seeds be run through sieves with a mesh of that diameter in order to separate the small specimens. In a certain experiment, he secured from two pounds of commercial seed nineteen and one-half ounces of large

3332. Half-Long Scarlet radish. (x1/2)
seed, ten and two-third ounces small seed, the remainder being bits of gravel; sticks and other impurities. The chief value of this sorting lies in the greater uniformity of the crop. Almost every plant can then be relied upon to reach maturity. It is the practice in some houses to transplant the young radishes. The seed may be sown in flats or in beds at one end of the house, and when the radishes have made two or three leaves, they are transplanted into permanent quarters. In this operation, all the small and weak plants are discarded and the crop is therefore more uniform. It is supposed by some growers, also, that the breaking of the tap-root in the process of transplanting tends to make the tuber shorter and thicker and to induce an earlier maturity. By means of transplanting, the use of the house may be economized. Whilst one crop is growing, another may be started in a seed-bed or in flats. As soon as the first crop is removed, the ground may be thoroughly raked, fertilized, and the new plants put in. In some cases the new crop is transplanted between the rows of the old crop a few days before the latter is removed. But, unless the soil is rich and in good condition, it is better to wait until the crop is removed in order that the land may be thoroughly fitted for the new plants. Radishes are often grown in conjunction with lettuce. If they are grown in the same temperature, the varieties most used for forcing, as also for the early spring crop in the garden, are the globular or half-long kinds. With these varieties, a depth of soil of 4 inches is sufficient for good results.

L. H. B.

Another view of the cultivation of the radish.

There are few garden roots in which fresh crispness is more essential to palatability than in the radish, or which can be more easily held in prime condition for so long after gathering, and usually one is able to secure roots of excellent quality from the market. On the other hand, an abundant family supply can be grown on a small area and the radishes can be quickly gathered and fitted for the table, so that every country garden or even town yard may be easily made to furnish a family supply. Radishes are cool-weather plants, and although when young or quickly grown, they may be killed by severe or long-continued freezing, they will endure a moderate frost without injury; the plants do not thrive in the cooler weather of autumn. These require more stability-manure is very likely to result in ill-shaped coarse-grained strong-flavored roots, and the uniformity and symmetry of the root is very dependent upon the soil, the quality and friability of the soil. The seed should lie some ten to twenty grains to the foot, in drills about 1 inch deep, and covered with about an inch of soil. It has been found advantageous, just before the starting plants begin to push through the soil, to cover the row with a liberal sprinkling of either tobacco dust, or of land plaster and kerosene, as a repellant to black beetle and other insects.

Forcing varieties.

A group of varieties of radishes has been developed in which the roots reach usable size very quickly,—in some stocks by the time the cotyledons are full sized and before more than three or four leaves have developed,—so that under favorable conditions a culture may be started, grown to maturity, marketed and the roots become tough and unpalatable if grown slow and continue in prime edible condition much longer. In garden cultures, the first sowing should be made as soon as the ground can be worked and ordinarily it will furnish usable roots in twenty-five to thirty days and remain in edible condition from five to twenty days. To secure a succession, two to five sowings should be made at intervals of ten to twenty days, but it is useless to attempt to grow radishes in the hot weather of midsummer, as they would not only make a poor growth but the roots would be tough, strong-flavored and unpalatable.

Radishes require for their best, or even for a good development, a rich friable soil which has been made so by heavy manuring and judicious culture in previous years rather than by heavy manuring, while the use of fresh stable-manure is very likely to result in ill-shaped coarse-grained strong-flavored roots, and the uniformity and symmetry of the root is very dependent upon the soil, the quality and friability of the soil. The seed should lie some ten to twenty grains to the foot, in drills about 1 inch deep, and covered with about an inch of soil. It has been found advantageous, just before the starting plants begin to push through the soil, to cover the row with a liberal sprinkling of either tobacco dust, or of land plaster and kerosene, as a repellant to black beetle and other insects.

Seedsmen offer a wide range of varietal forms, ranging from the quick-maturing red or white Olive-Shaped, the Half-Long or the Long Scarlet, to the later-maturing longer-seasoned Chartier, or White Vienna, and the still later larger Strasbourg or Stuttgart, which might be classed as summer varieties, although when planted so as to mature in the heat of midsummer they are likely to be strong-flavored and unpalatable.

Fall and winter radishes.

There are varieties which develop to usable size more slowly than the preceding and which remain crisp and tender much longer. They should not be planted until midsummer or later so that they may come to maturity in the cooler weather of autumn. These require more room for their best development than the spring varie-

RING, ranging in shape from those distinctly flat, through flattened, thickened or long-turnip-shaped, and globular, to tankard or half-long, and in color from white through various shades of red and yellow to dark purple. In some varieties the color is of uniform shade over the whole root, in other much or less of the lower part is white, while in others the generally white surface is marked with dots and splashes of red. In the forcing of radishes, uniformity as to rapidity of maturing and in attraciveness of color are the most important qualities. The success of any culture is very dependent upon the varietal character of the seed used, and varieties are continually offering under new names stocks that are in reality but superior strains of the older varieties.

Spring radishes.

These are slower in coming into usable size than the forcing sorts, but the plants are larger, harder both to cold and heat, and the roots are larger and continue in prime edible condition much longer. In garden cultures, the first sowing should be made as soon as the ground can be worked and ordinarily it will furnish usable roots in twenty-five to thirty days and remain in edible condition from five to twenty days. To secure a succession, two to five sowings should be made at intervals of ten to twenty days, but it is useless to attempt to grow radishes in the hot weather of midsummer, as they would not only make a poor growth but the roots would be tough, strong-flavored and unpalatable.

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ties but are even more responsive to fertile well-prepared soil and frequent cultivation. They may be used as they reach desirable size and will stand considerable frost without injury, but should be pulled and stored much as one would carrots or parsnips so as to avoid severe freezing. The Long Black Spanish, the White Russian, the Chinese Scarlet Winter and Deep Scarlet Panier, the latter one of the most symmetrical and beautifully colored roots in cultivation, belong to this class which is well worthy of more general cultivation.

Chinese and Japanese radishes.

These are possibly the oldest of cultivated kinds. The large many-leaved plants are 2 feet or more across and form immense roots which not infrequently weigh forty to fifty pounds. The flesh is less agreeable in texture and flavor than that of the sorts more commonly grown, and though they have been loudly espoused by seedsmen, they have never come into very general cultivation in this country, except by the Chinese and Japanese who use them as a cooked vegetable more than as a salad.

Seed-growing.

There are few garden vegetables in which uniformity of varietal character is more important to satisfactory results than the radish. This is particularly true of the quickly maturing forcing varieties, the seed of which is largely grown in Europe. As grown there, carefully bred stock-seed is sown thickly in narrow rows and when the most mature roots reach usable size, the crop is pulled, all immature or off-character roots are rejected, and those which are of satisfactory form, size, and color are promptly reset about 10 inches apart in rows about 3 feet apart and soon start into fresh growth and mature a crop of seed.

In this country, seed of both the forcing and larger-rooted sorts are commonly planted ten to twenty to the yard in drills, 3 feet apart, and when the plants are mature enough to indicate their varietal quality, the plantings are carefully gone over, the inferior and superfluous roots pulled and destroyed, and superior ones to furnish the desired quantity of stock-seed are pulled and set out by themselves, where there will be little danger of the flowers being fertilized by pollen from other plants.

The yield and quality of seed is very dependent upon uniformly favorable weather conditions inducing a quick, even growth, fertilization of the flowers by insects, and freedom from storms or exceptionally high temperatures. A hive or two of bees in the field will often materially increase the yield of seed. When the later and the most immature pods begin to ripen, the plants may be cut and laid in windrows or piles not over 3 to 4 feet deep on the threshing-floors and allowed to remain from ten to fifty days (depending upon weather conditions), until the stems are fully cured and dry. The seed may then be threshed out either with flails or machine and sacked, but must be watched, and if necessary, winnowed out, to prevent heart-burn. It is a better practice, particularly with the later sorts, to leave the harvested plants under shelter until midwinter or early spring before threshing. Again, in case of some of the later harder-fleshed sorts, better yields are secured by not planting until autumn, and before severe weather, pulling, topping, and storing the small roots until spring, much as is done with seed-crops of beets or turnips.

W. W. TRACY.

RAFFIA is the Malagasy name of a palm which furnishes a staple article of commerce called raffia fiber. It is indigenous to Madagascar, where it grows without cultivation or attention of any kind. One palm leaf, or frond, produces eighty to one hundred long green divisions 2 to 5 feet in length, like the leaves of the sugar-cane, but of a dark lustrous green color and thicker and stiffer. The under part of this green leaf is of a pale greenish yellow color, and from that side the inner skin is peeled off in the same manner as the skin on the outside of a pea pod, except that it peels off straight to the tip without breaking. It is then of the palest green, and after being dried in the sun assumes a light straw-color. This is the raffia fiber of commerce. Raffia fiber is extensively used by the natives for making cloths called silk lambas and rebannas, which bring fancy prices in Europe and America, where it is used in the manufacture of various kinds of hats, and the like. A large trade is also had in raffia fiber in Europe for use in the manufacture of fancy baskets, but in America, while raffia fiber has been used to a limited extent in the manufacture of hats, its principal use is for tying vines, flowers, asparagus and celery bunches and the like. Raffia is not affected by moisture or change in temperature so as to risk cutting or winding the most delicate tissues, and it does not break or ravel when folded or knotted. These qualities bring it into general use in Europe, especially in the vineyards of France, where it is extensively used, and consequently maintains its price. It is virtually inexhaustible in Madagascar, the supply being limited only by the scarcity of labor. For export, the fiber is collected in large skeins, twisted or plaited, and then packed in compressed bales of about 100 kilograms (220 pounds) each. About 20,000 bales are exported annually.

CHAS. W. JACOB & ALLISON.

RAFFLESIA (named for Sir Thomas Stamford Raffles). Rafflesiaceae. Fleshy parasites, with a solitary large sallow fl. with a cadaverous odor rising from a superficial rhizome, leaves, fl. parts, and tube, fleshy, with a tube-hemispherical at the base, solid in the male fls., and adnate to the ovary in the female fls., broad-canapulate above the ovary, limb 5-parted, the segms. imbricated in 1 row; ovary inferior, with numerous ovules. About 5 species, Malaya. R. Arnoldi. R. Br. Fls. flesh-colored, 3 ft. across, mottled with a thick fleshy rim or corona lining the upper part of the tube. In the male fls. there is a thick fleshy column within the corona and adnate to the perianth-tube and having at the top a wide flat plate, the overhanging margin of which is revolute and on which is placed a ring of sessile anthers. The female fls. are similar, but lack the anthers and possess an ovary adherent to the base of the perianth-tube and having a single cell. Sumatra. G: 7:547. J.H. III. 54:373.

RAILROAD-GARDENING. That phase or application of landscape gardening (or landscape architecture) which aims to improve the appearance of railway rights-of-way and station grounds; and, as an art of design, which lays out the approaches and makes the subdivisions of the grounds as best to serve convenience and beauty.

In this article, in a cyclopedia of horticulture, it is not intended to discuss the theory of design for railway properties, but rather to consider the plant-growing features; yet the layout must be taken into consideration. The subdivision of the property and the general theory of arrangement are necessarily controlled by the nature of the property itself, the extent of trackage, the need for passenger and freight access, the size of settlement to be served. Probably nowhere are the main elements more rigidly fixed by the necessities of the case, for the engineering requirements must be met; and yet there are large civic relations that should receive careful consideration.

In a small suburban railway station property, the planting feature may well be very prominent or even, to the general observer, dominant. Large trees are in place, and flanking lines of shrubbery and many good
XCV. Radish, in several varieties.
growing features. In small cities, of say 10,000 inhabitants more or less, the station buildings become relatively more dominant and the planting falls into a subordinate place, and the gardening may take on the features of ornament; the approaches and the general layout begin to assume a civic character. In large cities, the architecture, arrangement, and formal approaches necessarily dominate, the plant materials are reduced to a very minor feature or disappear altogether, and the landscape architect approaches the work as a problem in city-planning and design. There remains the small country station in the farming country, which usually has been wholly neglected in respect to its landscape features and which has little-expense beyond the mere right-of-way; this is a problem quite by itself and which has not yet been studied to any extent. This application of the landscape art to real rural conditions will develop when the whole subject of country-planning begins to appeal to the public mind.

**Historical sketch.**

The railroad-gardening movement is best understood by a consideration of its historical development, and this is here attempted, although the treatment is not complete nor does it pretend to bring the subject down to date.

**The movement in England.**—Planting has been practised on the station grounds of some English railways for many years, but it is almost exclusively limited to purely ornamental gardening. The corporations do little beyond offering prizes to station-masters and their assistants. This system was put in operation about forty years ago on the Great Eastern, in about 1885 on the Midland, and at a more recent time on the Great Western Railway. The prizes range from 5s. to £5, and in 1900 aggregated £300 on the Midland Railway. The little planting that is done by the railway companies themselves is confined to a few trees of low growth near stations, to a background of shrubs for some of the so-called “platform gardens,” and to sowing broom and gorse on certain slopes of the permanent way between stations. The “allotment gardens” that attract attention on English roads are small tracts near the block signal stations where railway employees use vegetable- and fruit-gardens for their own use, and sometimes care for a few flowering plants.

**Sweden.**—Ornamental planting has been universal on government railways, as well as on most private railways in Sweden, since 1862. According to the Royal Administration of the Swedish State Railways, the following distinctions are made: (1) decorative and fire protective plantings on station grounds; (2) mixed plantings (decorative and economic) on “habitation grounds”; (3) plantings along the railway lines as hedges or for protection against snow. Station planting consists of trees selected to suit the climate of various parts of the country, of shrubs, and of perennials and annuals (flowering as well as bedding plants). At the largest stations (only about seventy-five) annuals are exclusively used for “modern or elegant combinations.” The planting at habitation grounds consists of fruit-trees, small-fruits, a few ornamental shrubs, some flowering plants, and a small kitchen-garden. The state railways yearly plant out about 40,000 hardwooded plants (trees and shrubs), and 400,000 softwooded plants (perennials and annuals), which are nearly all grown at five greenhouses, hotbeds, and nurseries situated in different parts of the country. On private railways the same plan is followed on a smaller scale.

**In various other countries** there are scattered examples of ornamental, economic, and protective planting on railways, including the cultivation of fruits along the rights of way of certain railways of Germany and of France.

The Canadian Pacific Railway Company has planted a considerable part of its right of way to tamarack and other suitable trees to supply the tie material of the future.

The director of the association called Het National Belang, at Utrecht, says that the association has contracts with the State Railway Company and the Holland Railway to plant the dykes of their roads. Different kinds of willows, low apple and pear trees (half-stem appel en peeren-bloemen) and wild prune trees are used, the fruit of the last being “used for jams.”
The common quince is used to a limited extent in Uruguay for binding earth on embankments, and the paradise tree for shading station platforms. "The Ombu is the national tree of Uruguay,—useless as fuel or timber, useless as food, but as Jerome as Jonah, guarded at midday at certain seasons."

The Royal Railway Department of Siam reports through M. Kloke, acting Director General of Railways, that efforts have formerly been made to establish the prickly pear in Ceylon and other islands of the Korat section, which were destroyed by cattle; Eucalyptus trees grown from seed received from Australia have developed quickly into "stately trees"; and good success has also resulted from the introduction of a tree from Manilla which is said strongly to resemble the cherry tree, and is well suited for making "shady alleys;" and that India-rubber trees are used at smaller stations.

Remarkable work has been accomplished in Algiers. The director of the P. L. M. Railroad Company wrote some years ago that about 825,000 trees had been planted between 1869 and 1875, of which 495,000 were forest trees and 30,000 fruit-trees. The prevailing forest trees are eucalyptus and locusts; others are mulberry, plane, pine, cypress, willow, poplar, oak, sycamore, and mimosa. About one-fifth of the forest trees were planted about stations and watch-towers for ornamental purposes, and the remaining four-fifths were used in protective plantings. The fruit-trees include mandarin, apricot, and almond.

In Mexico some companies, notably the Mexican Central, maintain flower-gardens and parks at larger stations.

United States.—The first traceable indications of the movement in this country are about 1870. It was not until several years later that infrequent allusions to the work crept into print. From the year 1880, however, the movement gained in favor so rapidly that by 1884 several new and exceptionally artistic stations had been built for the Boston & Albany Railroad Company after designs by the late eminent architect, H. H. Richardson, and the latter date marks the adoption of a consistent scheme of permanent planting, aiming at nature-like effects instead of the purely ornamental, i. e., formal gardening, previously used. This happy result was due to the influence of Charles S. Sargent, of the Arnold Arboretum, a director of the road, and to Wm. Bliss, its president. Designs for the improvement of the grounds around these stations were made by F. L. Olmsted, the veteran landscape architect, and since 1884 the development of these plans, as well as all of the horticultural interests of the road, have been in charge of a competent landscape gardener, E. A. Richardson, who says: "The plan followed is to conform the treatment and development of the station grounds to the adjacent ground; a natural style being followed amid natural surroundings, and a more cultivated style in highly cultivated regions; to utilize all natural advantages of ground surface, rocks, water, and native growths; to make large use of trees, shrubs, vines, and plants indigenous to the locality where improvements are being made; to supply beds for shrubs with from eighteen to twenty-four inches of good loam; and to plant so closely in the beginning that as the plants grow they can be thinned to supply other grounds as needed." It goes without saying that these methods are not only the most practical but that they insure the most artistic results.

Among the first railway companies to improve their station grounds by planting were the Central of New Jersey (1886), the Baltimore & Ohio (date uncertain), the Boston & Albany (1880), the New York Central & Hudson River (1880), the Erie (1881), the Southern Pacific (1885), the Pennsylvania (1886), and the Austin & Northwestern of Texas (1887). Other roads appreciate the value of the work and encourage it; and railroad-gardening has now become a recognized form of landscape improvement, although yet at its merest beginnings.

The methods.

In the public mind, railroad-gardening usually means the formal use of flower-beds about stations. Such work is ornamental gardening, not landscape gardening. Most of the so-called landscape gardening at railroad

3335. One method of treating a railway ground,—temporary formal ornament and no durable flank-planting.

and sodding. This so encouraged the baggage-master that he solicited the townspeople for money to buy seeds and plants, and with such success that he maintained for three years a flower-garden that favorably impressed the higher officials of the road, and led to the establishment of similar gardens at other points, and eventually to the adoption of a system of planting which, under intelligent artistic supervision, has been radically changed in style till it now stands as the nearest approach to a comprehensive and consistent example of railroad-gardening. (Fig. 3334.) In 1882 and 1884 several new and exceptionally artistic stations had been built for the Boston & Albany Railroad Company after designs by the late eminent architect, H. H. Richardson, and the latter date marks the adoption of a consistent scheme of permanent planting, aiming at nature-like effects instead of the purely ornamental, i. e., formal gardening, previously used. This happy result was due to the influence of Charles S. Sargent, of

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The methods.

In the public mind, railroad-gardening usually means the formal use of flower-beds about stations. Such work is ornamental gardening, not landscape gardening. Most of the so-called landscape gardening at railroad
stations is really merely decorative. Carpet-beds are relatively costly as compared with hardy shrubbery. They last but a few months and then leave bareness, while the best hardy trees and shrubs skilfully arranged are interesting all the year round. (Figs. 3333, 3334.) This making of nature-like pictures with relatively simple, inexpensive, and permanent materials is a much higher art than that involved in creating and maintaining flower-beds and a few summer-blooming plants. However, both have their places. Many a tired traveler is cheered by the bright colors of a neatly kept railroad station. Such displays are suitable at the stations if anywhere along the line. They are always preferable to dirt, ugliness, and a general air of indifference. But railroad-gardening never becomes worthy our best attention until it rises to the plane and importance of planning. (Fig. 3337.)

Some of the underlying considerations in the landscape improvement were stated in an editorial in "Garden and Forest," 1889, by the late W. A. Stiles, from which we quote: 'Up to the present time, with few exceptions, railroad-gardening has failed to accomplish what the public has a right to expect of it from an artistic point of view. Instead of using their opportunities for increasing the taste and knowledge of the communities they serve, railroad managers have generally been satisfied to reproduce all that was glaringly bad in the prevailing horticultural fashion of the time. Perhaps this is inevitable, and it will continue so as long as they feel that they need not call for the advice of an expert of a higher class than the ordinary jobbing gardener. It is the old story—a man employs an architect to build his house, but thinks he needs no advice in laying out the park that surrounds it.'

'No railroad-gardening is ever to become a potent and permanent means of public education, it must be organized upon a more economical basis, and with more regard to the laws of good taste and good business. This subject has already occupied the attention of a few thoughtful men, and we are confident that some progress has at last been made.' Mr. Stiles commends the plans of the then new station grounds of the Boston & Albany Railway for "convenience, neatness, and simplicity. No beds, no brilliant flowers, no startling effects. They rely for attractiveness on convenient, well-kept roads, neat turf, a few good trees, and masses of well-selected and well-planted shrubs, among which herbaceous and bulbous plants are allowed to grow. The plan is simple, and when thoroughly carried out in the beginning it is easy to maintain."

On the treatment of the right-of-way between stations, Mr. Stiles says: "What is needed is a ground-covering that will be more permanent than turf and will not need its constant cutting and attention, which can be secured without the enormous first expenditure for accurate grading and the deep soil that makes a grass slope presentable," and adds: "Such low plants as wild roses, dwarf willows and sumacs, sweet fern, bayberry, etc., when once established will prevent surface soil from washing, will not grow tall enough to interfere with operating the road, and if destroyed by fire would soon grow again from the root and re-cover the ground."

The proof of these deductions is seen yearly on many roads, where thousands of miles of railroad rights-of-way which, in the spring and early summer, are like ribbons of flowered brocades linking the towns together but later in the season become blackened wastes from accidental or intentional fires. Year by year this mournful program is repeated.

Railway officials offer no practical objections to the use of small trees and of shrubs between stations which are cut every two years, yet the expenditure for accurate grading and the deep soil that makes a grass slope presentable, and for the outer boundaries of rights of way that are 100 or more feet wide, on straight stretches, or on long tangents, and not on short curves or near grade crossings. The tracks should never be menaced by the danger of trees falling on them in wind-storms, nor should the telephone lines and poles be interfered with, nor the view of the line obstructed. The danger to planting from fire can never be entirely eliminated until some non-spark-producing fuel is substituted for coal.

Planting for protection, as practised so far, includes: (1) covering banks with vegetation to prevent erosion, and (2) planting for protection from wind and snow, and from landslides. All this has been successfully done in various parts of the world. Snow-hedges are comparatively common at home and abroad. A notable example of confidence in the advantage of belts of trees for this purpose is seen in the groves planted some years ago by the Northern Pacific Railway Company. About 60,000 trees were set out in 1890, and the chief engineer of the road says: 'This experiment has been undertaken to determine the possibility of substituting groves for snow-fences. It is necessary to protect all railway cuts in these prairie regions in some manner as the strong winds across the treeless prairies cause the snow to drift badly. A strip 100 feet wide, is cultivated to keep down weeds and overcome danger from fire, and through the middle of it runs a grove 60 feet wide, the inner edge being 125 feet from the track, and parallel with the tracks through cuts. The trees are
planted in parallel rows spaced 6 feet apart at right angles with and 3 feet apart parallel with the track. The two outer rows on each side are golden Russian and laurel-leaved willows; the third row from the outer margins, box-elder and ash; and the five central rows, cottonwood. This arrangement is expected to produce a dense grove, increasing in height from both sides to the center, which will furnish an effective windbreak."

The feasibility of planting for protection against the encroachments of shifting sand on the seacoast, along rivers, and on so-called desert lands, has been demonstrated by the researches and experiments of the United States Department of Agriculture. The advantages of such plantings are sure to be eventually recognized and utilized by railway companies whose lines are exposed to this danger. The disagreeable features and their suppression constitute an important phase of landscape improvement about railway properties. There are two important classes of disfigurement: defacement by signs, and defacement by abused and neglected grounds adjoining railway rights-of-way. The more noticeable of these is the display of hideous sign-boards that disfigure railway rights of way and, indeed, seem to have the right of way on highways of every description. These amount to a public nuisance that should be legally controlled, but as they are placed on adjacent land or buildings instead of on railway property, their direct suppression by railway officials is out of the question. These eyecores, however, furnish an added and cogent reason for massing plantations of small trees, shrubs, and vines at certain points along rights-of-way where the topography of adjacent land invites such disfigurement. These gaudy signs not only blot out or mar most fine landscape views (being adroitly placed to mar most fine landscape views (being adroitly placed to direct end), but are allowed to distort otherwise unobjectionable farm buildings, while the approach to villages and towns is announced in screaming colors by the crowding together of these frightful adjuncts of civilization. While railway companies are not strictly responsible for these conditions, it is certain that they might sway public opinion and effect a much-needed reform by continuous, systematic work in the way of "planting out" the disfigurements, and by establishing attractive plantations wherever possible. This policy is likely to result in a reformation in the direction of the second source of unpleasant views from trains; viz., the unkempt, sordid, and often wretchedly squalid appearance of grounds adjoining rights-of-way through villages, towns, and small cities. If a park is maintained on the station grounds, nearby residents are likely to catch the good spirit and improve the looks of neighboring back yards. To this end, a rule against dumping on railway ground should be strictly enforced. The objectionable features that obtain in large cities must probably be endured until mitigated by the efforts of municipal art and social-service leagues.

Protection of natural scenery is a prime consideration. Notwithstanding the prominence given in railway advertising to fine natural scenery, little credit seems due to railway companies in general for protecting such scenery. That they might wield a mighty influence for their own and the public good is proved by a few examples. It is learned that the unofficial work of representatives of the New York Central and the Michigan Central roads did much to create the public sentiment that led to the formation of government parks on each side of Niagara Falls, and that the same roads should be credited with comprehensive and extended efforts to secure legislation looking to the prevention of further defacement of the palisades of the Hudson. Many of the movements for protecting natural views and worthy objects have close relation with the improvement of railway properties.

Planting for economic purposes is among the possibilities along rights of way, for the purpose of producing timber for furnishing cross-ties, poles, and posts. It is asserted that, under competent supervision, this branch can be made not only to pay the entire expenses of the department but to become a source of revenue. This branch of the work appeals to practical railway men as perhaps no other phase can be expected to, and to what extent the fortunes of various groves of locust, catalpa, and tamarack influence the point of view of chief engineers it would be difficult to learn, but that numbers of them are turning otherwise unoccupied railways lands to this use is certain. In Indiana, for example, some railway companies have planted a part of their holdings with trees for the double purpose of growing timber for economic uses and to secure the resulting reduction in taxes, which is a feature of the state forestry law.

It is often asked whether the planting or horticultural department of a railroad can be made partly self-supporting. There seems little doubt that by one means or another this department might be made at least partly self-sustaining, but the consensus of opinion among railroad men is distinctly against the advisability of making it so, except indirectly. It is conceivable that railroad nurseries and greenhouses might supply planting stock to individuals to their advantage; and possibly railway rights-of-way aggregating immense areas might be planted to crops, perhaps to fruit-trees as is done to some extent in European countries (a project which has also been recently suggested for the roads of India), but the opinion is general that legitimate railroad business is limited to the transportation of people and of freight. Even if this is true, it is still certain that
the department may legitimately be made to yield substantial financial returns. This feature of the department work is as yet in a preliminary stage that makes definite conclusions as to the extent of its benefits impossible, but enough has already been accomplished to demonstrate the usefulness of a well-conceived and correctly developed policy of protective and economic planting.

The attainable ideals are many. Railway companies can do no more effective advertising than by demonstrating the possibilities of the country traversed for home-making. Instead of desolate wastes of dust and cinders, their way-station grounds should present refreshing scenes of shade and verdure. Their grounds should be treated according to the rules of landscape art that hold good in all planting. When adjacent land drops away, giving good vistas, these should be preserved; objectionable features should, as far as possible, be "planted out;" sky-lines should be varied, banks clothed, and variety and views supplied, particularly in flat and uninteresting regions. Railroad-gardens should be in the hands of those who will adorn instead of deface them; who will look to the formation of features that will take care of themselves after planting is established—features that require considerable expenditure, a good knowledge of trees and of shrubs, and a large amount of taste in the designer at the outset, but after being established, like the island gardens of Paris, "the hand of man might be withheld for half a century without their suffering in the least." This conception of railroad improvement is therefore much larger and more inclusive than the mere adornment of station grounds; eventually it will modify the development of the entire property over which passengers ride.

FRANCES COPLEY SEAVEY.

RAISIN: Grape, page 1586.

RAJANIA (named in honor of John Ray, 1628-1705). Dioscoreaceae. Sts. from tubers, twining, and the habit of Dioscorea: lvs. alternate, undivided, hastate, cordate-oblong or linear; fls. dioecious, small, racemose, the male along the rachis often fascicled or in very short racemes, the female and sometimes both sexes simple and on short slender pedicels; perianth-segms. 6; stamens 6 in the male fls.; ovary ovoid or oblong; fr. reduced to one carpel through abortion, easy-like, indehiscent—About 10 species, W. Indies.

pleonethra, Griseb. Fig. 3338. Tubers very irregular cocks-combed: plant subshrubby, 5-6 ft. high: lvs. cordate-roundish or cordate-ovate, 2-5 in. diam., deltoid-pointed or cuspidate, 9-nerved; petiole about as long as or shorter than the lvs.; the aerial tubers produced at the base of the petiole: fls. dioecious, in racemes which are often fascicled, the male racemes compound, 3-8-fl.d., flexuose, the female simple: samara semiovate-oblong, bluntish, wing twice as long as the seed. Cuba and other islands of the W. Indies.

F. TRACY HUBBARD.

RAMIE: Boehmeria nivea, a fiber plant. See Cyclopedia of American Agriculture, Vol. II.

RAMÓNDA: Ramondia.

RAMONDIA (named for L. F. E. von Ramond de Carbonnières, French botanist and traveler, 1753-1827). Usually spelled Ramondia, but first written Ramonda. Gesneriaceae. Subcaulescent herbs with red-hamate-villous hairs, suitable for rockwork. Leaves basal, softly rugose; scapes leafless, 1- to few-fl.: fls. violet or pale purple; calyx free, 4-5-rarely 6-parted, the segms. ovate or oblong; corolla with scarcely any tube, rotate or broad-campanulate, 4-5-rarely 6-lett, the lobes broad; perfect stamens as many as the corolla-lobes, affixed at the base of the corolla; ovary superior, conical: caps. oblong, rather acute.—About 10 species, mountains of Eu.

Ramondia pyrenaica is one of the choicest and most interesting alpine plants. Few, if any, inhabitants of rock-gardens have been so often pictured. It is a small tufted, hardy perennial herb, like most alpine plants, and its scapes bear one or few flowers in spring. These are an inch or so across, and normally purple or violet, but there is a pure white variety which is in much favor. The ramondias vary in the number of their petals, or rather corolla-lobes. For example, P. Nathaliae often has four-lobed and five-lobed flowers on the same plant. The floral parts in the genus are in fours, fives, or sixes. These plants are rare and local in Europe and are interesting as being among the few alpine survivors of a family that is now essentially tropical. Although several ramondias are in the trade, only one is well known. This is R. pyrenaica, which is hardy in the eastern states. It is a beautiful dwarf alpine plant well adapted for the rock-garden. It is rather hard to establish but can be easily grown from seed. If seeds are sown in the spring, and the small plants grown along in pots for the first summer and kept in a cool shady position, they will make neat little plants by the end of autumn. They should be kept in a coldframe for the winter. These one-year-old plants grown in pots are much easier to establish than younger plants. They may be planted in small pockets in the rockery in a slightly shaded and elevated position, and given good deep peaty soil. When the plants become established they will blossom freely, and if allowed to ripen their seed they will sow themselves freely amongst the rocks. Old plants can also be increased by division. They ought to be covered in winter with hay or dry leaves so that they will not be heaved out of the ground by the alternate thawing and freezing. The plants require perfect drainage.

a. Color of fls. purple or white.

b. Corolla 6-parted, rotate.

RAMPION, Rampion, is well to mix it with sand. The seed should not be spiny, grown in the warmhouse for their bloom or pardy outdoors in the extreme southern United States. Sowing until June. For botanical description, see

Although rampion is usually biennial, it sometimes runs to seed the first year, especially if the seed is sown early. Campanula.

Soil, partial shade and water during the hot season. Each way for development. The plants like a light rich plant allowed to remain should have at least 4 inches careful waterings are necessary until the plants become ready for use in October or November and may be chiefiy used, generally in a raw state, but the leaves may also be used as a salad. The roots are white, a foot or so long, and spindle-shaped, like a long radish. They are ready for use in Asia and Afr. Closely allied to Mitrastigma and Gardenia.

AA. Shrubs or trees without spines.

RANÁNEVA (anagram of Ravenea). Ravenea of Bouché. Phalanges. One species of palm perhaps allied to Hyophorbe, from which it differs, among other things, in its dwarf habit, usually dioecious and in the fls. being arranged alternately on the short branches of the spadix. The genus Ranévea seems, however, to be of uncertain relationship. Bouché's generic name Ravenea dates from 1878. It appears in Bentham & Hooker (3:883) as Ravénia. In spelling it is so similar to Ravénia of Vellozo, 1825, that the two cannot be distinguished by pronunciation, and there-
fore a new name was given. Cult. as in Hyophorbe. Prop. by seeds in stovehouse, under glass.

Hildebrandtii, Bailey (Ravena Hildebrandtii, Bouché). Becoming 8-12 ft. high, but flowering under cult. when half that height, spineless, erect: lvs. elliptic-oblong or ovate-oblong in outline, long-stalked, pinnate, the pinna 20 or more pairs and narrow-lanceolate-acut. spadix long-stalked, the staminate recurved and with short densely fl. spreading branches, the pistillate erect, with filiform strict branches thickened at the base: fls. pale straw-color, the calyx 3-lobed, the petals 3 and joined at the base, the stamens 6: fr. black. Comoro Isls. (east of Afr.). I.F. 27:403. B.M. 6776. C.F. 4:293. An handsome dwarf palm, described by W. Wison to be "as elegant as Geonoma gracilis and as sturdy as a Kentia. It deserves to take a prominent place among garden palms, its small size, free habit, elegance, good constitution, being all in its favor, while in the freedom with the which it flowers and produces seed we have an exceptional character among dwarf palms." Perfect fls. are sometimes produced, although the plant is usually dioecious. Described as one of the most valuable recent palms.

L. H. B.

RANÚNCULUS (Latin name for a little frog; applied to the genus by Pliny in allusion to the wet places in which many of the species grow). Including Bubulcus, Victoria, Ranaeacea. Burmann, Crowfoot. Annual and perennial herbs, a number of which are grown in the garden and sometimes in the greenhouse for their showy flowers. Most of the species are hardy perennials, some of them aquatic.

Leaves entire or dissected; cauline lvs. alternate, often few: fls. white, yellow or red, terminal, solitary or panicled, rarely sessile at the branch axis; sepals 3-5, caduceus; petals all or most (up to 15) provided with a nectar-bearing pit or an enlarged conspicuous or rarely minute scale; stamens shorter than the sepals and petals, frequently numerous, sometimes only few in small-fl. species; carpels numerous, 1-ovuled: achenes compressed or subglobose, smooth or variably striate, costate, rugose, or spiny.—About 300 species dispersed all over the world, mostly in the temperate and colder regions, few in the tropics.

The structure and arrangement of the achenes is well shown in Fig. 3340.

Culture of the ranunculuses. (E. J. Canning.)

The culture of ranunculuses in gardens and by florists has been confined chiefly to the Persian and Tuban ranunculus, R. asiaticus, since the Asiatic species is far more attractive than the European. In England and in other European gardens, R. asiaticus has been in cul­tivator a very long time. Parkinson mentions it in his Paradux, published in 1629. He termed it "the double-red crownfoot of Asia." Since his time R. asiaticus and its varieties have been greatly improved, both in size of flowers and variety of colors. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace almost every shade except blue, and some are striped and variegated. A well-grown mass of these charming flowers in full blossom is a sight not soon forgotten. They are not so well known in American gardens as in those of England or at least not in the eastern states, since the writer has rarely met with them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming is about the last week in May and the first week in June, which is too late for spring bedding, while the season of blossoming is too short for summer bedding. Therefore a position should be given them in the herbaceous border where they will receive some shade during the warmer parts of the day, or a level place in a rock-garden with a northern exposure. The roots are tuberous, being like miniature dahlias roots. They are not hardy, at least not in any of the northern states. The tubers should be carefully lifted after the foliage has all "ripened off" (which occurs usually toward the end of August), and stored until the following spring in some cool shed where they will not freeze. They should be planted as soon as the frost is well out of the ground in spring, about 2 inches in depth and about 6 inches apart, making the soil very sandy on top so that the leaves will push through readily without heaving the soil. Like their congeners the European ranunculi, they like plenty of moisture at the roots during the growing season, and if they can be shaded from the sun when in flower their blossoming period will be materially lengthened. They may also be grown for flowering in the greenhouse. The gardener may well have a few pans each year, planting the roots in pans of light soil toward the end of January and placing them in the coolest greenhouse, where they will bloom toward the middle of April. He will probably prefer the Turban varieties, since they are stronger-growing and rather larger than the Persian. The species may be propagated by seeds, but this process is not worth while because the bulbs may be procured so cheaply. Of the native and European species of ranunculus, those of the Batrachium section, such as R. aquatilis and its varieties, are interesting aquatic plants, while R. repens var. flor-e-pleno, and R. amplexicaulis are useful as subjects for the bog-garden.—For herbaceous borders or moist corners in the rock-garden R. acuminatus var. flor-e-pleno, R. cortusafoius, R. amnonoides, R. parras siolius, and R. Ficaria are the only species worth growing. These are readily propagated from seeds or by division of the plants in spring. See the supplement list, p. 2009, for some of these.

3340. Head of buttercup achenes.

RANÚNCULUS 2905

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CC. Lvs. suberform or rounded-cordate; st. creeping in the mud. 3. hederaecus.

Bn. Achenes smooth or nearly so; petals usually with a brown-boring pit and scale, the latter sometimes imperfect or very minute in c.

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R. Head of achenes short; achenes subglobose; beak recurved. 3. flor-e-pleno.

KEY TO THE SPECIES.

A. Sepals 3 .......................... 1. Ficaria
AA. Sepals 6.

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R. Head of achenes short; achenes subglobose; beak recurved. 3. flor-e-pleno.
1. Ficaria, Linn. (Ficaria Ficaria, Kurst.). Perennial: roots fleshy, thickened: sts. short, decumbent, branched at base, often with bulbils in the I. -


2. Shutia, Lam. Perennial, aquatic: sts. submersed, usually very long: lvs. submersed, petioled, the lower lvs. of often long-petioled, about twice 3-parted, divisions very long-linear, 2-3-cleft, segms. nearly parallel; peduncle tapering, bearing a spreading raceme: fls. large, white; petals often more than 5, broadly ovate, many-veined, contiguously persistent; achenes obovate, inflated, much rounded at the end laterally, apiculate; receptacle conical, naked. June. Rivers, Eu.

3. Hederaceus, Linn. (Batrachium hederaceum, S. F. Gray). Perennial, semi-aquatic: sts. creeping, rooting at the nodes: lvs. submersiform or rounded-cordate, 3-5 heart-shaped round lobes widening to their base and usually entire or notched at the apex, usually opposite and with a black half-moon; stipules various: peduncles usually shorter than the lvs.: fls. 5-5-5 cm. across, white; petals very narrow, 3-4, 3-5-3-nerved, sometimes hardly exceeding the calyx; stamens 5-12; style prolonging the nearly straight inner edge of the ovary: achenes few, glabrous, obovate, laterally compressed at the base, inflated or rounded at the top, microus; receptacle obovate, naked. June. Shallow ponds or mud. W. Eu. and naturalized in N. Amer., Newfoundland to S. Va. B.B. (ed. 2) 2:116.


5. Monspeliaceus, Linn. Perennial, 1½ ft. high, white-woolly or sericeous: sts. erect, few-fld.: lvs. woolly, ovate-rotund, cordate, the radical 3-lobed, lobes crenate, trifid or 3-toothed; the upper 3-parted, divisions cuneate, incised-lobed: fls. numerous, large, shining citron-yellow, 2 in. across; petals reflexed: achenes in a cylindrical spike, obovate, slightly verrucose, beak straight, as long as the body. Servia, Macedonia, and Greece. G.C. III. 40:163.

6. Orthorhynchus, Hook. Perennial, 10-18 in. high, hirsute to nearly glabrous: sts. erect from a flesciled root of thick fibers: lvs. mostly obovate, pinnately compound: lfts. or segments, 5-7, lower commonly short-petioled, usually 3-parted, fls. yellow; petals reflexed, reflexed, petals obovate: achenes numerous, pubescent, compressed, beak recurved and equaling the carpel; receptacle glabrous; head of achene ovate. April, May. Medit. region.

7. Asiaticus, Linn. (R. orientalis, Hort., not Linn.). Fig. 331. Perennial, 6-12 in. high: sts. erect, simple or branched, somewhat appressed hirsute: lowest radical lvs. cuneate-ovate, dentate at the obtuse

are the most highly cult. members of the genus. (2)

or var. africanus, Hort.

others. They are very variable in form and color, and increasing in number. They are of two main types:

wlt.h many CflSp petals, not flat and spreading but erect

bulbs. The cult. forms of R. asiaticus are constantly increasing in number. They are of two main types: (1) The florists' section, called Persian Ranunculus, or true R. asiaticus. These require more care than the others. They are very variable in form and color, and are the most highly cult. members of the genus. (2) The gardeners' section, called Turban Ranunculi, or var. africàns, Hort. (R. africàns, Hort.). Compared with the first section, these have larger, broader, 3-parted Ivs., not so much cut; fls. larger and broader, with many crisp petals, not flat and spreading but erect and curved inward, forming a spherical fl., as in the double peonies. Var. superbissimus, Hort., is a taller-growing very large semi-double-fld. form. July-Sept. R.B. 16:133.

8. cortusfollius, Wild. Perennial, 1–3 ft. high, velvety hairy: roots thick, fleshy, fascicled: fls. branched, corymbose above: lower lvs. long-petioled, subcordately reniform, incised lobes cut and dentate; cauline lvs. nearly sessile, 3–5-lobed, lobes narrow; floral lvs. sessile, lanceolate: fls. several to many in a terminal and axillary rather paniculate infl., yellow; sepals 5, ovate to lanceolate, spreading, green with pale margins; petals 5, large, broadly obovate, glossy; achenes compressed, hairy on sides, tapering into recurved beaks; nearly their own length; head of acorns short-ovoid. May. Isl. of Teneriffe, Canary Isls. B.M. 4025. Gn. 45:28. Gn.W. 8:517. J.F. 3:239.—Not very hardy and needs protection in winter and early spring. It is well suited for pot culture. It is increased by division of the roots in autumn.

glacialis, Linn. Perennial, 3–6 in. high: sts. reddish brown, 1–3-fld.: lower lvs. petioled, rather fleshy, palmately 3-parted or 3-cleft, lobes trifid, or again lobed, the lobes rather obtuse; the other lvs. similar but sessile and involucrete: sepals very hirsute; petals obovate to cuneate, obtuse, white or reddish; achenes very numerous, obliquely obovate, slightly compressed, smooth, glabrous, margin above membranaceous-winged; beak straight; receptacle glabrous. May–Aug. Alpine Eu., Arctic regions, Greenland. Gn. 45, p. 28; 48, p. 501. G.C. III, 53:117.—With age the fls. become coppery red.

10. Máthewssii, Cheesm. Perennial, 15–20 in. high, glabrous or a few weak hairs on the petioles and peduncles; radical lvs. reniform or orbicular ternate-cut, the main divisions petioled, coarsely toothed or lobed; petals stout, 3–9 in. long; cauline lvs. sessile, deeply toothed or lobed: fls. 1–4, large, pure white, sweet-scented, 2½–3 in. across; sepals 5, slightly villous, reflexed; petals numerous, 12–20, oblong-cuneate, rounded at apex; gland solitary, large and basal: achenes forming an oblong-globose head ½ in. or more diam., turgid, pilose, beak long, subulate. New Zeal. Gn. 78, p. 2.

11. aconitifollus, Linn. Perennial, 6 in. to 3 ft. high, pubescent; sts. branched; lvs. palmately 3–5-parted; segms. incise-dentate; upper lvs. sessile with linear-lanceolate lobes: fls. white, several to a st.; sepals flat, glabrous; petals oblong, cuneate or orbicular: achenes 6–15, obovate, laterally sub compressed, nerved, glabrous, beak straight, recurved at the top; receptacle villous. May, June. Mountains of Cent. Eu. Gn. 70, p. 135. G.M. 45:196. Var. flóre-plenus, Hort. (R. aconitifollius var. plénum, Hort.), called White Bachelor's Button and Fair Maids of France, has large double white fls. Gn. 45, p. 29; 48, p. 506; 65, p. 24. Gn. 4:415; 10:411; 36:226. Var. flóre-plenus, Hort., has double golden yellow fls.—This species and its varieties are well adapted for border planting.

12. alpéstris, Linn. Perennial, 3–6 in. high: st. usually 1-fld.; lvs. petioled, orbicular-cordate, 3-lobed, lobes rather obtuse, lobate-crenate at the top, sometimes the lvs. are trifid or hardly so; this is true of the sessile cauline ones: sepals glabrous, spreading; petals 5, white, rounded-obcordate, emarginate; achenes obovate-globose, glossy, glabrous; beak straight, hooked at the summit. Mountains of Eu.


15. pyrenaeus, Linn., also incorrectly offered in the trade as pyrenecus, Hort. Perennial, about 1 ft. high: lvs. linear or lanceolate, entire, all basal, bluish green: scape tomentose at the top, 1-4-in.; fls. white, rather large; sepals glabrous; petals obovate; achenes obliquely obovate-globose, side glossy, beak short, hooked; receptacle pubescent. June-Aug. S. Eu.

16. parnassifolius, Linn. Perennial, 3-8 in. high: stamens long-petioled, rather cordate or ovate-rounded, upper surface shiny green, under surface lanate on the nerves; petioles lanate; cauline lvs. sessile, ovate-lanceolate; fls. snowy white or rarely purplish; sepals pubescent, roseate, very obtuse; petals obovate; achenes in a spherical receptacle pubescent. June. Alps and Pyrenees. B.M. 386.

17. insignis, Hook. f. Perennial, 1-3 ft. high, usually villous: stamens and erect, pinnately divided: radical lvs. petioled, broad ovate, 3-5-parted, terminal division petiolated, lateral sessile or nearly so, all variously lobed or cleft: peduncles sulcate: fls. bright yellow, about 1 in. across; sepals spreading, hairy below; petals obovate, much longer than the sepals: achenes in a globose head, ovate-oblong, compress, beak very short, bowed; receptacle slightly villous. May-July. Eu., Siberia, N. Amer., Newfoundland to Va., Ont. and Brit. Col., Bermuda and Jamaica. B.B. (ed. 2) 2:1113. Var. flore-pleno, DC., Fig. 3345, is a double form not uncommon in gardens.

18. gramineus, Linn. (S. graminifolius, Salisb.). Perennial, 6-12 in. high: stamens, fibroflose at the neck, otherwise glabrous, 1-7-fl.: lvs. lanceolate or linear, entire: fls. yellow, brilliant; sepals glabrous; petals cuneate, scales of the petals minute: achenes in a head, obliquely obovate-globose, faces reticulate, nerved, beak short; receptacle glabrous. April-June. Eu. and Morocco. B.M. 164.

19. lingua, Linn. Fig. 3342. Perennial, 2-3 ft. or more high: roots densely fibrous: stamens erect, glabrous; lvs. 6-10 in. long, lanceolate, acuminate, sessile, semi-amplexicaul, entire or toothed: fls. showy, yellow, about 1½ in. across, somewhat panicled; sepals ovate, villous; petals shining: achenes 60-80, in a globose head, compressed, with a straight border which is larger at the top, beak large, short, sword-shaped; receptacle glabrous. June–Sept. Marshes, ditches and pond borders. Eu. and Temp. Asia south to the Himalayas. G. 48:500.—Useful for water-gardens and aquatic planting. Var. grandiflorus, Hort., apparently differs only in the size of fl.

20. répens, Linn. Perennial, stoloniferous: root-stock short and thick; roots fibrous: stamens decumbent, 8 in. to 2 ft. long, more or less appressed-hairy: lvs. 3-divided, the terminal segm. or all three petiolulated, all ovate, cuneate or truncate, acute, incised-lobed: peduncles sulcate: fls. yellow, about 1 in. across; sepals spreading, hairy below; petals obovate, much longer than the sepals: achenes in a globose head, plano-convex, ovate-obicular, beak slightly curved less than half the length of the body; receptacle slightly villous. May–July. Eu., Siberia, N. Amer., Newfoundland to Va., Ont. and Brit. Col., Bermuda and Jamaica. B.B. (ed. 2) 2:112.—One of the common field buttercups. Var. flore-pleno, Hort., Fig. 3343, a double form not uncommon in gardens.

21. bulbosus, Linn. (R. speciosus, Hort.). Perennial, about 1 ft. high: root a true bulb: stamens erect, hirsute: lvs. petioled, broad ovate, 3-5-parted, terminal division petiolulated, lateral sessile or nearly so, all variously lobed or cleft: peduncles sulcate: fls. yellow, about 1 in. across, terminating the branches; sepals often reflexed; petals 5-7, much larger than the sepals, ovate, shining above: achenes in a globose head, ovate, compressed, beak very short, bowed; receptacle slightly villous. Eu., Persia, N. Afr., naturalized in N. Amer., New England to N. C., Tenn., and La. B.B. (ed. 2) 2:112.—One of the common field buttercups. Var. floré-pleno, Hort. (R. speciosus flore-pleno, Hort.), is a double form not uncommon in gardens.

22. En theological. Perennial, 6-15 in. high: root-stock rather stout: stamens slender, glabrous: lvs. all radical, numerous, 1-3 in. diam., 3-5-foliate or biterinate; lfts. long-petiolulated, toothed, 3-5-lobed or 3-5 narrow cuneate incised, toothed or lobed segms., occasionally pinnately divided: scapes 1-5, longer than the lva., 1-2 in. across; sepals 5, broadly ovate; petals usually 5, rarely more, broadly obovate; achenes in a small rounded head, numerous, turgescent, glabrous, beak stout, straight or curved. New Zeal.

23. monthanus, Wild. Perennial, about 6 in. high: rootstock short, creeping; stamens pubescent, with soft appressed or spreading hairs, usually toward the top, unusually 1-fl.: radical lvs. few, petioled, glabrous, orbicular or pentagonal, palmately 3-parted, segms. obovate, trifid, obtuse, sinus sharp; cauline lvs. 3-5-parted, sessile, somewhat clasping, segms. linear-oblong, divergent, obtuse: fls. bright yellow, terminal, about 1 in. or more across; segms. petiolulated, heart-shaped, young yellowish green; petals 5, large, broadly ovate with a very short scale at base; achenes 20-30, turbid, glabrous, beak recurved, much shorter than the body; receptacle pilose. May–July. Eu., and Temp. Asia south to the Himalayas. G. 48:500.—Useful for water-gardens and aquatic planting. Var. dentatus, Baumg. (R. carpaticus, Herbich). Lvs. much more
toothed than in the type: plant much taller: fls. larger.
B.M. 7266. Gn. 52:202:

24. polyanthemos, Linn. Perennial: sts. erect, many-fld, spreading, pilose: radical lvs. broadly ovate-obovate, palmately 3–5-parted, segms. linear, dentate; petals spreading, pilose: peduncles subulate; fls. yellow: sepals reflexed: achenes plano-compressed, suborbicular, margined, one-fourth to one-third as long as the body, coiled to hooked, rising abruptly.

Turkey. Var. palestinus, Boiss. (R. palestinus, Boiss.). Lvs. 3–5-parted, divisions divergent from the base, cuneate-oblong, 2–3-lobed. Palestine and Syria; a form of this known horticulturally as R. palestinus alrococetus, with large intense scarlet fls. borne on long peduncles. Palestine.

29. anemonifolius, DC. Perennial, scarfully 1 ft. high: sts. erect, 1–2-fld.: somewhat fibrous at the neck otherwise glabrous below, appressed-pubescent above: radical lvs. pubescent, broadly orbiculate, sometimes 3 in. diam., 3-parted, divisions cuneate, deeply trifid, segms. acute, dentate: caulis lvs. few, divided into linear segms.: fls. large, yellow: peduncles finally striate: young achenes obovate, compressed, beak hooked, one-ninth the length of the body. Asia Minor.


—R. aquatilis, Linn., sometimes called lodewort, ram's foot, etc., is an interesting aquatic plant common in temperate regions, the floating lvs. often broad and 3-lobed, while the submerged lvs. are cut up into numerous thread-like segms.-R. bulbifera, B.M. 1482, has fls. of a soft shade of butter-yellow, fading white, and likes partial shade and a moist situation, according to trade-lists.-R. bulbifera, Linn., is a yellow-fld. species offered in single and double forms by Dutch bulb-dealers. Medit. region.—R. campylophyllus, Hook., offered in Colo. in 1904, is considered by Gray as R. affinis var. validus. It is an American species pictured in B.M. 2909 with yellow fls. 1 3 in. across.—R. speciosus, Muhl. Height 1 ft. June. N. Amer. Hort. 2:11—R. Elegans, Hook., the New Zealand water-lily, grows 2–4 ft. high, has petiole lvs. and waxy white fls. 4 in. across, borne in many-fl. panicles. In Eu. it is considered a cool greenhouse plant. It is a gorgeous species and sought to succeed somewhere in N. Amer. G.C. II 15:724; 23:371; Ill. 51: suppl. June 29. Gn. 67, p. 23; 74, p. 375.—R. pullatus, Waldst. & Kit., a native of the Hungarian Alps, has yellow fls. nearly an inch across.—R. septentrionalis, Pers., has been listed; a native plant allied to R. repens.—R. spectabilis is pli

Rape

RAPE (Brassica Napus). Fig. 3345. In recent years rape has become an important forage plant. The name rape includes several varieties which are grown for two purposes: (1) for seed from which oil is expressed.
long hard tap-root like that of There are Chinese types of radish that have hard roots. When grown strictly as a
soiling plant, the tops are cut and hauled to the feed-lot or stable. Dwarf Essex rape much resembles
a rutabaga turnip at first. It is like a rutabaga with an exag-
erated leafy top and without a swollen fleshy root. Rape is a
cool-weather plant and may be grown in almost any part of the
United States by sov-
ing it at the proper
time. As a cover-crop
in the orchard in the East it may be sown as late as
September 15 with good results. It is an excellent
pioneer plant in the work of renewing humus in worn-
out lands. In the Middle West, where shade is needed,
rape is used as a nurse plant for clover when the latter is
sown in orchards in midsummer. Turnips may be
used for the same purpose.

RAPHANUS (classical name, from the Greek). Some-
times spelled Raphanus. Cruciferae. Annual or bien-
nial branching herbs, one of which, R. sativus, is the
radish (which see).

Leaves various and variable, the radical and some-
times the cauline lyrate-pinnatifid; fls. small but rather
showy, slender-pedicelled, in open terminal racemes,
rose-lilac or white, or in some species yellow; sepals
eclipt; stamens 6, free: pod a long-cylindric:
1. long, few-seeded, with a long beak. It is from this
species that Carrière produced radishes by means of
plant-breeding (see Radish). To the second section
belongs R. sativus, Linn., the RADISH, considered to
be native to Eu. and Asia, but imperfectly known in
an unaltered wild state. It is usually annual, although
commonly spoken of as biennial because the roots can
be kept over winter and planted the
following spring. The winter radishes are truly biennial in northern climates. Radish has pink-lilac or nearly white fls.,
and short thick spaggy taper-pointed pods. Some-
times it runs wild in waste places, and then bears a
long hard tap-root like that of R. Raphanistrum. The
radish is extensively cultivated for its thick root, which
has been developed into many shapes and colors. There
are Chinese types of radish that have hard roots
little more than 1 in. diam., and sometimes becoming
nearly 1 ft. long. Some forms are scarcely distinguish-
able from short turnips. The Madras radish (India) is
grown for its soft tender pods, which are eaten raw
or in pickles. The rat-tailed or serpent radish, var.
caudatus (R. caudatus, Linn.), has enormously long
pods (see Fig. 3346), which are eaten either pickled,
or raw as are radish roots. Frequently the pods are 1 ft.
long. The root is slender and fleshy. This is a cultural
variety, coming true from seed.

3345. Dwarf Essex rape. (Xv2)

RAPHA (Greek, needle, referring to the fact that the fr. ends in a noticeable point). Palmae. Mone-
carps with scarious unarmored or with the sheaths only armed:
sts. erect, simple or dichotomously branched, densely
annulate: lvs. in a terminal crown, equally pinnatisect;
flts. linear-lanceolate, acuminate, rachis not produced
at the apex: sporides monoeous, large, pendulous,
cylindrical, much-branched; the branches and branch-
lets thick, compressed, the latter pectinately arranged,
densely covered with cup-shaped bracts; common
spathe none; fls. solitary in each bract, the male at the
base of the ultimate branches of the spadix, the female
at the apex; calyx tubular, entire or minutely toothed;
corolla curved, the petals 3, linear-lanceolate, valvate;
16-16: fr. large, oblong or ellipsoid, rostrate, 1-seeded.—About 15 species, Trop. Afr. and the
Masca
gene. Ia. 1 in. long, short-peduncled, with 12
Mart. Raph., var. Roppia Palm. Trunk 6-26 ft. high:
lvs. up to 63 ft. long, petiole up to 13 ft. long, nearly 1 in.

3346. Rat-tailed radish—Raphanus sativus var. caudatus. Grown for its
enormous pods. (Xv4)
RAPHIONACME (Greek, raphis, needle and, and lepis, scale; referring to the subulate bracts). Sometimes spelled Rhaphionacme. Rosaceae, subfamily Pomoceae. Ornamental shrubs grown for their handsome foliage and attractive white or pinkish flowers. Leaves tomentose when young, alternate, short-petioled, serrate, rarely entire; fls. in terminal racemes or panicles; sepals triangular; petals 5, oblong or obovate; stamens 15-20; ovary completely inferior; styles 2-3, connate toward the base; fr. subglobose, purplish black or bluish black, with 1 large subglobose or nearly compressed seeds.—Two or perhaps 4 species in S. Japan and China.

These are handsome evergreen shrubs with alternate or obscurely whorled leaves, white or slightly pinkish flowers and small pen-sized black fruits. None of the species is hardy North, but R. umbellata will stand about 10° of frost or even more with some protection; they are well suited for cultivation in the southern states and California. They will thrive in any good well-drained soil and if cultivated on a sandy loam and leaf-mold or peat will suit them. Propagation is by seeds or by cuttings of ripened wood under glass late in summer; also by layers, and sometimes grafted on hawthorn.

umbellata, Schneid. (R. japonica, Sieb. & Zucc.). Shrub, to 12 ft., with stout upright branches; fls. short-petioled, elliptic to broadly oval or obovate, obtuse or acutish, narrowed at the base, crenate-serrate, glabrous or slightly pubescent when young, thick, 1½-3 in. long, fls. white, ½ in. across, fragrant, in dense, tomentose panicles or racemes; petals obovate, obtuse; fr. to ½ in. across. May, June. S. Japan and adjacent islands. S.Z. 1:83. Gn. 22, p. 43; 32, p. 20; 34, p. 158. G. 7-106; 10-114. Var. integerrima, Rehd. (R. iva, Schneid. (R. iva, Sieb. & Zucc.). B.R. 652. R.H. 1874:270. Gn. 9:596.—A very variable species; several forms have been described as distinct species, as R. strigosus, Nichols., is the most ornamental; lvs. opposite and membranaceous: inflorescences many-fid.; stamens white or purplish, shorter than sepals; petals 5, obovate, obtuse, and pubescent; fr. subglobose, purplish black or bluish black, with 1 large subglobose or nearly compressed seeds.—Two or perhaps 4 species in S. Japan and China.

RAPHIONACME (Greek, needle and point, referring to the 5 pointed or awned scales in the throat of the corona). Aseleptadaceae. Herbs, with tuberous root-stock often furnished with an elongated woody neck; juice milky: lvs. opposite: fls. small or moderate-sized, terminal in few- or many-fl. cymes, or in the forks of the st., or subaxillary from one axil, rarely from both; calyx 5-parted; corolla-tube distinct, campanulate. Lobes 5, erect, spreading or reflexed; crown of 5 free, entire, 2-3-divided or 3-parted lobes alternating with the corolla-lobes: follicles often solitary by abortion.—About 20 species, Trop. and S. Afr. R. pulcherrimum, N.E. Br. & Stapf. Perennial herb with a turnip-shaped root 2-3 in. diam., covered with dark brown flaky bark; sts. annual, 1-4 in. long, erect or decumbent; fls. in 2-4 pairs, opposite or forming a rosette close to the ground, orbicular, elliptic or obovate-ovate, obtuse and apiculate, or subacute at the apex, rounded or subcordate at base, green above, purple beneath: fls. in small terminal and axillary cymes or clusters, bright purple; petals lanceolate, acute, purplish with green tips; corolla about ½ in. diam., deeply 5-lobed. Trop. Afr. B.M. 8:323.

RAPHIOSIS: Raphis.

RAPHTER: Raphis.

RAPHIOLEPIS (Greek, raphis, needle, and crown, referring to the linear scales of the crown). Glabrous twining shrubs: lvs. opposite and membranaceous; inflorescences long-peduncled, axillary, umbelliform cymes; fls. large, white, and long-peduncled; calyx 5-glandular inside; corolla campanulate, thick, lobes 5, erect, spreading or reflexed in bud and overlapping to the right; crown with 5 membranaceous scales which are produced into long slender linear ligules; follicles thick, acute, smooth.—About 2 species. Asia. R. pulechrum, Wall. Branches slender, smooth, and herbaceous: fls. 3-7 in. long; cymes 4-6-fl.; the pedicels very slender: fls. pure white, 1-½ in. long; sepals broad; corolla thick. Himalaya region and Burma. J.F. 4:335.

RASPBERRY (from rasp, a tool resembling a file, and berry), a name applied to certain species of the genus Rubus, particularly to Rubus idaeus, R. strigosus, and R. occidentalis, from which have been derived common cultivated forms grown for their excellent edible fruits.

Raspberry plants have perennial roots and erect or nearly cleft biennial canes bearing thimble-shaped red, yellow, black, or purple-colored fruit consisting of many cohering drupelets which separate from a partially dried receptacle. The raspberry is distinguished from the blackberries and dewberries, which belong to the same genus, in bearing fruit that separates from its juicy receptacle, while that of the blackberries and dewberries does not separate from their juicy receptacles.

Origin of horticultural varieties.

The first raspberries introduced into cultivation in America were varieties of European origin belonging to the species Rubus idaeus. These varieties, adapted to a mild humid climate, did not prove sufficiently hardy to merit their continued cultivation after hardy native varieties of good quality began to be propagated. At present but two varieties, the Antwerp and Superlative, representing the European species Rubus idaeus, have become established. These two varieties are raised only in the Pacific Coast region and are there being gradually superseded by American varieties.

By far the greater part of the varieties under cultivation at present belong to the American species Rubus strigosus and R. occidentalis. The American red raspberry, R. strigosus, is very similar to the European species, R. idaeus. Both species have erect canes, but the American species has proved much hardier and adapted to a wider range of environmental conditions. Two of the first varieties of this species to come under cultivation were the Marlboro and Cuthbert, and these are still two of the most widely grown varieties. The black raspberry, R. occidentalis, has produced canes which are longer than those of either of the red-fruited
species, and bears black fruit. The acreage of this class is, at present, much less than that of the red raspberry. The Gregg, one of the first varieties of this species introduced into cultivation, is also one of the leading varieties grown at present.

Yellow-fruited varieties have come from both the American species, the erect-growing sorts from R. strigosus, and those with recurved canes rooting at the tips from R. occidentalis. Purple-caned varieties, of which the Columbian is the most widely grown, are hybrids between R. strigosus and R. occidentalis.

Up to the present time, the greater part of the varieties under cultivation have appeared as chance seedlings. Recently, however, many promising new varieties have been originated as a result of systematic effort to produce better sorts. Thus, as the result of definite breeding work, the New York State Experiment Station has originated the June red raspberry, and the South Dakota Experiment Station the Ohta and Sunbeam red raspberries. These as well as other experimental stations, have many promising varieties under test. L. E. Wardell, a practical grower of Marlboro, New York, has originated the Empire red raspberry, another promising variety. Many others are also trying to originate better varieties, some of whom are using in their work foreign species recently introduced into this country.

Geographical distribution.

The limit of the successful culture of this fruit corresponds closely with the distribution of its wild forms. The southern limit is southern Virginia, along the mountains to northern Tennessee, westward through the Ozark Mountains and southern Oklahoma. It is chiefly grown in northern regions. The great commercial centers of the industry are, at present, in New York State and Michigan. Smaller centers of its culture, aside from the proximity of the large cities, are found near Hagerstown in western Maryland; in central New Jersey; near Kansas City, Kansas; about Loveland, Colorado, and in the Puyallup Valley of Washington. The culture of the raspberry, however, is not confined to these centers, but is widely distributed throughout the northern districts.

Propagation.

The red varieties are propagated by the use of suckers which spring from the underground parts. Nurserymen secure their stock by digging in the spring suckers sent up during the previous summer. Some growers who wish to increase their own plantation wait until young suckers begin to come up in the spring and transplant these. The black raspberries, as well as the purple varieties now raised, are propagated by encouraging the tips of the young canes to root. As the young canes bend over and the tips approach the ground, soil is thrown over the tips. Plants suitable for setting the following spring will be formed during the remainder of the growing period by these rooted tips. By pinching back the tips in early summer when the canes are about 2 feet high, they will branch and several plants may be secured from each cane.

Culture.

The raspberry thrives best in a deep fertile loam containing plenty of humus. Most varieties grow better on the heavier than on the lighter types of soil, though this is not universally true. The soil must be well drained and a location with good air-drainage will be preferred to lowlands, as certain varieties are peculiarly susceptible to poor air-drainage. Fertilizers are not generally used on raspberry fields, as among growers using them their composition varies widely. The fertilizers should depend on the needs of the particular soil, and such needs can be determined only by actual tests of the soil with varying amounts and kinds of plant-foods.

Two methods of culture are commonly used, the hill system and the solid-row system. Under the first system the plants are usually set 5 feet apart each way, while under the second system they are set 3 or 4 feet apart in the row, the rows being from 6 to 8 feet apart. Under the hill system less hand-labor is required for the returns in fruit than under the solid-row system. The plants should be set as early in the spring as possible, as the moisture conditions are usually better in early spring. In setting the plants, the principal requirement is that the soil shall be thoroughly firmed about the roots. Vegetable intercrops may be grown between the rows during the first season and should help pay for the cost of cultivation for the first year. Cabbage, cauliflower, beans, peas, and lettuce are often used for this purpose. Cultivation should be thorough and frequent, not only in early spring. In setting the plants, the principal requirement is that the soil shall be thoroughly firmed about the roots. Vegetable intercrops may be grown between the rows during the first season and should help pay for the cost of cultivation for the first year. Cabbage, cauliflower, beans, peas, and lettuce are often used for this purpose. Cultivation should be thorough and frequent, not only in early spring.
and ripening do the plants need the large supply of moisture that frequent cultivation conserves.

Training and pruning.

In training the red raspberries when the plants are set by the hill system, a stake is usually placed by each plant before the second year's growth begins and the year-old canes tied to it (Fig. 3347). This allows the new canes to grow up outside the old ones and makes picking easier. When the solid-row system is used, several methods of training are practised. (1) When the plants are vigorous but do not grow very tall, the suckers are allowed to grow up between the plants in the row, while those between the rows are destroyed by frequent cultivation (Fig. 3348). No pruning is required. (2) When the canes grow very long, they are not pruned until spring and then are sometimes cut back to a height of about 3 feet in order that the cane may support its crop of fruit. Weaker canes are removed at this time. (3) Instead of cutting the canes back as described above, they are often trained to trellises in the following ways: (a) A trellis is made by stretching a wire on posts set about 30 feet apart in the row. The old canes are tied to this wire to keep them upright when ripening their fruit (Fig. 3349). Two wires, one above the other, are sometimes used in making this kind of trellis, and the canes either tied in an erect position to both wires (Fig. 3350), or they are arched over the upper wire and tied to the lower (Fig. 3351). When tied in an erect position, those portions of the canes projecting more than 6 inches above the wire are pruned off. (b) The trellis is often made by stretching two wires along the line of posts from the ends of crosspieces about 15 inches in length (Fig. 3352). The old and new canes are kept between the wires and out of the way when the cultivating is done. Sometimes the old canes are tied to the wire, half of them being tied to the wire on one side and half to the wire on the other side (Fig. 3353). The young canes then come up between the old canes and will be out of the way of pickers and cultivators. Many variations of the above systems are in use.

RASPBERRY

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Pickling and handling.

Raspberries should be harvested as carefully as possible in order to avoid injuring them. The subsequent behavior of the berries on the market depends in a large measure on the care used in picking and handling. Berries injured or bruised in handling, or soft from being over-ripe, or from rainy weather, are quickly attacked by certain mold fungi which cause their decay. To avoid as much injury as possible, three fingers should always be used in picking; very few berries should be held in the hand at one time, to avoid mashing them; the berries should always be placed, not dropped, into the basket or cup; all decaying, over-ripe, and injured berries should be discarded and no later handling of the berries in the baskets allowed. The crates should be hauled on spring wagons to avoid jolting and neither the berries nor the crates containing them should be exposed to the sun. Pint baskets should be used in harvesting red varieties and either pint or quart baskets for the black and purple varieties. (Fig. 3354.) In Pacific Coast regions a basket, or "cup" as it is called there, holding a pound of berries, is commonly employed.

The old fruiting canes of all types of raspberries should be cut out and taken from the field immediately after the crop is picked. Some fruit is usually secured the second year after planting, often enough to pay the entire cost of cultivation for that year. The duration of the plantation depends on the varieties, the care, the locality, and the practice of the grower.

Some growers of the black raspberries harvest one crop and then plow the plantation up; most persons keep the fields for two or three crops, and still others gather six to eight crops before destroying the plantation. The red raspberry fields are usually fruited longer than are those of the black raspberry. Growers generally plan to secure eight to ten crops from a field. Yields from fields receiving good treatment will vary from 50 to 150 bushels to the acre, depending upon the locality, the soil, and the variety grown.

In many northern and western sections, varieties are grown that require winter protection. This is best secured by drawing the soil from one side of the row of plants, using either hoes or a plow, inclining the canes to that side, and covering them entirely with earth about 2 inches deep. The canes are left as late as possible in the spring before uncovering. When the buds begin to start, the canes are forced into an erect position.

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The above systems are applicable to the red raspberries. The black and purple varieties do not sucker and are usually trained as follows: The tips of the young canes are pinched back when they are about 2½ feet from the ground. This causes them to branch and form bushes better able to support a heavy crop of fruit. If the side branches grow very long, they are pruned back in the spring to a length of 6 to 18 inches. Sometimes a trellis is made and they are trained on the system described above under (a).

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Some growers of the black raspberries harvest one
RASPBERRY

Varieties.

The principal red varieties grown at present are Cuthbert (Fig. 3355). Herbert, King, Marlboro, Ranere (St. Regis), and Perfection (Fig. 3356). Promising new varieties are June, Empire, Sunbeam, and Ohta. Much interest has recently been shown in the fall-bearing type represented by the Ranere. Among the black raspberries, the Cumberland, Farmer, Gregg, and Kansas are the leading varieties. The Golden Queen is the principal yellow sort grown. The Columbian is the principal purple-caned variety at present, although the Shaffer (Fig. 3377) and Cardinal are also grown. The Royal is a very promising new purple-caned sort.

Enemies.

Among the more serious diseases of the raspberry are crown-gall, anthracnose, cane-blight, and orange-rust. When plants free from these diseases are set, very little trouble is likely to be experienced later from them. The means of control commonly employed when these diseases are found are eradication and destruction of plants affected by crown-gall and orange-rust, and the cutting out and removing from the field of all canes affected by anthracnose and cane-blight. Scur-frothers are considered the most serious insect enemy of the raspberry. The adults lay their eggs in the tips of the canes. When these tips are seen to be withering and dropping, they should be cut off and burned. If the cut is made well below the point of injury, these tips will contain the eggs or young larvae of the borer. GEORGE M. DARROW.

RATHBUNIA (named for Richard Rathbun, Assistant Secretary in charge of U. S. National Museum). Cactaceae. Plants not large, the stems and branches often weak; spines stout, those of the flowering areoles not differing from the others; flowers diurnal, single, only from the upper areoles, very narrow and elongated, at first straight, but in age more or less curved, oblique at thrust, scarlet, persistent; petals very short, spreading or reflexed; anthers attached near the middle of the tube, exserted; fr. spiny, globular, red, breaking open irregularly; pulp red; seeds black, compressed, minutely pitted, with a large basal oblique hilum.—Three species have been described. Native of the west coast of Mex. The species all have rather weak stems, often clambering and resembling somewhat Cereus serpeninus, but usually stouter and with different spines and flowers. The flowers are very narrow and scarlet, and more enduring.

alamosensis, Brit. & Rose (Cereus alamosensis, Coul.). Upright, columnar, about 4 ft. high by 2 in. diam.; ribs 7–9; spines numerous, stout; central spines usually 4; fr. from the upper areoles, funnelform, about 1½ in. long, red. W. Mex.

R. acaulis, Brit. & Rose, and R. Kéberli, Brit. & Rose, are sometimes confused with the above, and may be handled under this name in the trade. J. N. Rose.

RAUWÓLFIA (named for Leonhart Rauwolf, a physician of Augsburg in the sixteenth century). Apocynaceae. Trees or shrubs, mostly glabrous, sparingly grown, suitable for the greenhouse and outdoor planting in the far southern parts of the United States. Leaves opposite or verticillate, those of a whorl often very unequal: infl. terminal or pseudo-axillary, peduncled, few- or many-flowered, compound, umbelliform or corymbose, rarely racemose: frs. small; sepals 5, almost free or united into a flat 5-toothed cup; corolla salver-shaped, lobes 5, twisted and overlapping to the left; disk annular or cup-shaped, entire or slightly lobed; carpels 2, free or more or less coherent: drupes 2, distinct or somewhat united.—About 60 species from the tropics of both hemispheres.

chinensis, Hemel. A small evergreen shrub, with dark green lvs., white frs. which are borne in dense terminal trusses, and numerous red berries. China.—Intro. into Orange Co., Fla., as an ornamental, where it is semi-hardy, but always sends up strong new shoots in the spring. Requires a light rich soil and plenty of water, with some protection against the sun. Each spring, it should receive fresh rich compost.

pleioscindica, K. Schum. A shrub or small tree, up to 20 ft. high; lvs. in whorls of 3 or 4, lanceolate to elliptic, 3–7 in. long; frs. in cymes, arranged in umbels, white; corolla-tube 3–3½ in. long. Trop. Afr.

F. TRACY HUBBARD.

RAVENALA (the name of the plant in Madagascar), Musaceae. Musa-like plants becoming 20 to 30 feet high, with a palm-like trunk, cultivated for ornamental uses.

Leaves exceedingly large, crowded in 2 ranks, thus forming a fan-shaped head of foliage; petioles long, with concave bases scarcely sheathed; scapes 1–2, acuminate in the upper axis longer or shorter than the vs.; bracts spathe-like, many, boat-shaped, acuminate–frs. many, large, in a spathe or bract; petals long-exserted; sepals free; fr. a 3-valved caps.—A genus of 2 species, 1 from Madagascar and the other from Brazil and Juliana.

a. Less shorter than petioles.

madagascariensis, J. F. Gmel. TRAVELER'S TREE, so called from the clear waters sap from the large box-like cells of the leaf-stalks or caught in the leaf-sheaths, and which affords a refreshing drink. Fig. 3358. Lvs. often 30 ft. high, very large, fibrous: frs. white, in spikes about 7 in. long. G.C. III. 21:2254. A.F. 12:535. R.H. 1896, p. 152; G.C. III. 2:693; 50:460. A.G. 20:870. Cult. in Fla. and S.
RAVENAL

Calif.; also rarely under glass in the northern states. It is said that in S. Calif., the traveler’s tree was never really successful.

AA. Les. as long as the petals.

guyanensis, Steud. Becoming 15 ft. high; lvs. oval-elongated: fls. white; spathes 1 1/2 in. long.—Offered 1893 in S. Fla.

F. W. BARCLAY.

RAVÉNIA (name not explained). Rubiaceae. Tender glabrous shrubs suitable for the warmhouse. Leaves opposite, 1 3-foliate; lfts. lanceolate, entire: fls. red or white, borne on rather long axillary peduncles; sepals unequal, the 2 outer being somewhat foliaceous; corolla-tube straight, rather long; the limb nearly regular.—Two species from Cuba and Brazil.

spectabilis, Griseb. (Lemônia spectabilis, Lindl.). Tender shrub: lfts. 3: fls. purplish red, about 1 in. across, solitary or in open, few-fld. clusters on axillary peduncles as long as the lvs. Cuba. B.R. 26:59. R.H. 1844:25.—The plant once offered in Fls. as Leonomia spectabilis apparently is of some other genus. F. W. BARCLAY.

REBÜTIA (named for Rebut). Cactaceae. Plants very small, globose, covered with small tubercles, resembling in habit very much a many-milliarial fl. appearing from the side and even the base of plant, large in comparison with the plant, red or orange-colored, with slender, funnelform tube; bracts on ovary small, naked in their axis: fr. a small berry.—Originally described with 1 species, but a study of S. American material indicates that there may be 5 or 6 other species to be transferred here from other genera. The original species has been referred both to Echinopsis and Echinocactus, from both of which it is abundantly distinct.

minúsula, Schum. Plants globose, 1 2 in. diam., covered with low tubercles: spines in clusters of 25 30, 1 1/2 in. long: fls. often numerous, arising from near the base of plant, 1 1/4 in. long, bright crimson. N. Argentina. B.M. 8583 (as Echinocactus).

Flebrigii, Brit. & Rose (Echinocactus Flebrigii, Gürke). Globose, depressed at apex, 2 in. diam.: spines 30 40 in a cluster, 1/2 in. long, white, or some of the longest ones nearly 1 in. long with brownish tips: fls. nearly 1 in. long. Bolivia. Blühende Kakteen, pl. 109. J. N. ROSE.

REHMANNIA (Jos. Rehmann, 1779 1831). Scrophulariaceae. Perennial viscid-villous herbs suitable for the cool greenhouse, grown for the showy bloom. Stems leafy, branched from the base, either low, scapiform and almost leafless, or (especially in cult.) tall and few-lvd.: lvs. alternate, obovate or oblong, coarsely dentate: fls. rather large, borne in terminal racemes and short-pedicelled, brownish purple or pale, the throat intensely colored; calyx ovoid-campanulate, 5-cleft at the top; corolla pilose, slightly incurved, tube rather broadly subventricose, limb obliquely 2-lobed, the lobes spread, the rear or inner one deeply 2-cleft, the front one 3-cleft; stamens 4; caps. broad, partly included in the calyx; seeds numerous.—About 5 species, China and Japan.

angulata, Hemsl. Perennial plant, 1 3 ft. high, glandular-hairy: lvs. pinnately lobed, with red with a band of scarlet at the margin, rather coarsely dentate: fls. rather large, borne in terminal racemes and short-pedicelled, brownish purple or pale, the throat intensely colored; calyx ovoid-campanulate, 5-cleft at the top; corolla pilose, slightly incurved, tube rather broadly subventricose, limb obliquely 2-lobed, the lobes spread, the rear or inner one deeply 2-cleft, the front one 3-cleft; stamens 4; caps. broad, partly included in the calyx; seeds numerous.—About 5 species, China and Japan.
REHMANNIA

Var. tricolor, Hort. Fls. at first bright purple, later almost violet-rose. The throat is shaded with vermilion and the throat white, spotted with purple. China.

Briscui, Hort. (R. elata x R. Henryi). Intermediate in most characters, dwarfer than the former in having an erect infl. instead of a condensed one: the fls. are intermediate in color and of a soft pink: the lvs. arranged in a rosette are similar in shape to those of R. elata.

REINWARDTIA

Henryi and have the same dark veiningings, while they are much more velvety-hairy than those of R. elata but less so than those of R. Henryi. A garden hybrid. G.C. III. 47:188.

elata, N. E. Br. (R. angulata, Hort. not Hemsl.). Fig. 3350. Twice as large as R. angulata: lvs. 2-4-lobed on each side, lobes acute, entire; bracts or flowering lvs. long-cuneate at base: corolla slightly larger than R. angulata, bright rosy purple on the lips and yellow dotted red in the throat. China. B.M. 8177 (as R. glutinosa, Libosch.]

3359. Rehmannia elata. (X 1/2)

REINECKIA (J. Reinecke, a German gardener). Lilaceae. A tender perennial herb, with attractive foliage in tufts 1-1½ ft. high from a thick, creeping rootstock: lvs. rather large, channelled: scapes leafless: fls. sessile, in a loose spike; perianth-tube cylindrical; petals recurved, spreading; ovary 3-lobed, with a few seeds to each cell: berry globular, usually with 1 seed per cell. A single species from China and Japan. The following is procurable from Dutch bulb-growers.

3360. Reinwardtia trigyna. (X 1/2)


Leaves alternate, entire or crenate-serrate; stipules minute, subulate, caducous: fls. yellow, in axillary and terminal cymose fascicules, rarely solitary; sepals 5, entire, lanceolate, acuminate; petals 5, contorted, fugacious, much longer than the sepals; stamens 5; ovary 3-5-celled: caps. globose, splitting into 6-8 cocci.

—Two species, India. The genus is closely allied to the flax (Linum), and Reinwardtia trigyna is known by the gardeners, who usually accent trigynum on the second syllable instead of the first. Reinwardtia is distinguished from Linum by the yellow fls., 3-4 styles and unequal or deficient glands; Linum has mostly blue, rosy or white fls., 5 styles, and equal glands.

Reinwardtias are showy subshrubs about a foot high with bright yellow flowers. They are useful for the decoration of the conservatory in winter time, at a season when yellow is scarce. To have presentable plants, it is necessary to give them a good deal of attention. It is difficult sometimes to get suitable cuttings; the strong growths which start away from the base when the plants are cut down make the best plants. Top-shoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for...
About 15 or more species, in Malay Archi-

ves distichous on the st.: fls. in large, droop-

rather crowded, strap-shaped, 2-3

spreading, similar or the lateral sepals often

larger and of a different calm; labellum small,

Rts. very long, climbing, somewhat branched: 1vs.

movably joined to the column, spurred or

red blotches; labellum very small. Philippines. B.M.


Does not flower readily in cult., but is very showy.

spatulate, deep red, blotched with orange; lateral

form anther). 1. St. slender, climbing, 10-12 ft. high:

Lvs. alternate, oblong to linear-oblong: panicle

about 1 ft. long and nearly as broad; fls. 2-3 in. long;

petals and dorsal sepal erect, linear-spatulate, orange-

branched, climbing by means of white fleshy roots: lvs.


RENANThÉRA (named from the remi-

form anther). Orchidaceae. Tall climbing epiphytes.

Stems branched, sometimes 12-14 ft. high:

Lvs. distichous on the st.: fls. in large, dropo-

ing racemes or panicles; sepals and petals

spreading, similar or the lateral sepals often

larger and of a different color; labellum small,

movably joined to the column, spurred or

spurless, often with small, erect, lateral lobes.

—About 15 or more species, in Malay Archi-
pelago and Cochin-China. Cult. is similar to that of

Aerides and Vanda.

RENEALMIA (in honor of Paul

Renanthe, W. ARDTIA

RENEALMIA 2917

(R. annamensis Rolfe. Dwarf, erect, up to 1 ft. tall: lvs. un-

equally 2-lobed at apex, 2-3 in. long, about 5 mm. broad; racemes


very remarkable orchid.

R. annamensis Rolfe. Dwarf, erect, up to 1 ft. tall: lvs. un-

equally 2-lobed at apex, 2-3 in. long, about 5 mm. broad; racemes
terminal or scapose and either paniculate or racemose; 
fls. white, yellow or red; calyx short, 3-lobed; corolla short-tubed, the lobes erect or finally spreading, sub-
equal or the posterior broader and concave; ovary 3-celled: caps. globose. About 60 species, Trop. Amer.
as a dye-plant; also ornamental, with reddish peduncles and bracts, and yellow fls.: lvs. like a canna; the 
foliage is woody at the base. B.R. 227. Many named varieties of R. odorata are in the trade. See Mignonette.
glabra, Linn. Glabrous and somewhat glaucous perennial, less than 1 ft. tall, with many spreading sts.:
Ivs. linear, entire, or 2-toothed near the base; petals 5-6, the upper ones 3-lobed; stamens about 14. 
Pyrenees.—Recommended for dry places, as a border plant. See p. 1467.

AA. Lvs. usually prominently lobed or pinnatifid.

álba, Linn. White Upright Mignonette. Straight-
growing erect glabrous annual or biennial, 1–3 ft., 
weedy: Ivs. numerous, long-stalked, deeply and 
irregularly pinnatifid, the segms. usually linear and 
sometimes toothed: fls. glaucous white, in a very 
long slender spike; stamens about a dozen, and petals
5–6. S. Eu. G.C. III. 20:45. G.W. 8, p. 255.—A com-
mandable plant for growing as an ornamental subject 
in the R.-border with other plants. It bears many 
spikes on tall branches, making it a conspicuous 
plant; treated as a half-hardy annual; odor not pleas­
ing. It occurs somewhat in this country as an aden­
tive plant.

cristállina, Webb. Glabrous, sparingly branched, 
somewhat glaucous annual; Ivs. usually 3-parted, or 
the lowest ones entire: fls. deep yellow, in racemes. 
Canary Isls.—Has been offered as a garden annual.

L. H. B.

RÉSTIO (Latin, rope, alluding to the use made of 
the plants in S. Afr.). Restiéceae. Perennial herbs 
with a tufted or creeping rootstock, of little horticultural 
significance: sts. terete, compressed, or 4-sided, 
with remote sheathing If.-sheaths, usually more or less 
mucronate, sometimes prolonged into a linear blunt 
if.: male and female infi. similar or dissimilar, spicate, 
spikes solitary or spikelets numerous in spicate or 
panicked cymes; fls. ducous, 1-bracteate; perianth 
usually of 6, sometimes 4 segms. in 2 rows, rarely none; 
ovary 2- or 3-celled: caps. 2- or 3-celled, or by abortion 
1-celled, 1 seed in each cell. About 170 species, half 
of them from S. W. Afr. the remainder from S. W. Austral. 
R. subtervitátilis, Mast. Sts. erect, 3–4 ft. high, with 
verticillate branches: sheaths about 1 in. long, coria­
ceous, strate above, membranous, spreading, acum­
inate, smaller sheaths foliaceous from beneath a 2-lobed 
linear apex: perianth-segms., male, broadly obovate, 
the lower villous keeled, female, broader: caps.
oblquely ovate, 1-celled, 1-seeded. S. Afr. G.M. 
43:76.

REST-PERIOD IN PLANTS. The rest-period of 
plants is that period or stage when the part or parts 
at inaction are incapable of responding to favorable growing 
conditions. A rest-period of some length; either 
short or long, appears to be universal with all perennial 
plant forms. So far as known, none has a continuous 
growth. Trees and shrubs growing in the open, both in 
cold and warm climates of the tem­
perate zone, may begin to enter the rest-period in some of their branches 
as early as midsummer. This is indi­
cated by cessation of length growth 
and formation of terminal buds. 
Some may be ready to grow again in a 
week, while others are unable to 
grow for five or six months. Herbari­
eous perennials begin their rest after 
dying down in summer or fall. The 
death of the aerial parts is accom­
panied by the formation of terminal 
and formation of terminal buds.

REST-PERIOD (Latin, rope, alluding to the use made of 
the plants in S. Afr.). Restiéceae. Perennial herbs 
with a tufted or creeping rootstock, of little horticultural 
significance: sts. terete, compressed, or 4-sided, 
With alternate, simple or compound lvs., and terminal 
skips of inconspicuous perfect fls., which have 4–7 small 
greenish toothed or cleft unequal petals and 8-40 nate, smaller sheaths foliaceous from beneath a 2-lobed 
eximw, gigantea, grandtflora, pyramidalis, multiflora, 
pumila; they represent stature-forms and habit-forms 
of the horticulturists. Var. rosea quinaria, Edw. is woody at the base. B.R. 227. Many named varieties of R. odorata are in the trade. See Mignonette.
exceptions. Bulbs begin their rest when the tops die down after flowering. Many will not grow again for several months. Many seeds germinate poorly, or not at all, if planted immediately or shortly after ripening. Failure to grow is usually due to the influence of a rest-period. However, aside from the effects of a rest-period, seeds are not germinating if they are on account of a hard or tough seed-coat which is more or less impervious to water. In garden practice, seeds are stored for a few weeks or months before planting in order that they may pass through a period of "after-ripening." Those with hard or tough seed-coats are stored by stratifying in moist sand.

Investigation has shown that practically all woody plants native to the temperate zone have a rest-period. Many of these are unable to grow in late fall or early winter, even when transferred to a warm moist greenhouse. In trees and shrubs the rest-period begins to set in as early as midsummer. The length of the rest varies greatly. In some cases it may last only a few days or weeks, while in others it may persist from three to six months. Red raspberries, mountain-ash, and spireas are almost free from a rest-period, while white oak, tulip tree, and American beech commonly rest for six or seven months. Among herbaceous perennials, the life-of the annual is considerably longer than the rest-period which usually lasts for two or three months. Asparagus, rhubarb, hardy chrysanthemum, golden marguerite, calliphysis, and a host of others are ready to grow in a week or two after the old plants are pulled down. All spring-flowering bulbs appear to have a distinct rest-period lasting from three to five months. From 50 to 75 per cent of the seeds of herbaceous plants, annual and perennial, have a rest-period, while the resting phase is noticeable and generally very distinct in fully 90 per cent of the seeds of trees and shrubs.

The rest-period is commonly looked upon as the period of dormancy in plants and seeds, but this view is incorrect. The rest-period of trees, for example, begins and ends entirely independent of the winter season. While cold weather may prevent growth from taking place, it does not necessarily prevent the rest-period from coming to an end and thus leaving the trees ready to reawaken when surrounding conditions are favorable. In mild climates the rest begins and ends with great regularity. The same is true in cold climates, but in the case of trees, at least, the true condition of rest cannot be determined on account of the absence of the cold which prevents growth. In trees the rest sets in gradually and is not complete until all the growing points have ceased elongating and formed terminal buds. In like manner the trees pass out of their resting state gradually, some twigs often being ready to grow much earlier than others. These phenomena are very noticeable when trees are grown under glass.

The rest-period of many trees and shrubs may be broken or greatly shortened by special treatments. Those with a long rest-period are very difficult to arouse during the early stages of their rest. The greater part can be forced with comparative ease during the middle period of their rest and to some extent during the latter phases, although at this time the treatments must be less severe or the plants may be killed. The agents most generally used for forcing growth are ether, drying, and freezing. Submerging in warm water will sometimes start growth, particularly in dormant twigs. Twigs of flowering shrubs, such as lilac, deutzia, spireas, and golden-bell, may be caused to burst into bloom in early or midwinter by placing them in a tight vessel and pouring over them the rate of one teaspoonful of ether vapor for twenty-four hours, when they should be taken out and stood in vessels of water in a warm moist room. It is very necessary to have the air moist to keep the buds from drying out before they begin to grow. Potted plants of all kinds, both woody and herbaceous, may be similarly treated, provided the surface of the soil in the pots is dry, as moist or wet soil will absorb too much of the ether. Many herbaceous plants do not respond to the ether treatment and some are killed. The best agent for forcing very hardy herbaceous perennials is to lift them in the fall, subject them to a temperature a few degrees below freezing for twelve to twenty-four hours, and then place them in a mild hotbed. By mid- or late winter most plants may be forced with heat alone. There are perhaps thirty or forty different agents that have been successfully used for forcing plants.

Of just what value the rest-period is to the different plants and plant parts is not known. It is highly probable, however, that the period of inactivity is utilized for the conservation of energy through the special work the enzymes are able to perform while the growing parts are dormant, that they could not do in the presence of active growth.

The cause of the rest-period and the specific effects of the rest-period-breaking agents on the plant organism have been carefully studied only in connection with woody plants. It has been thought that the rest-period of trees sets in on account of the inhibition of the enzyme activity due to an over-accumulation of the products of their work. The early phases of the rest-period occur and are passed through while the plants are in full leaf and often while some of the parts are still making active growth. The parts to enter the resting state first, in fruit-trees particularly, are the so-called spurs which are short lateral outgrowths usually arising from wood that grew the previous year. These cease growing early in the season, probably because of imperfection of solution. The crude sap from the roots rises most rapidly in those branches and twigs that are nearest in a straight line upward from the ground. It would appear then that the spurs, on account of their position, are deprived of water very early in the growing season. Assimilation goes forward rapidly in those parts that first approach a state of maturity. With a decreased water-supply and a greatly increased deposition or accumulation of carbohydrates, enzyme activity is soon checked and not entirely inhibited. As the season advances, the approach of cool weather may hasten the period of dormancy, but the trees would go dormant just the same, although later, in a mild climate or under glass. It is thus seen that the rest-period of trees is gradual, beginning with the spurs and gradually involving all of the branches.

Briefly, the rest-period perhaps begins to set in on account of the inhibition of the enzymes by the over-accumulation of the products of their work. This is the early rest of mid- or late summer. In the fall, excess supplies of carbohydrates continue to be accumulated and, with trees growing in the open, the further inhibition of the enzymes is actively aided by the approach of cool weather. These factors acting together bring about the main or middle state of rest. However, since dormant trees are never completely at rest, respiration continuing all the time, and doubtless enzyme activity too, the over-accumulation of carbohydrates is gradually reduced. Toward the last of this period occurs the after-rest, which, as the enzymes become more and more active, gives place to the beginning of growth.

Research has shown that diastatic, proteolytic, fat-splitting, and oxidizing enzymes all play a prominent part in bringing about, as well as ending, the rest-period in woody plants. Any forces or agents that will reduce the activity of these ferments will be the means of causing the rest-period to set in earlier. Food, any agent that will stimulate the enzymes into activity will be the means of bringing the rest-period to an end. (See Research Bulletins Nos. 1, 15, 16, 17, 21, Missouri Agricultural Experiment Station.)
RESTREPIA (Joseph Emanuel Restrep, a student of natural history in the tropics). Orchidaceae. Very interesting little plants, allied to Masdevallia and not unlike that genus in habit and appearance. Stems tufted on creeping rhizomes, each bearing a single inf. and clothed below with scales; fl.-sts. appear from the axil of the lvs.; perennial, producing fls. for several years in succession; dorsal sepal free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, bifid only at the apex; petals like the dorsal sepal, but smaller; labellum oblong or ovate, often with 2 small teeth near the base.—About 40 species, from Brazil to Mexico, few of which are cult. for their curious fls. They are easily grown at a temperature suited for cool odontoglossums (40-55°). They thrive well planted in a mixture of peat and sphagnum in pots, which are usually suspended near the glass. They have no definite resting period, but do not require so large a quantity of water in winter as during their most active growth. Pot moderately firm, and rest in a coolhouse.

A pantannifera, HBK. Sts. slender, clustered, 4-6 in. high, clothed with imbricated scales, and bearing one (rarely more) ovate-cordate petioled fl.; peduncle from the axil of the fl., slender, 1-fl.: dorsal sepal 1½ in. long, lanceolate, tapering into a slender clavate tail, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antenna-like, purple at the tip. Nov.-Feb. Colombia, Venezuela. B.M. 6288; 7930. I.H.16:601. A.F.6:631.

Dayana, Reichb. f. A small plant growing in dense tufts: lvs. roundish, acute, cordate: dorsal sepal free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, bifid yellow and brown. Costa Rica.

Elegans, Karst. Tufted, epiphytic, 2-3 in. high: lvs. 1-1½ in. long, elliptic: peduncle usually in pairs; fls. 1½-2 in. long; dorsal sepal erect, lanceolate, white, streaked purplish, with a tail as long as itself, which is clubbed at the tip and yellow; lateral sepals connate into an oblong, emarginate, concave blade, yellow, spotted purple; petals like the dorsal sepal, but spreading and only half the size; lip half the size of the connate lateral sepals and of the same color but edged with red. Venezuela. B.M. 5966. F.S.7:2.4. R. aspericostatum, Reichb. f. Only 2-3 in. high: fls. small, deep yellow, densely spotted with crimson or chocolate-brown. Venezuela.

HESTREPIA (Joseph Emanuel Restrep, a student of natural history in the tropics). Orchidaceae. Very interesting little plants, allied to Masdevallia and not unlike that genus in habit and appearance. Stems tufted on creeping rhizomes, each bearing a single inf. and clothed below with scales; fl.-sts. appear from the axil of the lvs.; perennial, producing fls. for several years in succession; dorsal sepal free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, bifid only at the apex; petals like the dorsal sepal, but smaller; labellum oblong or ovate, often with 2 small teeth near the base.—About 40 species, from Brazil to Mexico, few of which are cult. for their curious fls. They are easily grown at a temperature suited for cool odontoglossums (40-55°). They thrive well planted in a mixture of peat and sphagnum in pots, which are usually suspended near the glass. They have no definite resting period, but do not require so large a quantity of water in winter as during their most active growth. Pot moderately firm, and rest in a coolhouse.

A pantannifera, HBK. Sts. slender, clustered, 4-6 in. high, clothed with imbricated scales, and bearing one (rarely more) ovate-cordate petioled fl.; peduncle from the axil of the fl., slender, 1-fl.: dorsal sepal 1½ in. long, lanceolate, tapering into a slender clavate tail, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antenna-like, purple at the tip. Nov.-Feb. Colombia, Venezuela. B.M. 6288; 7930. I.H.16:601. A.F.6:631.

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RESURRECTION PLANTS are such plants as "come to life" after being apparently dead. They are kept in a dried state as curiosities, to be "resurrected" on occasion, and sometimes they are grown for a similar purpose. Some of them are used as house plants, the tips or on the sides of the inrolled branches. (Fig. 3365.) The plants are up-rooted by the winds and blown about during the dry season, but this belief is thought by many to be "the rolling thing before the whirlwind" mentioned in Isaiah, and were brought to Europe by the crusaders. The shape of these balls might be fancifully compared to that of an unopened rose. When the winter rains descend or when the balls are blown into the Mediterranean, the branches at once open back and stretch out straight, the fruits open, and the seeds germinate very quickly, "often in the fruit," according to Warming. The dead plants do not, of course, "come to life," but they retain their hydroscopic properties for many years.

Botanically, Anastatica is distinct by reason of its short and broad fruit or silicle, which has two ear-like appendages at the top. The silicle is divided by a transverse partition into two cells, each of which contains a seed. There is only one species. The genus belongs to the Arabis tribe of the Crucifereae, but is exceptional in not having a long slender silicle. The growing plant has ovate leaves, the lower ones toothed, and the flowers are small, violet, and yellow, with purple lines and a purple tip. The plant is a native of Mexico and eaches into western Texas. Many selaginellas curl up if allowed to dry, and several of the Mexican species do so in their native places in the dry season, but this species is said to make a tighter mass than any other. When placed in lukewarm water the fronds loosen and roll back into a flat or saucer-like position. The plant may become green and grow, and it is also said that it may be dried and revived an indefinite number of times. The specimen shown in Figs. 3366, 3367 was "resurrected" four times after it came into the hands of the Editor, and showed no indications of a limit to its reviving possibilities. Selaginellas are beautiful moss-like plants. What appear to be the leaves are really the branches, and the true leaves are scale-like. See Gn. 17, p. 400; F. 1871, p. 144; also Selaginella.

1. A member of the composite family (Odontospermum pygmaeum, or Asteriscus pygmaeus) is also called rose of Jericho, has the same range as No. 1, and was also brought to Europe by the crusaders. (Fig. 3338.) The plant is a native of the sandy deserts from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall and the branches become woody and roll up into a ball, reminding one of a "whirlwind" mentioned in Isaiah. (Fig. 3339.) The ball or the seeds are the seeds, or, in botanical language, the fruits, which are borne in a protected position near
RESURRECTION PLANTS

4. Several species of Mesembryanthemum are known to be hygroscopic. According to Kerner & Oliver, "the capsular fruits of these plants remain closed in dry weather; but the moment they are moistened the valves covering the ventral sutures of the fruit-loculi open back, dehiscence takes place along the ventral sutures, and the seeds, hitherto retained in a double shroud, are washed out of the loculi by the rain." It is doubtful whether these capsules are offered in the trade.

The cultivation of resurrection plants.

Anastatica is sometimes grown for curiosity or for botanical purposes, but the plant is anything but ornamental. It has often been grown for classes in botany, sowing the seed in February in pots and keeping the plants in pots all summer. Bottom heat is not necessary at any stage, at least in America. The plant could be grown in a window-garden. The seeds may be sown in February in 4-inch pots, using a light, sandy soil, in a house with a temperature of 60° F. As soon as the seedlings are large enough they are transplanted into other 4-inch pots, three plants to a pot.

The Selaginella lepidophylla is perennial. It is rarely cultivated in greenhouses for ornament, like the evergreen kinds of selaginellas. It is grown chiefly in botanical gardens or by fanciers of ferns and selaginellas, as it is by no means the most beautiful member of the genus. The writer grew a plant of it for four years, and once saw at one of the botanical gardens a plant which through long cultivation had developed a stem almost a foot high. It looked like a miniature tree-fern, except of course that the fronds were arranged in a dense rosette, which gave the fronds a flat rather than a pendulous appearance. Whether the plants received directly from Texas have a crop of spores on them is a question. The spores do not discharge when the plants are wetted. Many extravagant statements are made about the bird's-nest moss. The dried plants offered by the trade will turn green and grow unless they are too old or have been kept dry too long. They would probably not grow if kept over more than one season. They cannot be dried again and again indefinitely and still remain alive.

If a plant has been grown in a pot three or four years and is then dried off it will die. Most persons who grow these plants as curiosities place them in a bowl of water with perhaps a little sand and a few pebbles. The water causes them to turn green and they will grow for a time. Then if taken out of the water they may be kept dry for a time and the process repeated, but each time the plant loses its lower or outer circles of fronds much faster than new ones are made and at about the third time the plant is commonly used up.

There is a fern (Polypodium polydioides, page 2744) which could just as truly be called a resurrection plant. It is a native of the southern states, where it grows up the trunks of trees and over rocks and stones. At certain times it is dried up and parched, but as soon as moisture conditions are restored it looks as fresh as ever. In warm dry countries there are ferns of various genera that dry up and then are resurrected quickly when wet weather comes; some of these are very interesting.

EDWARD J. CANNING.

RETINISPORA. Often but not originally spelled Retinispora. A genus of conifers founded originally by Siebold and Zuccarini on the two Japan species of Chamaecyparis, distinctly distinguished from the American species by the resinous canals of the seeds (from Greek, retine, resin, and spora, seed). Afterward the genus was united with Chamaecyparis, but in horticultural nomenclature the name is applied to a number of juvenile forms of Thuja and Chamaecyparis, chiefly those introduced from Japan. As these juvenile forms all resemble each other very much, indeed much more than do the typical forms to which they belong, it is not strange that they should have been considered to be distinct species and even to belong to a separate genus. Even botanists failed to recognize the true relation of these forms and went so far as to place one of them in the genus Juniperus. With the exception of Retinispora eriostachys, which C. Koch recognized as the juvenile form of Thuja occidentalis, the origin of these juvenile forms remained doubtful until L. Beissner, after having carefully studied the subject for years, disclosed the relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedlings which have still retained their primordial foliages, and he also published cases in which larger plants of these doubtful forms have been observed accidentally to develop branches with the foliages of the typical form. See, also, Gt. 1879, pp. 109 and 172; 1881, pp. 210 and 299, and 1882, p. 152.

There are four of these juvenile forms generally in...
cultivation, each of them with an intermediate form showing either a kind of foliage approaching that of the type or two different kinds of foliage on the same plant. There seems to be no doubt that all these forms have been secured by propagating branches of young seedling plants. All seedlings of Chamœcyparis, Thuja, and other genera of the Cupressaceae produce in their juvenile state a kind of primordial foliage very different in appearance from that of the adult plants. The first leaves are always linear and spreading, passing gradually into acicular and at last scale-like leaves. In some plants, especially if they have not sufficient nourishment, the primordial foliage is retained longer than usual and these have probably been selected for perpetuating the juvenile state, by means of cuttings. By continuing through many generations the propagation of those branches which show the juvenile state most distinctly, these forms have become well-fixed varieties and even sometimes bear seeds without changing the foliage on the fruiting branches. These seeds, however, produce plants of the typical form and only a few of them retain the primordial foliage somewhat longer than usual.

The juvenile forms very much resemble some species of Juniperus in habit and foliage. They bear linear spreading leaves in pairs, changing in winter to a brown, reddish, violet or steel color, and do not show the regular frond-like branching of the typical forms. The leaves, however, are much softer and not sharply and acutely pointed as in Juniperus; they are mostly marked with whitish or grayish green lines beneath, which is never the case in Juniperus. Only the upper side of the leaves like Juniperus. The leaves, however, are much softer and not sharply pointed as in Juniperus; they are mostly marked with whitish or grayish green lines beneath, which is never the case in Juniperus. Only the upper side of the leaves like Juniperus.

Though these Retinispora forms are described under the genera and species to which they belong, where also references to illustrations are cited, descriptions are given here to afford a closer comparison of these similar and much confused forms. The two forms of foliage in the common red cedar are well shown in Fig. 2025, Vol. III. For other pictures of Retinispora forms see Chamœcyparis and Thuja.

Chamœcyparis obtusa var. ericoides, Bochmer (Retinispora Sänderi, Sander. Juniperus Sänderi, Hort.). Dense round-headed bush with upright branches and bluish gray foliage: lvs. acicular, decussate, spreading, about 1½ in. long, thickish, concave above and with a green line in the middle, the lower lvs. often acutish, the upper ones obtuse.

Chamœcyparis pisifera var. squarrosa, Beisen. & Hochst. (Retinispora squarrosa, Sieb. & Zucc.). Fig. 893. A dense, pyramidal or round-headed bush or some-

3369. Retinispora. The specimen on the left is Thuja orientalis var. decussata; middle, Chamœcyparis thyoides var. ericoides; right, C. thyoides var. andelyensis. (×35)

These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually becomes unsightly when older. They are all readily prop. by cuttings. See also Chamœcyparis and Thuja.

Thuja orientalis var. decussata, Beisen. & Hochst. (Retinispora juniperoides, Carr. R. decorata, Hort. R. squarrosa, Hort.). Fig. 3369. Dense, round-headed bush, with bluish green foliage changing to violet or steel-color in winter: lvs. linear, soft grayish green beneath. These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually becomes unsightly when older. They are all readily prop. by cuttings. See also Chamœcyparis and Thuja.

Thuja orientalis var. decussata, Beisen. & Hochst. (Retinispora juniperoides, Carr. R. decorata, Hort. R. squarrosa, Hort.). Fig. 3369. Dense, round-headed bush, with bluish green foliage changing to violet or steel-color in winter: lvs. linear, soft grayish green beneath. These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually becomes unsightly when older. They are all readily prop. by cuttings. See also Chamœcyparis and Thuja.

Thuja occidentalis var. decorata, Beisen. & Hochst. (Retinispora decorata, Hort. R. dubia, Carr.). Dense, broadly pyramidal or round-headed bush, with upright branches and dull green foliage, changing to brownish green in winter: lvs. linear, soft grayish green beneath. The intermediate form, var. Ellwangeriana, Beisen. (Retinispora Ellwangeriana, Hort.), has usually two kinds of lvs., but the linear lvs. are smaller than those of the preceding form.

Thuja orientalis var. decorata, Beisen. & Hochst. (Retinispora juniperoides, Carr. R. decorata, Hort. R. squarrosa, Hort.). Fig. 3369. Dense, round-headed bush, with bluish green foliage changing to violet or steel-color in winter: lvs. linear, soft grayish green beneath. These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually becomes unsightly when older. They are all readily prop. by cuttings. See also Chamœcyparis and Thuja.

REYNOSIA (named for Dr. Alvaro Reynoso, 1830-1886, a Cuban agricultural chemist). Rhamnaceæ. Unarmed evergreen shrubs or trees, with rigid branches, sparingly cultivated, possibly for its edible fruit. Leaves opposite, leathery, entire and emarginate; stipules small and caducous: fls. small, perfect, yellowish, inserted on the margin of the fleshy disk; ovary almost superior, 2-3-celled: seeds, usually ovoid, 5, valvate spreading; petals wanting; stamens 5, inserted on the margin of the fleshy disk; ovary almost superior, 2-3-celled: drupe with a thin fleshy pulp and a crustaceous stone.—About 10 species, 1 in S. Fl. latifolia, Grisch. RED IRONWOOD. DARLING PLUM. Smaller tree, 20-25 ft. high: lvs. oval, oblanceolate, obtuse, usually emarginate, 1½ in. long, leathery; mar-

REYNOSIA
gins revolute: fls. in axillary umbels, borne in May: fr. ripens in Nov. or the following spring. S.S. 2: 266.

F. Tracy HUBBARD.†

RHABDOThAMNUS (Greek, rod and bush, a shrub with many rod-like branches). Generacée. Divergently branched shrub, with slender branches. Ivs. small, opposite, petioled, rotundate, commonly dentate, often dissimilar: pedicels solitary in the axils, filiform and without bracts: fls. red-striped; calyx free, deeply 5-lobed, the lobes membranaceous, acuminate; corolla tubular-campanulate; the limb slightly oblique, somewhat 2-lipped, the lobes 5, rotundate, spreading and subequal; stamens 4, perfect: caps. ovate, acuminate, coriaceous, finally 4-valved. One species, New Zeal. R. Soldanii, A. Cunn. A much-branched, hispid shrub 1-3 ft. high: branches very slender, spreading at right angles: Ivs. opposite, often in unequal pairs, oval or orbicular, coarsely toothed: fls. axillary, solitary, about 1 in. long; calyx hispid, 5-lobed, lobes lanceolate, orange, striate red, line 2-lipped, upper lip smaller, lower lip deeply 3-lobed, the lobes rounded: caps. ovoid acute. New Zeal. B.M. 8019. G.C. III. 37:146.

RHAMNÉLLA (referring to its close affinity to Rhamnus). Rhamnacée. About 6 species in E. Asia. Deciduous shrubs or small trees: Ivs. alternate, stipulate, serrulate: fls. small, green, in axillary clusters; sepals, petals, and stamens 5; ovary incompletely 2-celled: fr. a black drupex with a 1-seeded stone. In habit resembling Rhamnus, but in Ivs. and frs. more like Berchemia. Only the following species is in cult.; it seems somewhat tender and has no particular ornamental qualities; cult. and prop. like rhamnus, R. franguloides, Weberbauer (R. japonica, Miq. M. rhunthus franguloides, Maxim.). Small tree to 30 ft.: Ivs. ovate-oblong, acuminate, finely serrulate, with 5-10 pairs of veins, glabrous except on the veins beneath, 2-5 in. long; fls. in 5-15-flb. clusters: fr. cylindrical-oblong, black, ½th. long. Japan, Koror, E. China. S.I.F. 2:48.

ALFRED REHDER.

RHAMNUS (its ancient Greek name). Including Frangula. Rhambusce. Buckthorn. Ornamental woody plants grown chiefly for their handsome foliage and some also for their attractive fruit. Deciduous or evergreen shrubs or small trees, sometimes spiny: Ivs. alternate or opposite, short-petioled, with small deciduous stipules, penninerved, serrulate or entire: Ivs. small, in axillary clusters, umbellate racemes, perfect, polygamous or dioecious; sepals, petals, and stamens 4-5, petals sometimes wanting: style usually undivided; ovary 2-4-loculed: fr. a globular or oblong 2-4-seeded drupe; nutlets with a leathery usually dehiscing wall.—About 100 species native chiefly to the temperate regions of the northern hemisphere. A few species are found in the tropics and as far south as Brazil and S. Afr. Several species yield yellow or green glass and the fr. and bark of some are used medicinally. The wood of R. Frangula is made into charcoal valued for the manufacture of gunpowder.

The buckthorns are handsome shrubs with generally bright green often rather large leaves and with inconspicuous greenish flowers usually in axillary clusters followed by berry-like, usually black, rarely red, fruits. Many of the species as R. cathartica, R. dahurica, R. fallax, R. Frangula, and R. alnifolia can be depended upon as hardy, while R. Purshiana and R. lanceolata are hardly at least as far north as Massachusetts. R. immerotina and R. caroliniana are somewhat more tender. The handsome foliage on Ivs. is r. fallax and R. immerotina and the evergreen R. tisclophi and R. crocœa. R. Purshiana, R. caroliniana, R. alnifolia, R. dahurica, and R. Frangula are also noteworthy on account of pretty foliage. Of the evergreen species which are not hardy North, R. crocœa and R. tisclophi are to be recommended for their ornamental bright red fruits. Buckthorns are useful for planting in shrubberies; they like a rather moist soil, especially R. lanceolata, R. alnifolia, R. caroliniana, and R. Frangula, and grow well in shaded or partly shaded situations, but R. cathartica and its allies prefer dry soil. R. cathartica is a valuable hedge plant, though it is now not used so extensively as in the past. The species are propagated by seeds stratified or sown in fall, and by layers. Some, as R. lanceolata, R. fallax, and R. alnifolia, are propagated by cuttings; R. Purshiana, has been successfully raised in England from softwood cuttings put in mild bottom heat under glass about the middle of July. The evergreen species are propagated by cuttings of ripened wood under glass. Rarer kinds are sometimes grafted, those of the Frangula group usually on R. Frangula and the true buckthorns on R. cathartica or allied species.

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CC. Shape of Ivs. deciduous.

DD. Length of Ivs. 1½-3 in.; Ivs. broadly obovate to elliptic, thin. 1. cathartica

DD. Length of Ivs. 2½-4 in.; Ivs. obovate elliptic to oblong, leathery. 2. dahurica

DD. Length of Ivs. 4-6. 3. japonica

DD. Length of Ivs. 1½-2 in.; Ivs. 4-merous, apetalous: petals: Ivs. oblong-lanceolate. 4. fallax

DD. Length of Ivs. 6-8. 5. immerotina

DD. Length of Ivs. 1½-3 in.; Ivs. 5-merous, with petals. 6. alnifolia

DD. Length of Ivs. 3-5 in.; Ivs. 4-merous, with petals: Ivs. oblong-lanceolate. 7. lanceolata

DD. Length of Ivs. 5-8. 8. crocea

DD. Length of Ivs. 6-8 in.; Ivs. 5-merous, with petals. 9. ilicifolia

DD. Length of Ivs. 1½-3 in.; Ivs. 6-15 in. 10. Alaternus

AA. Winter buds naked: petals 6; seeds convex at the back, not grooved, with flat and fleshy cotyledons: unarmed shrubs with alternate Ivs. (Frangula.) 1. Fls. in peduncled umbels. 2. buckthorns are useful for planting in shrubberies; they like a rather moist soil, especially R. lanceolata, R. alnifolia, R. caroliniana, and R. Frangula, and grow well in shaded or partly shaded situations, but R. cathartica and its allies prefer dry soil. R. cathartica is a valuable hedge plant, though it is now not used so extensively as in the past. The species are propagated by seeds stratified or sown in fall, and by layers. Some, as R. lanceolata, R. fallax, and R. alnifolia, are propagated by cuttings; R. Purshiana, has been successfully raised in England from softwood cuttings put in mild bottom heat under glass about the middle of July. The evergreen species are propagated by cuttings of ripened wood under glass. Rarer kinds are sometimes grafted, those of the Frangula group usually on R. Frangula and the true buckthorns on R. cathartica or allied species.

BB. Ivs. alternate: unarmed shrubs. 3. japonica

CE. Foliage deciduous. 4. Fallax

CC. Foliage evergreen. 5. immerotina

CC. Foliage deciduous. 6. alnifolia

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CC. Foliage deciduous. 10. Alaternus

CC. Foliage evergreen. 11. californica

CC. Foliage deciduous. 12. Purshiana
1. **cathartica**, Linn. Buckthorn. HART’S-TONG. WAYTHORN. RHINEBERG. Fig. 3370. Shrub or small tree, attaining 12 ft., usually thorny: lvs. oval to elliptic or ovate, usually rounded at the base or cordate, obtuse or acute, acuminate, crenulate-serrate, beneath green, glabrous or pubescent, 1 1/4-2 in. long: fls. 2-5-fl.d. clusters, with 4 petals: fr. black, about 1/2 in. across; seed with a furrow usually open only at the base. Enu. W. and N. Asin; often escaped from cult. and naturalized in the U. S. B.B. (ed. 2) 2: 502. Gng. 9: 2. H.W. 3, p. 56.

2. **daurica**, Pall. (Rh. cathartica var. daurica, Maxim.). Fig. 3371. Large, spreading shrub, with stout thorny branches, sometimes a tree, to 30 ft.: branchlets yellowish or grayish brown, lustrous: lvs. slender-stalked, obovate to oblong-oblong, acuminate, crenulate-serrate, beneath green, somewhat coriaceous at maturity, 2-4 in. long: fls. and fr. similar to those of the preceding species, but fr. somewhat larger. Dahuria to Amurland and N. China. G.F. 9: 425 (as R. creata; adopted in Fig. 3371).—Sometimes cult. under the name of R. creata. Var. nipponica, Makino. Lvs. narrow-oblong, bright green beneath, 2-6 in. long and 1-2 in. broad. Japan.

3. **japonica**, Maxim. Spreading shrub with thorny branches, to 10 ft.: branchlets yellowish or grayish brown, lustrous: lvs. slender-stalked, obovate to oblong-obovate, short-acuminate, cuneate at the base, serrulate, sparingly pubescent or glabrous beneath, with 4-5 pairs of veins, 2-3 in. long: fls. in axillary clusters; fr. black, 1/2-1 1/2 in. across; seed usually with closed furrow. Japan. S.I.F. 2: 48.

4. **fálax**, Bois. (R. alpina, Auth., not Linn.). Shrub, to 10 ft., with stout, upright, glabrous and reddish brown branches: lvs. elliptic-oblong to oblong or obovate-oblong, cordate or rounded at the base, abruptly acuminate, crenulate-serrate, with 12-20 pairs of veins, dark green above, pale green and glabrous or nearly so beneath, 3-5 1/4 in. long: fls. in 3-7-fl.d. clusters; petals 4: fr. globose, black, 1/2 in. across or less. Mountains of S. and Cent. Eu.—This and the following species are the handomest of the deciduous-lvd. buckthornas because of the large size of their lvs.


7. **lanceolata**, Pursh. Tall, upright shrub, with puberulous branchlets: lvs. obtuse to lanceolate, to oblong-lanceolate, acuminate or obtuse, finely serrulate, glabrous or somewhat pubescent beneath, 1-3 1/2 in. long: fls. in few-fl.d. clusters, with 4 petals: fr. with 2 nutlets. Pa. to Ala., Texas, and Neb. B.B. (ed. 2) 2: 503.

8. **crocea**, Nutt. RED-BERRY. Evergreen shrub to 3 ft., with rigid often spinescent branches: lvs. orbicular to oblong-obovate, glandular-dentilicate or serrulate, dark green and lustrous above, bronze- or copper-colored and glabrous or slightly pubescent beneath, 1-3 1/2 in. long: fls. in few-fl. clusters, 4-merous, apetalous: fr. bright red, about 1 1/2 in. across, edible. Calif.

9. **iliifólia**, Kellog (R. crocea var. iliifólia, Greene). Evergreen shrub or small tree, to 12, or sometimes to 20 ft., with rather stout scarcely spinescent branchlets: lvs. ovate to orbicular, spinulose-dentate, dark green and lustrous above, often golden beneath, 1 1/2-2 in. long: fls. in short racemes, with 5 petals: fr. bluish black. S. Enu. H.W. 3, p. 59. Var. angustifólia, DC. (R. angustifólia, Hort.), has narrower, oblong-lanceolate lvs. There are also varieties with variegated foliage.

10. **alaténsus**, Linn. Evergreen shrub or small tree, attaining 20 ft., with glabrous branches: lvs. oval or ovate to ovate-lanceolate, acute, serrate or almost entire, glossey and dark green above, pale or yellowish green beneath, glabrous, 1 1/2-2 in. long: fr. in short racemes, with 5 petals: fr. bluish black. B. S. S. 2: 63, fig. 3. Var. tomentella, Brew. & Wats. (R. crocea var. tomentella, Rehd.). This species is superior to the preceding species on account of the more plenteous and somewhat larger bright red berries, also the lvs. are larger and resemble those of Prunus iliicifolia.


12. **Purshiana**, DC. CASCARA SAGRADA. Tall shrub to medium-sized tree, occasionally attaining 40 ft.: young branchlets pubescent or tomentose: lvs. elliptic to ovate-oblong, acute or obtuse, usually dentilicate, with often wavy margin, dark green above, glabrous or pubescent beneath, 1-7 in. long: peduncles longer than petals: fr. globose, changing from red to black, about 1/2 in. across, with 2-3 nutlets. Brit. Col. to Mont., Idaho, and N. Calif. S.S. 2: 62, 63.—Cascara Sagrada bark is extensively collected in Ore. and Wash. for use in drug manufacture.

13. **carolinína**, Walt. INDIAN CHERRY. Shrub or small tree, attaining 50 ft.: branchlets of young branches puberulous: lvs. elliptic to oblong, acute or acuminate, obscurely serrulate or almost entire, lustrous and dark green above, glabrous or nearly so, somewhat leathery at length, 2-6 in. long: peduncles shorter than petals: fr. globose, about 1/2 in. across, bright to black, sweet, with 3 nutlets. N. Y. to Fla., west to Neb. and Texas. S.S. 2: 61. B.B. (ed. 2) 2: 503.
14. *crenata*, Sieb. & Zucc. Shrub, to 10 ft.; young branchlets and young lvs. rusty pubescent; lvs. oblong-ovate to oblong-lanceolate or oblong-oblong, acuminate or long-acuminate, finely crenate-serrulate, pubescent beneath, at least on the veins, with 7–12 pairs of veins, 2–4 in. long; peduncles usually shorter than petioles; fr. subglobose, ½ in. across, changing from red to purplish black. Japan to Cent. China. S.I.P. 2:47.


*RHAPHIDOPHORA* (Greek _for needle-bearing; alluding to needle-like hairs)._Araceae._CLIMBING ARUMS, to be treated like Philodendron and Pothos. Species 60 in Engler, Pflanzenreich, hft. 37 (IV. 238. 1908), of the East Indies, allied to *Pothos*, but distinguished by the presence of odd hairs in the intercellular spaces and by the two-loculed rather than three-loculed ovary. The generic name is sometimes spelled *Rhaphidophora*.

It is not known that any species of *Rhaphidophora* are in the American trade. *R. pertusa*, Schott (*Pothos pertusa*, Roxb. *Scindapsus pertusa*, Schott), has large monstera-like lvs., with long and narrow side lobes and numerous holes in the blade. R.H. 1885, p. 501. *R. decorata*, Schott, is a gigantic climber with large, pubescent lvs., the segments or lfts. oblong-lanceolate-acuminate and strongly nerves; spathe yellowish. B.M. 7282. *R. Peeploa*, Schott, has entire oblong or elliptic-oblong lvs., with roundish or subcordate base; spathe yellowish.

**RHAPHITHAMNUS** (Greek _for needle-bearing._ allying to needle-like hairs)._Araceae._CLIMBING ARUMS, to be treated like Philodendron and Pothos. Species 60 in Engler, Pflanzenreich, hft. 37 (IV. 238. 1908), of the East Indies, allied to *Pothos*, but distinguished by the presence of odd hairs in the intercellular spaces and by the two-loculed rather than three-loculed ovary. The garden plant *Pothos aureus*, sometimes provisionally referred here, is to be sought in *Scindapsus*. The generic name is sometimes spelled *Raphidophora*.

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RHAPIS (Greek, needle; alluding to the shape of the leaves or perhaps the awns. tribe Sàbalæce.) Fan palms of very distinct habit, being among the few palms that produce suckers at the base, thereby forming bushy clumps.

Low palms, with leafy densely cespitose reedy st. clothed with remains of the reticulate H.-sheaths: lvs. alternate and terminal, submembranaceous, connate or semiorbicular, irregularly and digitately 3- to many-parted; segms. linear, cuneate, or elliptical truncate, entire, dentate or lobed; nerves 3 to many; transverse veins conspicuous; rachis none; ligule very short, semicircular; petiole slender, biiconvex, smooth or serrulate on the margins; sheath long, loosely fringed on the margin; spadices shorter than the lvs., slender-peduncled: rachis sheathed by deciduous bracts: branches spreading; spathes 2-3, incomplete, membranous: fls. yellow.—About 5 species, natives of China and Japan. This genus is distinguished from its near allies (for a list of which see Licuala) by the fls. being dioecious; corolla 3-toothed; anthers dehiscing extrorsely. The name Rhapis is commonly spelled and pronounced Raphis, but this is incorrect. They can be grown in temperate house with a night temperature of 55-60°. The soil should be good loam 3 parts, leaf-mold 1 part and sand 1 part. Prop. by imported seeds or by the freely produced suckers. Hardy in S. Calif. and S. Fla., and, in fact, the hardest of all the palms with the exception of certain species of Sabal and Chamaerops.

R. cyanocarpus, Miers (Citharæglon cyanodctrum, Hook. & Arn. R. parviflora Miers). Tree, to 20 ft.; young branchlets pubescent; spines slender, ½-1 in. long; lvs. sometimes in 3's, ovate, acute, rounded at the base, entire, glabrous above and glabrous beneath except-basally hairs on the midrib, 1½-3½ in. long; fls. lilac, slender, about 1½ in. long; fr. globose, bright blue, ¼-½ in. across. Chile. B.M. 6849.—A handsome densely leafy shrub, particularly ornamental when studded with its bright blue frs.

RHAPIS hystrix, the blue palmetto or needle palmetto, is the most beautiful and elegant of our native dwarf palms. It is very local in its distribution, being found in rich low soil both in Georgia and Florida, but it is everywhere rather rare. Its most striking characteristics are the long sharp black spines projecting in every direction from the dark fibers which cover the trunk. These spines, which are often a foot long, seem to protect the inflorescence, which before opening resembles a large white egg and which is imbedded among the spines. This palm bears staminate and pistillate flowers on separate plants. The woolly clusters of fruit or seeds are borne on short stems also surrounded by the sharp spines. This palmetto is easily transplanted. The leaves are dark shiny green, relieved by a pale silvery gray on the under surface. It is a very beautiful plant, and, groups of it are striking. The stem is 2 to 3 feet high and the leaves rise to a height of 3 to 4 feet. (H. Nehrling.)

**RAPHIS HUMILIS**

*Fig. 3373. Rhapis humilis.*

**R. parvifolius,** Hort. Tree, 7.4-10 ft. high. Lvs. with 5-7 segms. and terminal, submembranaceous, connate or semiorbicular, irregularly and digitately 3- to many-parted; segms. linear, cuneate, or elliptical truncate, entire, dentate or lobed; nerves 3 to many; transverse veins conspicuous; rachis none; ligule very short, semicircular; petiole slender, biiconvex, smooth or serrulate on the margins; sheath long, loosely fringed on the margin; spadices shorter than the lvs., slender-peduncled: rachis sheathed by deciduous bracts: branches spreading; spathes 2-3, incomplete, membranous: fls. yellow.—About 5 species, natives of China and Japan. This genus is distinguished from its near allies (for a list of which see Licuala) by the fls. being dioecious; corolla 3-toothed; anthers dehiscing extrorsely. The name Rhapis is commonly spelled and pronounced Raphis, but this is incorrect. They can be grown in temperate house with a night temperature of 55-60°. The soil should be good loam 3 parts, leaf-mold 1 part and sand 1 part. Prop. by imported seeds or by the freely produced suckers. Hardy in S. Calif. and S. Fla., and, in fact, the hardest of all the palms with the exception of certain species of Sabal and Chamaerops.

**R. cyanocarpus**, Miers (Citharæglon cyanodctrum, Hook. & Arn. R. parviflora Miers). Tree, to 20 ft.; young branchlets pubescent; spines slender, ½-1 in. long; lvs. sometimes in 3's, ovate, acute, rounded at the base, entire, glabrous above and glabrous beneath except-basally hairs on the midrib, 1½-3½ in. long; fls. lilac, slender, about 1½ in. long; fr. globose, bright blue, ¼-½ in. across. Chile. B.M. 6849.—A handsome densely leafy shrub, particularly ornamental when studded with its bright blue frs.

**RAPHIS Hystrix** (Greek, probably means Rhapis-leaved). *Palmæce.* BLUE PALMETTO. NEEDLE PALM. One species ranging from S. C. to Fla. It is a dwarf fan palm with erect or creeping trunk 2-3 ft. long, and long-stalked nearly round deeply and pressed, bifid, woolly: fls. minute, orange: fr. small, unequally cleft lvs. with about 15 segms.: spadices studded with its bright blue frs. ALFRED REHDER.

**RHAPHIS** (Greek, needle-leaved) is very local in its distribution, being found in rich low soil both in Georgia and Florida, but it is everywhere rather rare. Its most striking characteristics are the long sharp black spines projecting in every direction from the dark fibers which cover the trunk. These spines, which are often a foot long, seem to protect the inflorescence, which before opening resembles a large white egg and which is imbedded among the spines. This palm bears staminate and pistillate flowers on separate plants. The woolly clusters of fruit or seeds are borne on short stems also surrounded by the sharp spines. This palmetto is easily transplanted. The leaves are dark shiny green, relieved by a pale silvery gray on the under surface. It is a very beautiful plant, and, groups of it are striking. The stem is 2 to 3 feet high and the leaves rise to a height of 3 to 4 feet. (H. Nehrling.)

**RHAPIS Hystrix**, Wendl. & Drude (Chamærops hystrix, Fraser). Fig. 3372. St. 2-3 ft., erect or creeping, proliferous, clothed with the fibrous remains of H.-sheaths intermingled with long, erect spines: lvs. 3-4 ft., somewhat glaucous especially beneath, circular in outline, with numerous 2-4-toothed segms.; petiole triangular, rough on the margins; sheaths of oblique fibers interwoven with numerous strong, erect spines; spadix 6-12 in. long, short-peduncled: petals ovate, drupe ¾-1 in. long. S. C. to Fla. I.H. 33:486.

JARED G. SMITH.

**RHAPIS** (Greek, needle; alluding to the shape of the leaves or perhaps the awns of the corolla). *Palmæce.* tribe Sàbalæce. Fan palms of very distinct habit, being among the few palms that produce suckers at the base, thereby forming bushy clumps.

Low palms, with leafy densely cespitose reedy st. clothed with remains of the reticulate H.-sheaths: lvs. alternate and terminal, submembranaceous, connate or semiorbicular, irregularly and digitately 3- to many-parted; segms. linear, cuneate, or elliptical truncate, entire, dentate or lobed; nerves 3 to many; transverse veins conspicuous; rachis none; ligule very short, semicircular; petiole slender, biiconvex, smooth or serrulate on the margins; sheath long, loosely fringed on the margin; spadices shorter than the lvs., slender-peduncled: rachis sheathed by deciduous bracts: branches spreading; spathes 2-3, incomplete, membranous: fls. yellow.—About 5 species, natives of China and Japan. This genus is distinguished from its near allies (for a list of which see Licuala) by the fls. being dioecious; corolla 3-toothed; anthers dehiscing extrorsely. The name Rhapis is commonly spelled and pronounced Raphis, but this is incorrect. They can be grown in temperate house with a night temperature of 55-60°. The soil should be good loam 3 parts, leaf-mold 1 part and sand 1 part. Prop. by imported seeds or by the freely produced suckers. Hardy in S. Calif. and S. Fla., and, in fact, the hardest of all the palms with the exception of certain species of Sabal and Chamaerops.

**R. cyanocarpus**, Miers (Citharæglon cyanodctrum, Hook. & Arn. R. parviflora Miers). Tree, to 20 ft.; young branchlets pubescent; spines slender, ½-1 in. long; lvs. sometimes in 3's, ovate, acute, rounded at the base, entire, glabrous above and glabrous beneath except-basally hairs on the midrib, 1½-3½ in. long; fls. lilac, slender, about 1½ in. long; fr. globose, bright blue, ¼-½ in. across. Chile. B.M. 6849.—A handsome densely leafy shrub, particularly ornamental when studded with its bright blue frs.

ALFRED REHDER.

RHAPIDOPHYLLUM (Greek, probably means cyanocarpus, Miers & Am. LA F.R.0.) MACRÉA. Fig. 2739. Sts. 2-3 ft., erect or creeping, proliferous, clothed with the fibrous remains of H.-sheaths intermingled with long, erect spines: lvs. 3-4 ft., somewhat glaucous especially beneath, circular in outline, with numerous 2-4-toothed segms.; petiole triangular, rough on the margins; sheaths of oblique fibers interwoven with numerous strong, erect spines; spadix 6-12 in. long, short-peduncled: petals ovate, drupe ¾-1 in. long. S. C. to Fla. I.H. 33:486.

JARED G. SMITH.
Aside from the common rhubarb, *Rheum Rhaponticum*, which is grown for the edible leaf-stalks, the species are little known in general cultivation. Few plants are more useful, however, for bold and striking foliage effects; and these effects are heightened by the towering flower-panicles. Most of the species are hardy and easy to grow, but they profit by a liberal winter mulch. Rheums are usually seen to best advantage against a heavy background of foliage or of rock (Fig. 1817, p. 1463). Even the common rhubarb is a useful ornamental subject when well placed. In order to secure large and fine foliage, the soil should be rich and moist. The species are propagated by dividing the root-masses, preferably in spring, leaving as much root as possible with each strong eye or bud.

The dried rhizomes of rhubarb are used medicinally. Several species afford the official product. The larger part of the rhubarb imported from the Orient is probably made from the crown or short stem (not the flower-stem) of *R. officinale*. *R. Rhaponticum* is sometimes grown for its medicinal roots.

**RHEUM** (Linn.)*Rheum Rhabarbarum, Blume. (R. officinale, Linn.)*

*Pterica* (Linn.)*Pterica officinale, Linn.*

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*Pterica* (Linn.)*Pterica officinale, Linn.*

*Pterica* (Linn.)*Pterica officinale, Linn.*
inopinatum, Prain. Small perennial of recent introduction; plant seldom more than 2 ft. high, the foliage clustered at the crown, the st. red and nearly leafless: lvs. orbicular-oval, gray-green, blades 6-9 in. long and nearly as broad, more or less blistered, not lobed but somewhat irregularly-marginated, obtuse, the petiole about 6 in. long and red-purple: inf. paniculate, bright red or crimson, produced in succession; fr. highly colored, the nutlets orbicular and 3-winged, nearly 2 in. across.

2375. Rheum officinale, showing the foliage crown before flowering.

Thibet. B.M. 8190. G.C. III. 48:391.—A handsome small species, in condition nearly all summer, with attractive red-stalked and red-nerved foliage.

Folia more or less lobed, the margins of the lvs. or segments usually toothed or notched.

c. Lvs. shallowly or obscurely lobed.

compascum, Linn. St. tall: petioles sulcate, plane above: fl.-blades thickish, broad-ovate, cordate, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin sharply toothed, the veins very prominent: panicle with drooping branches; achenes large, dark-colored. Siberia to China.

c. Lvs. deeply lobed or evenly divided.

palmarum, Linn. (R. sanguineum, Hort.). St. tall (5-6 ft.) and leafy: petioles subcylindrical, the margin rounded: fl.-blades broad, suborbicular and cordate, 8-9 ribbed, scabrous, deeply palmately lobed; the lobes obovate-oblong or lanceolate, acute, entire, dentate or pinnatifid: panicle leafy, with pubescent branches, the pedicels scarcely longer than the fls.: achenes oblong-oval and subcordate. N. E. Asia. Var. tanguticum, Regel (R. tanguticum, Hort.). Lvs. more elongated and not so deeply lobed. G.Z. 20, p. 17. Var. atrissinatum, Hort. (var. floribudum, Hort.), has a showy dark red panicle. Gn. 60, p. 10.

hybridum, Murr. Petiole long, canaliculate above and sulcate beneath: fl.-blades ovate, 3-5-ribbed, the base cuneate or scarcely cordate, incise-dentate, puberulent beneath: panicle lax, leafy: achenes large, 2 in. long, oblong-ovate, narrow-winged, blood-red, showy. Asia Minor to Persia. B.M. 7591. “Rheus” or “Ribes” is its Arabic name.—R. sanguineum, Hort. Dwarf: IVB. thick, or orbicular or broadly ovate: fls. white, in a dense spike rising about 2 ft. W. Himalayas.

RHEUM

(Rheum officinale, Baill. Fig. 3375. Robust, with a short, branching st. or crown 4-10 in. high: lvs. very large, 1-2 ft. across, round-oval, more or less pointed or acuminate, hairy, 3-7 lobed, the lobes extending one-third or one-half the depth of the blade and sharply angled-notched: fl.-sta. 3-10 ft. long, much branched, bearing numerous greenish fls. that give a feathery effect to the panicle: achenes red, winged. Thibet and W. China, on high taluslands. B.M. 6135. R.H. 1874, p. 95. Gn. 36, p. 243; 48, pp. 199, 208; 59, p. 282. G.C. III. 55:328. G. 9:341; 18:428; 23, 452, 453.—Probably the best species of the genus for general cultivation for ornament, making a striking foliage plant. It is from the short thin branching st. or caudex of this plant that most of the true official rhubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1872.

R. acuminatus, Hook f. & Thom. Dwarf plant (seldom exceeding 3 ft.), like a small form of R. emodi, with acuminate lvs., but fls. considerably larger, said to be an attractive plant in cult. but to die after flowering, st. and inf. deep red-purple. B.M. 4877. G. 36:659.—R. amurense, Hort., is a garden hybrid, of German origin, between R. emodi and R. palmatum. Himalayas. R.R. 1876, p. 266. L.H. 22:209. G.C. II. 15:793. G. 20, p. 104. A remarkable plant.—R. Rhabdanthum, Linn. 3-6 ft.; lvs. 1 ft. across, cordate to reniform, the margins crisp or undulate, the blade pubescent or bladed; fls. green, drooping: fr. about 1 in. long, oblong-ovate, narrow-winged, blood-red, showy. Asia Minor to Persia. B.M. 7591. “Rheus” or “Ribes” is its Arabic name.—R. sanguineum, Hort. Dwarf: IVB. thick, or orbicular or broadly ovate: fls. white, in a dense spike rising about 2 ft. W. Himalayas.

L. H. B.

RHEXIA

(Greek, rupture, referring to its supposed properties of healing).

Melastomaceae. MEADOW BEAVER. Low perennial often brightly herbs suitable for border and wild-garden planting.

Leaves opposite, sessile or short-petioled: fls. terminal, solitary or cymose; calyx-tube urn-shaped, adherent to the ovary below, and continued above it, persistent, 4-cleft at the apex: petals 4, oblique, falling early; stamens 8: caps. 4-celled, with 4- to many-seeded placenta.—About 12 species. N. Amer.

Rhexia virginica is found wild in company with side-saddle plants (Sarracenia purpurea) and cranberries in the low meadows of Massachusetts. It is what would be called a bog-plant. It is a pretty, low-growing, tuberous-rooted plant blooming in summer and chiefly interesting as being one of few species of a genus belonging to a family almost wholly composed of shrubby plants from tropical countries, such as Centradenia, Pietersonia, and Medinella. It increases by means of tubers and seeds, and under suitable conditions soon makes large clumps. Tubers potted in the autumn and kept in a coldframe flower nicely in springtime. (T.D. Hatfield.)

A. St. cylindical.

marilana, Linn. A slender erect usually simple-stemmed plant with red-dish purple fls. about 1 in. across, in loose cymes: lvs. short-petioled, oblone to linear-oblong, 1-1½ in. long, 2-5 lines wide, 3-nerved; anthers minutely spurred at the back. June-Sept. Pine barrens, N. J. to Fl., west to Ky. B.B. 2: 474.—Grows in drier places than R. virginica. It sometimes has white fls. and there is also a linear-lvd. form.

3376. Rhexia virginica. (X½)
RHIPSALIS 2029

AA. Bracts on ovary with hairs and bristles in their axils.

1. pilocarpa, L.f gland. Branches terete, the axes bearing 10-15 white bristles: fls. wheel-shaped, 1 in. broad. Brazil.

BB. Bracts imbedded in the branch.

BB. Bracts on ovary naked.


C. The branches of 2 kinds.

2. squidons, Schum. (Lepismium commutus, Pfeiff.). Somewhat branched, reaching a length of 2 ft.; branches very unequal in length, 2-1 in. thick, triangular, the angles winged: fls. 1-2, from the deep areoles, 5 lines long, greenish without, yellowish within. Brazil, Argentina. B.M. 3783.

BB. Bracts imbedded in the branch.

BB. Bracts on ovary naked.

C. Branches terete, slender.

3. myosurus, Schum. (Lepismium myosurus, Pfeiff.). Somewhat branched, a yard long; branches 3-6 lines thick, 3-4-angled, the angles not winged, the terminal branchlets generally acuminate, often tipped by a pencil of bristles: fls. solitary in the deep areoles, 4-5 lines long, rosy white: fr. red. Brazil. B.M. 3755.

CC. Edges of joints not winged.


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BB. Bracts on ovary naked.


C. The branches of 2 kinds.
2-4 short bristles, which on the end branches project as a little brush: fis. near the tops of the short branches, flat, \( \frac{2}{3} \) in. diam., with 12 white lvs. with yellowish midstripes, berry white. Uruguay and Argentina. B.M. 4030.

5. mesembrianthemoïdes, Haw. (Hartkea mesembrianthemoides, Lem.). Upright, the ends drooping, richly branched: long branches 4-8 in. long, 1 line diam.; flat branches 3-5 lines long, not more than 2 lines diam., spirally attached, thickly crowned: areoles sparsely woolly and bristly, the blooming areoles much more copiously so: fis. greenish outside, the sides: fis. \( \frac{1}{4} \) in. long, white. Brazil.

6. trigona, Pfeiff. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1-1\( \frac{1}{2} \) lines diam., pale green; ultimate branches spirally attached: areoles with sparse woolly hairs and frequently 1-2 minute bristles: fis. lateral on the short branches, purple-red: fis. about 8 lines long, yellow with reddish tips. Brazil. B.M. 2920 (as Cactus alatus).

7. grandiflora, Haw. (R. funiflora, Salm-Dyck). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diam. of more than \( \frac{2}{3} \) in.; ultimate branches short, often verticillate: areoles depressed, bordered by a red line, sometimes in old branches a bristle: fis. wheel-shaped, lateral on the branches, nearly 1 in. diam. B.M. 2740.

8. Cassytha, Gaertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1-1\( \frac{1}{2} \) lines diam., pale green; ultimate branches spirally attached: areoles with sparse woolly hairs and frequently 1-2 minute bristles: fis. lateral on the terminal joints, 2-3 lines diam.: berry like that of the mistletoe, 1-2 lines diam. Widely dispersed in Cent. and S. Amer., W. Indies, Mex., Mauritius, Ceylon, and Afr. B.M. 3080.

9. virgata, Web. Richly branching, pendulous, becoming a yard long; terminal branches hardly more than a line thick, spirally attached: areoles bearing sparse woolly hairs, with an occasional bristle: fis. lateral, 3-4 lines diam.: berry only 1\( \frac{1}{2} \) lines diam. Brazil. —Very much like the preceding.

cc. Branches not terete.

d. The branches narrow, angled.

10. trigema, Pfeiff. Richly branched, becoming a yard long: branches \( \frac{1}{2} \) to nearly 1 in. diam., 3-angled: areoles sparsely woolly and bristly, the blooming areoles much more copiously so: fis. greenish outside, white within, 4 or 5 lines long. Brazil.

11. paradoxa, Salm-Dyck. Sparsely branched, 1-2 ft. long; branches 1-2 in. long and \( \frac{1}{2} \)-1 in. diam., twisted at the joints, so that the angles alternate with the aërs: fis. \( \frac{2}{3} \) in. long, white. Brazil.

12. pentaptera, Pfeiff. Richly branched, 1-2 ft. long, 4-5 lines diam.: branches 2-5 in. long, 5-6-angled or almost winged: areoles in creases of the angles with scanty wool and an occasional bristle: fis. greenish white, 3-4 lines long: fr. white, bright rose-red above, crowned by the withered fl. S. Brazil, Uruguay, Argentina.

13. rosea, Lagerheim. Shrubby, more or less erect, usually 10 in. high: branches clustered, often hanging, 3-4-angled: fis. rare, large, 1\( \frac{1}{4} \) in. broad, rose-colored, fragrant. Brazil. 

dd. The branches usually flat or 3-angled, always broad.

14. rhombes, Pfeiff. (R. Swartziána, Pfeiff.). Branching, reaching a yard in length: joints green, if.-like, crenate-oblong or rhombic, 1-5 in. long, \( \frac{1}{2} \)-2 in. broad: fis. yellow, about 5 lines long. Brazil.


16. Houletiana, Lem. (R. Houletii, Lem.). Richly branched, becoming 3 ft. or more long, 1-1\( \frac{1}{4} \) in. broad, often tapering to the round midrib for a considerable distance, then becoming again broad and l.-like: fis. 8-9 lines long, yellowish white to yellow: berry red. Brazil. B.M. 4089.


J. N. Rosz.

RHIZÓPHORA (Greek, root and bearing, referring to the fact that the seeds germinate even while attached to the plant if they touch the ground). Rhizophoraceae. Trees, with thick terete scarred branches, sometimes planted to hold seashores: lvs. opposite, petioled, thick, leathery, ovate or elliptic, entire, glabrous: podunices axillary, di- or trichotomously branched, few-flowered, rather large, leathery, sessile or pedicelled: calyx-limb 4-parted; petals 4; stamens 8-12; ovary semi-inferior, 2-celled: fr. leathery, ovoid or obconical, 1-celled, 1-seeded.—About 3 species, seashores of the tropics. R. Mangle, Linn. Shrub or tree reaching a height of 30 ft.: lvs. 2-6 in. long, leathery, elliptic or elliptic-obo­vate, obtuse: peduncles 2-3-fid.; fis. pale yellow; sepals lanceolate; petals linear, or nearly so, leathery, clasp at tip. Coast of Fl. and the tropics. It forms impenetrable thickets.

RHODÁNTHE: Helipterum.

RHODAZÁLEA: a name given in France to a hybrid (R. Croezii, Hort.) between a garden rhododendron and Azalea mollis (Rhododendron sinense). Another name for this hybrid is Azaleodendron Crouzii, Hort.

RHÓDEA: Rhododendron.

RHODOCHITON (Greek, red cloak; alluding to the large rosy red calyx). Scrophulariaceae. A free-flowing graceful vine with lvs. cordate, acuminate, sparsely and acutely dentate: fis. solitary, pendulous, axillary, long-peduncled; calyx conspicuous, large, membranous, broad bell-shaped, 5-cleft; corolla-tube cylindrical, the throat not personate, 5-lobed; lobes oblong, nearly equal: caps. dehiscent by irregular perforations.—One species, Mex.


F. W. Barclay.

RHODODÉNDRON (Greek, rhodon and dendron, rose-tree; the Rhododendron of the ancient writers is Nerium). Ericaceae. Including Azalea which most botanists consider inseparable from Rhododendron, but horticulturists may be inclined to retain Azalea for the deciduous species and to use the Azalea names given in parentheses. Highly ornamental woody plants, chiefly deciduous species and to use the Azalea names given in parentheses. Highly ornamental woody plants, chiefly deciduous species. In Europe, there are several species whose flowers and many species also for their handsome foliage.

Evergreen or deciduous shrubs, rarely trees: lvs. alternate, short-petioled, entire: fis. pedicelled, in terminal umbel-like racemes, rarely lateral, in 1- to few-fid. clusters; calyx 5-parted, often very small; corolla rotate, campanulate or funnel-shaped, sometimes tubular, with 5-, sometimes 6-10-lobed limb; stamens 5-10, sometimes more; petals opening with pores at the apex; ovary 5-10-loculed; style slender with capitate stigma; caps. separating into 5-10 valves containing numerous seeds.

Another species occasionally seen in European collections but not offered in American trade.
minute seeds.—About 350 species are known, distributed through the colder and temperate regions of the northern hemisphere; in trop. Asia they occur in the mountains and extend as far south as New Guinea and Australia, the greatest segregation being in Cent. and W. China and the Himalayas; several species closely allied to those of the Malayan Archipelago are found in the Philippine Isls. but are not yet intro.; 16 species occur in N. Amer. The rhododendrons possess but few economic properties. The hardy close-grained species as R. cinnabarinum, R. glaucum, R. citatum, R. Fortunae, R. lepidotum, R. Collettianum, and the Yunnan species, as R. yunnanense, R. racemosum, R. arboreum, R. ponticum, are probably hardy; also R. arboreum, R. barbatum, R. Falconeri, R. Keysii, R. triflorum, and R. Wrightii in very sheltered positions. Species like R. Dalhousie, R. Edgeworthia, R. Griffithianum, R. farnosum, R. Mandarin, R. Nuttallii, and R. pendulum stand only a few degrees of frost. The Javanese species, as R. javanicum, R. jasminiformum, R. Brookeanum and R. Lobbi grow and bloom continually and stand no frost at all.

Variation in height.—Most of the species are shrubby; a few only, and these mostly Himalayan species, grow into small or medium-sized trees, attaining 60 feet in the case of R. barbatum, 40 feet in R. grande and R. arboreum, 30 feet in R. Falconeri and R. maximum. A number of northern and alpine species always remain dwarf, as R. ferrugineum, R. hirsutum, R. lapponicum, R. virgatum, R. lepidotum, R. racemosum, and others. A few Himalayan and Chinese species and most of the Japanese species are often epiphytal and grow on branches of large trees like orchids; e.g., R. Dalhousie, R. pendulum, R. Nuttallii, R. moupinense.

Hybrid rhododendrons.—Many hybrids have been raised and they are now more extensively cultivated than the original species. The first hybrid was probably the one raised from R. ponticum, fertilized by a hardy azalea, probably A. nudiflorum; it originated about 1800, in the nursery of Thompson, at Lambton, near London, and was first described and figured as R. ponticum var. deciduum (Andrews, Bot. Rep. 6:379). Many hybrids of similar origin were afterward raised for which the name Azaleoderinum has been propounded by Rodigas. The first hybrid between true rhododendrons was probably a cross between R. catawbiense and R. ponticum, but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan R. arboreum introduced about 1820 that the first plant was raised which became the forerunner of a countless number of beautiful hybrids. From the appearance of this cross, obtained about 1820, at Highclere, in England, and therefore called R. altaclarensis, the era of rhododendron hybrids is believed to be dated. Figs. 3378 and 3379 are common hybrid forms. A second era in the history of the rhododendron may be dated from the introduction of a large number of the beautiful Skimm rhododendrons about 1850. Raising them species like R. Griffithianum which entered into the parentage of many of the most striking tender hybrids, and from the introduction of the Javanese species shortly afterward. A third era will perhaps be trace from the recent introduction of the Chinese rhododendrons.

Their place in ornamental planting.—Rhododendrons are equally effective and desirable as single specimens on the lawn as when massed in large groups, and are especially showy when backed by the dark green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and flower at a different time, should not be grouped with the large-leaved ones, as they do not harmonize with them; however, they are exceedingly charming plants for rockeries or in groups with other smaller evergreens. It is certainly true that the rhododendrons have not yet received the attention they deserve. They are still far from being as popular as they are in England. The beautiful Himalayan species and their numerous hybrids are still almost unknown in this country, although without doubt they could be grown as well outdoors in the Middle and South Atlantic states as they are in England. If the right hybrids were chosen. Formerly it was considered impossible to grow the beautiful hardy hybrids in the New England wood of the arborecent species is used for fuel; also for construction and for turnery work; the lvs. of some species are used medicinally; those of R. arboreum and other species are believed to be poisonous to cattle. In India the lvs. of various species are sometimes made into a subacid jelly. The honey obtained from the lvs. is believed to be poisonous.

The rhododendrons belong to our most ornamental and most beautiful flowering shrubs and are often completely covered with their showy trusses of brilliantly and variously colored flowers and the evergreen species are attractive throughout the whole year with their handsome usually large foliage. They grow best in a peaty or porous loamy soil, which does not contain lime and always retains a sufficient amount of moisture; they like as a rule half-shaded positions. In regard to their culture and particular ornamental qualities, they may be divided into three horticultural groups: Evergreen rhododendrons, hardy deciduous azaleas, and Indian azaleas.

Evergreen rhododendrons.

Here belong the largest number of species comprising the two sections Lepidophorodendron and Leiorhododendron. Although most of the species are hardy only in warm temperate regions, there are many which are hardy at least as far north as Massachusetts. They are R. maximum, R. catawbiense, R. caucasicum, R. brachycarpum, R. Metternichii, R. Smirnowii, R. mucronatum, R. dalhuricum, R. micranthum, R. lapponicum, R. ferrugineum, R. hirsutum, R. Kotaki, R. carolinianum, R. minus, and probably also R. chrysanthenum, R. Przewalskii, R. campanulatum, R. Californicum, R. Ungernii, and most of the small-leaved Chinese species. Somewhat more tender are R. ponticum, R. nivum, R. Hodgsonii, R. Thomsonii, R. Anthopogon and many of the recently introduced Chinese species, as R. disolor, R. oreodoxa, R. decorum. South of Philadelphia such species as R. cinnabarinum, R. glaucum, R. citatum, R. Fortunae, R. lepidotum, R. Collettianum, and the Yunnan species, as R. yunnanense, R. racemosum, are probably hardy; also R. arboreum, R. barbatum, R. Falconeri, R. Keysii, R. triflorum, and R. Wrightii in very sheltered positions. Species like R. Dalhousie, R. Edgeworthia, R. Griffithianum, R. farnosum, R. Mandarin, R. Nuttallii, and R. pendulum stand only a few degrees of frost. The Javanese species, as R. javanicum, R. jasminiformum, R. Brookeanum and R. Lobbi grow and bloom continually and stand no frost at all.

Variation in height.—Most of the species are shrubby; a few only, and these mostly Himalayan species, grow into small or medium-sized trees, attaining 60 feet in the case of R. barbatum, 40 feet in R. grande and R. arboreum, 30 feet in R. Falconeri and R. maximum. A number of northern and alpine species always remain dwarf, as R. ferrugineum, R. hirsutum, R. lapponicum, R. virgatum, R. lepidotum, R. racemosum, and others. A few Himalayan and Chinese species and most of the Japanese species are often epiphytal and grow on branches of large trees like orchids; e.g., R. Dalhousie, R. pendulum, R. Nuttallii, R. moupinense.

Hybrid rhododendrons.—Many hybrids have been raised and they are now more extensively cultivated than the original species. The first hybrid was probably the one raised from R. ponticum, fertilized by a hardy azalea, probably A. nudiflorum; it originated about 1800, in the nursery of Thompson, at Lambton, near London, and was first described and figured as R. ponticum var. deciduum (Andrews, Bot. Rep. 6:379). Many hybrids of similar origin were afterward raised for which the name Azaleoderinum has been propounded by Rodigas. The first hybrid between true rhododendrons was probably a cross between R. catawbiense and R. ponticum, but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan R. arboreum introduced about 1820 that the first plant was raised which became the forerunner of a countless number of beautiful hybrids. From the appearance of this cross, obtained about 1820, at Highclere, in England, and therefore called R. altaclarensis, the era of rhododendron hybrids is believed to be dated. Figs. 3378 and 3379 are common hybrid forms. A second era in the history of the rhododendron may be dated from the introduction of a large number of the beautiful Skimm rhododendrons about 1850. Raising them species like R. Griffithianum which entered into the parentage of many of the most striking tender hybrids, and from the introduction of the Javanese species shortly afterward. A third era will perhaps be trace from the recent introduction of the Chinese rhododendrons.

Their place in ornamental planting.—Rhododendrons are equally effective and desirable as single specimens on the lawn as when massed in large groups, and are especially showy when backed by the dark green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and flower at a different time, should not be grouped with the large-leaved ones, as they do not harmonize with them; however, they are exceedingly charming plants for rockeries or in groups with other smaller evergreens. It is certainly true that the rhododendrons have not yet received the attention they deserve. They are still far from being as popular as they are in England. The beautiful Himalayan species and their numerous hybrids are still almost unknown in this country, although without doubt they could be grown as well outdoors in the Middle and South Atlantic states as they are in England. If the right hybrids were chosen. Formerly it was considered impossible to grow the beautiful hardy hybrids in the New England
states, and it was first shown by the splendid collections of H. H. Hunnewell at Wellesley, Massachusetts (see A.F. 13:24-81 and Gn. 5:375-7), that, even in a trying climate, they can be grown to perfection if the proper situations are found and the right way of cultivation is followed.

Outdoor cultivation.—The selection of a suitable situation is of foremost importance. If possible the bed should be sheltered against drying winds and the burning sun by tall conifers, but the shelter should be always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open well-drained soil which does not contain lime or heavy clay and has a moist and fresh subsoil will prove satisfactory. Where limestone or heavy clay prevails, beds must be specially prepared and filled with suitable soil. They should be at least 2 to 3 feet deep, or deeper when the subsoil is not porous, and in this case the bottom should be filled in about 1 to 2 feet high with gravel or broken stones for drainage. A mixture of leaf-mold or peat and sandy loam will make a suitable soil. In dry spells during the summer watering is necessary if the subsoil is not very moist; it is most essential that the soil never becomes dry. In autumn the ground should be covered with leaves, pine needles, hay, or other material to protect from frost. This mulch should be allowed to remain during the summer, especially when the plants are not large enough to shade the ground. An occasional top-dressing of well-decayed stable- or cow-manure will prove of much advantage. The ground should never be disturbed, as the roots are very near the surface. After flowering, the young seed-vessels should be removed. The rhododendrons are easily transplanted either in spring or in fall, especially if they grow in peat or turfy loam, and if a good ball of earth can be preserved in moving. They should be planted firmly, especially in porous, peaty soil, and thoroughly watered after planting. If they are carefully handled they are not much affected by transplanting, and tender kinds may be dug in fall, heeled-in in a frost-proof pit, and planted out again in spring. Potted and well-budded plants transplanted in January into a temperature not exceeding 60° will develop in about six to eight weeks into very attractive and showy specimens for decoration.

Hardy varieties.—The following varieties have proved hardy in the vicinity of Boston and may be recommended for planting in similar climates and for experimental trial farther north. They are mostly hybrids of *R. catawbiense* with *R. maximum*, *R. ponticum*, *R. caucasicum* and with some infusion of *R. arboreum* and perhaps a few other species. As in most of them the parentage of *R. catawbiense* is the most predominant, they are all usually called "catawbiense hybrids." Choice kinds are (those marked with an asterisk have proved the hardiest): *Album elegans*, blush, changing to white; *Album grandiflorum*, blush, changing to white, flowers larger, less spotted; *Alexander Dancer*, bright rose, paler in center; *Astromaenum*, rich blue; *August Van Geert*, bright carmine, spotted dark purple; *Bacchus*, crimson, large flowers; *Bicolor*, purplish pink, spotted; *Blandianum*, rosy crimson (H.F. 1859:153); *Mrs. C. S. Sargent*, deep crimson; *Charles Dickens*, dark red, spotted brown, one of the most striking red ones; *Cerulescens*, pale lilac; *Coriaceum*, white, spotted yellow, dwarf and free-blooming; *Crown Prince*, carmine, spotted greenish yellow; *Deliciosissimum*, blushed pink, changing to almost white, late (Gn. 63, p. 415); *Edward S. Rand*, rich scarlet; *Everestianum*, rosy lilac with crisped edges, excellent habit and very free-flowering (Gn. 20:105); *F. L. Ames*, white center, edged pink; *F. L. Olmsted*, pink; *Giganteum*, bright rose, large clusters; *Girlysanum*, white, suffused with pink (G.M. 44:355; 48:365); *Gomer Waterer*, blush-pink; *Grandiflorum*, clear rose; *Gordonia*, deep pink; *Hannibal*, rosy carmine; *Hortensia Sargent*, pink; *Henry W. Sargent*, crimson, large clusters; *H. H. Hunnewell*, rich crimson; *John Waterer*, dark crimson; *J. D. Godman*, carmine, distinctly spotted; *Kedron*, rich crimson; *King of Purples*, purple, spotted dark brown; *Lady Armstrong*, rose-red, paler in center, distinctly spotted; *Lady Clermont*, rosy scarlet; *Lady Frances Crossley*, salmon-pink; *Lady Gray Egerton*, delicate lilac, spotted greenish brown; *Lee's Purple*, purple; *Marie Carvalho*, deep rose, changing to pure white; *Melon*, rich blood; *Mrs. C. S. Sargent*, similar to Everestianum, but pink; *Mrs. Milner*, rich crimson; *Norma*, pink; *Old Port*, plum-color; *Princess Mary of Cambridge*, white with purple margin; *Purpureum crisimum*, lilac-purple, spotted greenish; *Purpureum grandiflorum*, purple, large clusters; *R. S. Field*, scarlet; *Ralph Sanders*, rich purplish crimson; *Rosa mundi*, white slightly flushed with yellow spots, dwarf (Gn. 63, p. 368); *Roseum elegans*, rosy lilac, dwarf, rose, *Seyton*, deep maroon, large clusters; *Wellsianum*, blushed, changing to white.

For greenhouse culture, the most successful way, especially with the taller-growing species, like *R. arboreum*, *R. Griffithianum*, *R. barbatum*, and *Purpurascens*, is to plant them out in a porous peaty soil provided with good drainage. If grown in pots, the sandy compost of leaf-soil and peat, with an addition of some fibrous loam, will suit them. The pots, which should never be too large, must be well drained and the plants freely watered during the summer, while during the winter water must be carefully applied. The Himalayan species and their hybrids will do well in a cool greenhouse, where the temperature is kept a few degrees above freezing-point during the winter. The Javanese species and hybrids, however, on account of their continual growing and blooming, require a warmer greenhouse and must have a minimum temperature of 50° during the winter. They like a moist atmosphere and showy specimens for decoration. If kept in good greenhouse and have a brilliant color of their flowers. A large number of beautiful hybrids have been raised; the following are a
small selection of them: Balsamin<e>florum, with double pink flowers (Gt. 37, p. 265. G.C.II.18:239; III. 12:769. J.H. III. 43:151. G.Z. 27:241); Balsamic<e>florum album, with double white flowers (Gw. 5:373); Balsamin<e>florum aureum, with double yellow flowers; Bredel, brilliant scarlet; Corinna, old rose (G. 41:845); Diadem, orange-scarlet; Duchess of Connaught, vermillion-red; Duchess of Edinburgh, scarlet with orange-crimson (F.M. 1874:115); Eos, scarlet-carmine (G.C.III. 19:327); Equisetum, lichens light fawn-yellow flowers (G. 56:62); Fatsia, satiny rose; Jasmine<e>florum carminatum, deep crimson (G. 41:328); Little Beauty, flowers small, but bright carmine-scarlet (G. 56:242); Lord Wolseley, bright orange-yellow, tinted with rose at the margins; Luteo-roseum, flowers satiny rose, suffused with white, center light yellow (G. 33: 313); Maiden's Blush, blush, with yellowish eye (Gn. 16:394); Princess Alexandrina, white, faintly blushed; Princess Frederika, yellow, faintly edged rose; Princess Royal, pink; Princess Mary, bright pink (Gn. 42:194); Taylori, bright pink, with white tube (F. M. 1877:242); Triumphans, crimson-scarlet.

Propagation.—All rhododendrons are easily propagated by seeds, which are very small and are sown in sandy pots or boxes well drained and filled with sandy peat. Pots should be well watered previous to sowing. The seeds should be covered only a very little with fine sand or finely cut sphagnum, or merely pressed in and not covered at all. To prevent drying, a glass plate may be placed over the pan or some moss may be spread over the surface; this, however, must be taken off as soon as the seeds begin to germinate. The seeds also germinate very readily if sown on fresh sphagnum, but in this case they must be pricked off as soon as they can be handled. In any case, it is of advantage to prick off the young seedlings as soon as possible, but if they are not sown too thickly they may remain in the seed-boxes until the following spring. The seedlings of hardy rhododendrons should be placed in coolframes and gradually hardened off; those of greenhouse species kept under glass. Rhododendrons are also sometimes increased under glass by cuttings of half-ripe wood taken with a heel, and if gentle bottom heat can be given after callusing it will be of advantage. They root, however, but slowly, except those of the Javanese kinds, which are mostly propagated in this way, since they grow very readily from cuttings. Layering is sometimes practised, especially with the dwarf and small-leaved species, but the layers usually cannot be separated until the second year. For the propagation of the numerous varieties and hybrids of hardy and half-hardy rhododendrons grafting is most extensively employed. R. catawbiense or seedlings of any of its hardy hybrids may be used as stock; R. maximus is also probably as good. In English and Belgian nurseries R. ponticum, which is inferior in hardness, is mostly employed as a stock, but this often proves fatal if the grafted plants are transferred to colder climates. R. arboreum may be used for strong-growing varieties intended for cultivation in the greenhouse or South. Veneer or side-grafting is mostly practised, and sometimes cleft- and saddle-grafting (see G.C. III. 24:425 and Figs. 3380, 3381). The leaves should be removed only partly and the stock not headed back until the following year. The grafting is usually done late in summer or early in spring in the greenhouse on potted stock without using grafting-wax, and the grafted plants kept shaded until the graft has been completed. If large quantities are to be handled the plants are sometimes not potted, but taken with a sufficient ball of earth, packed close together and covered with moss. Covered with moss to stop the atmosphere is also of much advantage if the plants are potted.

Other experience with the evergreen rhododendrons. (B. M. Watson.)—Rhododendrons, in this article, mean more particularly R. maximum and the hybrid varieties of R. catawbiense; in the main, however, the directions for the various operations apply to the azalea family.

Rhododendrons as a class are increased by seeds, layers, clefts, and grafts, and occasionally by cuttings. Seeds should be sown under glass, between January 1 and March 15, in soil one-half peat and one-half pure fine sand, with good drainage. The seeds are small and require no covering, the usual watering after sowing being quite sufficient. A thin layer of sphagnum over the surface of the seed-pan is good protection from the sun and keeps the soil evenly moist; it should be removed when germination begins. Seeds may also be sown on sphagnum, a thin layer being compactly spread above the seed-soil and drainage, and an even surface being secured by clipping. Seed-pan or flats of convenient size are used and they should be plunged in sphagnum still further to insure even moisture; the temperature of the house should be 45° to 50° F. Seedlings are prone to damp-off and should be pricked off into fresh soil as soon as they are big enough to handle; wooden pincers, made from a barrel hoop, are handy for this work. They are slow growers, and must be tended carefully. Keep under glass, well shaded until the weather is settled. Frames with lath screens make good summer quarters. Winter in pits and plant out in frames in peaty soil when large enough. Never let them suffer from dryness. It has been suggested that the seed of R. maximum might be planted on living moss under high-branched trees in swamps where the water does not collect in winter. (See Jackson Dawson on the "Propagation of Trees and Shrubs from Seeds," in Transactions of the Massachusetts Horticultural Society, 1885, part I, page 145.) Layers probably make the best plants, and in the best English nurseries layering is the common method of propagation. In the United States layering in spring is preferable, but abroad it is practised in both spring and autumn. It is a slow process, but desirable for the hardy hybrids of R. catawbiense. Roots form on wood of almost any age; when removed the layers should be treated as rooted cuttings and carefully grafted in well-drained soil where water and shade are easily furnished. See Layering. See, also, G.F. 6:63 (1868) for an interesting account of layering large plants by burying them to the top.—Grafting is the common method of propagation, and is employed almost universally in continental nurseries. R. ponticum is the usual stock, a free grower and readily obtained from seeds. Attempts have been made to use R. maximum in American nurseries, because of the tenderness of R. ponticum, but no great progress has been made. It is asserted that the rate of growth is somewhat slower than that of the hybrids; this seems hardly possible, and it is to be hoped that further experiments will be made. R. ponticum should
be established in pots in spring and grafted under glass in autumn and early winter, using the veneer-graft (see Grafting, page 1382, Vol. III). Graft as near the root as possible and plant the worked parts below the surface when planting in the nursery or permanently. With these precautions, and an extra covering of leaves until the plant is established on its own roots, the defect of tenderness in this stock can be overcome. Nurse carefully the young grafted plants in frames until of sufficient size to be planted in the nursery rows. Figs. 3380 and 3381 illustrate two common methods of grafting rhododendrons and other woody plants. The details of the unions are shown in Fig. 3380, and the completed work in Fig. 3381. Statements are made that cuttings of half-ripened wood will strike, but it is not likely that this will ever prove a practical method of propagating *R. maximum* or the *R. catawbiense* hybrids; it might be worth while to experiment with wood grown under glass, particularly with some of the smaller-leaved evergreen kinds.

As to cultivation, the point on which successful American growers of rhododendrons now insist is that the water-supply shall be sufficient. (See H. H. Hunnewell, *G.F.* 3:201, 1890.) To effect this: (1) make the soil deep and fine, using materials like peat, leaf-mold, well-rotted manure and yellow loam, all of which are retentive of moisture; (2) plant in masses, at any rate while young, so that they may protect each other and prevent evaporation; (3) give the bed a northern exposure or a situation where the force of the midday sun is broken; (4) do not plant under or near trees like elm, oak, or maple, which make undue inroads on the natural water-supply, nor so near buildings that the border is sheltered from rain or overdrained by cellar walls; (5) mulch with leaves summer and winter, protect from wind and sun with evergreen boughs in winter and in summer give heavy watering whenever the weather is excessively hot or dry.

The planting-bed should be prepared by excavating to the desired dimensions and at least 3 feet deep. The poor material should be discarded, but the good soil can be replaced, adding enough peat and the like (see above) to make good that which was rejected; all should be thoroughly and carefully mixed. Peat, although excellent, is not necessary. Yellow loam or hazel loam, if not too sandy, is equally good and is improved by additions of humus. To nearly pure peat an admixture of sand is beneficial; the essential point is that all soils for these plants must be fine. The beds should be prepared in autumn and left to settle all winter, due allowance being made for shrinking. In spring level off to the grade of the adjacent land and do not leave "rounded up." A bed higher at the center than at the sides perhaps makes a better display of the plants, but is more likely to dry up and does not catch all the water possible from occasional showers. It is generally conceded that lime soils and manures containing ashes and bone-meal, are injurious to rhododendrons; in limestone regions it is undoubtedly advisable to substitute, for the natural soil, others which are free from this objectionable element.

Plant rhododendrons in spring when weather is settled and the March winds have passed. If the ball of roots is dry, soak well before setting. Plant closely, so that the tops are only 10 to 12 inches apart and pay particular attention to "facing" them, i.e., see that the best side is facing the most important point of view, and that all are faced alike. Grafted plants should, if possible, have the worked portion below the surface. Do not plant in autumn. Plants grown on the premises may be transplanted in favorable weather in summer if great care is taken to prevent the roots suffering from dryness. In planning the original border it is well to leave room for extension; when planted, as described above, the beds can be enlarged at intervals of four or five years, or new beds made from the old stock. Place the beds so that the glare of the midday sun is screened both summer and winter, and avoid situations where there is any interference, owing to trees or buildings, with a naturally good condition of the soil in respect to moisture. If permanent protection is desired, use conifers, particularly the hemlock, in preference to deciduous trees. Good positions for beds may be found along the edges of ponds and streams, and in reclaimed meadows, with their cool moist soil, but keep afloat from any ground where the water collects in summer or winter. Beds, or even single plants, if sizable, may be introduced into open spaces in woodlands if the precautions noted above are observed and plenty of air and light are obtainable. It is somewhat difficult to combine rhododendrons and many deciduous shrubs, among which are the azaleas, their near relatives. A background of dark green conifers seems most appropriate. Mountain laurels, *Pieris floribunda*, *Leucothoe Catesbaei*, and *Daphne Canescens* are proper companions, but at times these seem better apart. Our native lilies, *L. Superbus* and *L. Canadensis*, are good associates and thrive under the same conditions. In very dry weather the water should be given, not daily in driblets, as lawns are sprinkled, but in quantity, enough at one time to soak the layers below it. Give and Christmas. Let the bed be covered to the depth of the soil, but at comparatively low points or else they will heat. Leaves make good winter protection, which should be given just before cold weather,—in eastern Massachusetts, between Thanksgiving and Christmas. Let the bed be covered to the depth of 10 to 12 inches, well worked in beneath the foliage but not over it. In spring dig as much as pos-
Rhododendron well placed.—One of the Rhododendron catawbiense varieties.
sible of this material into the ground, leaving a part for the summer mulch. Shelter the tops with evergreen boughs, the butts driven into the earth a foot or more; in windy positions a temporary board fence is useful.

Experience at Rochester, New York (John Dunbar).—About fourteen years ago, rhododendrons were planted in the Rochester City Parks in beds excavated to a depth of 2 to 2½ feet (sandy soil containing lime removed), and having a slope of 10% from an adjacent swamp. Cow-manure was well-worked in the surface. Rhododendrons planted in this preparation began to root immediately, grew with vigor, and flowered splendidly. About 20,000 square feet have been planted to rhododendrons in this way with unflagging success. A ¾-inch pipe water-system is connected with all of the beds, with faucets at convenient points, and the plants are thoroughly watered in the growing season, and are never permitted to enter the winter with dry roots. The natural drainage is perfect. Rhododendrons will not tolerate stagnant moisture at their roots. They are thoroughly protected by the lay of the land from the west, northwest, and north winds, but are completely exposed to the south, summer and winter, and with the exception of a heavy mulching of leaves, spread over the beds in the autumn, they receive no other protection. The lace-fly became a serious pest for several years prior to the planting of nymphs feed on the under side of the leaves and the foliage presents a sickly yellow appearance, as if attacked by red-spider. This is promptly destroyed and kept under control by two sprayings of Ivory soap from an adjacent swamp. Cow-manure was mixed prepared to America; it is usually more profitable to buy this stock each fall than to attempt to raise it in this country, where labor is high-priced and the climate dry and hot.

Propagation is usually by seeds sown in early spring in frames or pans, in sandy peat, without covering, and kept moist and shady. When the seedlings appear they should have air and a daily spryning. In autumn they are transplanted into boxes or frames, in sandy, peaty soil. The seeds germinate very readily sown in cut sphagnum, but ought to be pricked into boxes as soon as they can be handled. The second year the seedlings should be planted out in beds, sufficiently wide apart to allow a growth of two years. Long upright branches should be shortened, to secure well-branch ed plants. The named varieties are grafted on any of the common species, usually by veneer-grafting in autumn in the greenhouse, on potted stock. They may also be increased by cuttings of mature wood 2 to 3 inches long, taken from a height of three or four feet, placed in sand in a greenhouse, on potted stock. They may also be increased by cuttings of mature wood 2 to 3 inches long, taken from a height of three or four feet, placed in sand in a greenhouse, or in a cold frame, shaded from direct heat, and with the roots covered with sand, to hasten the formation of roots. The plants are kept in a cold frame through the winter.

The following are known as Ghent azaleas or Mollis hybrids (R. Morteri, Sweet, Azalea Mortieriana, Spae. A. gandaensis), are in cultivation. They have originated chiefly from crosses of R. sinense, and later R. japonicum, with R. luteum, R. calendulaceum and R. nudiflorum, also in some cases with R. occidentale and R. viscosum. Some good varieties are the following:


Indian azaleas.

This group contains R. indicum and other species of the section Tsuchutsuki and the hybrids of them. They are well-known evergreen shrubs, in the North requiring cultivation in the greenhouse during the winter, but some, as R. Kaempferi and R. poukhanense, have proved perfectly hardy in the neighborhood of Boston; also R. ledebouri and R. ledebouriense will stand many degrees of frost in somewhat sheltered positions. Indian azaleas are rarely liable to injury by seeds, which, when sown in the greenhouse in the same way as with the former group. Usually they are propagated by cuttings or grafting. The cuttings root best when made in August from half-ripened wood, and placed in sand under a frame, with gentle bottom heat. Choicer varie-

Hardy deciduous azaleas.

These include the species of the sections Pantathera and Rhodora and some of the section Tsuchutsuki, and the hybrids known as Ghent azaleas. Most of them are hardy, but in the North and in exposed situations a protection with brush, hay, or mats should be given in winter, to protect the flower buds from sudden changes of temperature.

In the open, the flower period of hardy azaleas extends from April to July. First comes R. canescens, R. rubescens, R. Vaseyi and R. Vaseyi; then R. nudiflorum and R. japonicum, followed by R. luteum and R. calendulaceum and nearly at the same time, R. Schlippenbachii, R. Albrechtii; somewhat later, R. occidentale, and last, R. arborescens and R. viscosum. One of the most beautiful is the American R. calendulaceum, which is hardly surpassed in the brilliancy and abundance of its flowers by any of the Ghent hybrids. There may also be mentioned, A. gandavensis), are in cultivation. They have originated chiefly from crosses of R. sinense, and later R. japonicum, with R. luteum, R. calendulaceum and R. nudiflorum, also in some cases with R. occidentale and R. viscosum. Some good varieties are the following:


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ties are usually increased by veneer- or tongue-grafting, either in winter or in July and August on vigorous growing varieties raised mostly from cuttings. Grafting on rhododendron is now used in some German nurseries with very good results. The best soil for azaleas, if grown in pots, is a sandy compost of half peat and half leaf-sole, with an addition of good fibrous loam. It is essential to plant them firmly, and to give very good drainage. The base of the stem should be just above the surface. The best time for repotting is after flowering, when the new growth commences. During the summer, they should be kept in the coldest room in the open in a sheltered spot, with the pots plunged in the soil, or planted out in prepared beds, where they make a very vigorous and healthy growth. In September they should be repotted and transferred to the greenhouse. They must have plenty of water and free syringing during the hot months. The natural flowering time is from April to June, but in the greenhouse, azaleas may be had in flower from November till June. Against the red-skipper and thrips, from which the azaleas are liable to suffer if the air is too dry, free syringing with water is the best remedy. Most of the plants used for forcing in this country are imported from Holland, Belgium, and Germany. Formerly azaleas were kept in summer in shade or partial shade, but now it is the custom of the best growers to give them full exposure to the sun, either planted out or in the pots plunged to the rim in ashes or other good drainage material; in the latter case a top-crossing of 2 or 3 inches of old cow-manure is very beneficial. The only American treatise is Halliday's "Treatise on the Propagation and Cultivation of Azalea Indica," Baltimore, 1880.

Some of the best varieties of Indian azaleas are the following (for a completer account, see August Van Geert, "Iconographie des Azalées," abbreviated here as Ic. Az. 20):

**Single-flowered:**
- **Antigone,** white, striped and spotted violet (R.B. 7:241. Ic. Az. 3);
- **Apollo,** vermilion (Ic. Az. 20);
- **Charmer,** rich amaranth, very large (F.S. 5:303, 304, 1);
- **Comtesse de Beaumont,** rich rose, blotched deep crimson;
- **Criterion,** rich salmon-pink, bordered white and blotched crimson (F.S. 8:796. F. 1849: 137);
- **Diamond,** white, blotched dark crimson (F.S. 21:2233, 2234);
- **Duc de Nassau,** rich rosy purple, very free and large;
- **Brazier Greetings,** small, flower often semi-double, crimson, very free-flowering; *Eclatante,* deep crimson, very free-flowering; *Elegante,* deep crimson, very free-flowering; *Exemplaire,* rich glowing crimson (Gn. 16:242, 4);
- **Fluer d'Eeckhaut,** white, striped red (Gn. 16: 242, Ic. Az. 13);
- **Hauert Lorraine,** small, bright pink flowers, very floriferous; *Heuze* (Firefly), deep crimson, "hose in hose," small fl. very free-flowering (R.B. 31:49);
- **Jean Verouve,** salmon, striped, bordered white (R.B. 2:145. Ic. Az. 11);
- **John Gould Veitch,** lilac-pink, bordered and netted white, striped crimson (F.S. 20:2071, 2072);
- **La Victoire,** reddish, white toward the edges, spotted maroon-crimson; *Louise von Baden,* pure white, sometimes speckled pink (F.S. 17:1796. F. 3:158);
- **Marie Charlotte Van De Eeckhaut,** pure white, with crisped edges; *Madame L. Van Houtte,* scarlet-rose, bordered white (F.S. 23:2383. Ic. Az. 5);
- **Marquis de Lorne,** brilliant scarlet, very fine; Miss E. Jarrot, pure white, with crisped edges (R.B. 14:213);
- **Mrs. Turner,** light pink, bordered white, spotted crimson (F.S. 8:451. Gn. 56, p. 306);
- **Mons. Thibaut,** orange-red; *Perle de la Belgique,* large, pure white; *President Victor Van den Hecke,* white, striped and spotted crimson, with crimson edges; *Princesse de Belgique,* pure white, one of the best; *Prince de Neufchateau,* pure white, spotted greenish yellow; *Professor Wolters,* pink, with amaranth blotch; *Reine des Paye-Bas,* rich violet-pink, bordered white (I.H. 13:149);
- **Roi de Hollande,** dark blood-red, spotted black; *Sigismund Rucker,* rich rose, bordered white, blotched crimson, very showy (F.S. 19:2010, 2011. Ic. Az. 31);
- **Stella,** orange-scarlet, tinged violet; *Wilson Saunders,* pure white, striped and blotched vivid red.

**Double-flowered:**
- **Alice,** deep rose, blotched vermilion (I.H. 23:244);
- **Baron N. de Rothschild,** rich purple-violet, large (F.S. 23:2477, 2478);
- **Bernard André,** dark violet-purple, large; *Bernard André alba,* white (I.H. 17:15. Ic. Az. 19);
- **Borsig,** pure white; *Charles Latrens,* dark salmon, blotched dark purple, good form and substance (F.S. 19:1071, 1972);
- **Charles Pynaert,** salmon, bordered white (R.B. 10:25);
- **Chicago,** deep carmine, bordered white, large; *Comtesse Eugenie de Kerchove,* white, flaked red-carmine; *Deutsche Perle,* pure white, early (R.B. 21:85. R.H. 1886: 516. Gn. 33:460. Ic. Az. 25);
- **Dominique Verouve,** bright orange; *Dr. Moore,* deep rose, shaded white and violet, very fine (R. B. 11:61);
- **Eggebrechti,* bright crimson; *Empereur du Brésil* (Emperor of Brazil), rich rose, banded white, upper petals marked red (Ic. Az. 15);
- **Ernest Eeckhaut,* deep carmine, very double; *Francois de Vos,* deep crimson (I.H. 14:512. Ic. Az. 14. F. M. 8:443);
- **Johanna Gotteschale,** white; John Lenselty, soft pink; *Louise Pynaert,* white (R.B. 4:306);
- **Madame Camille van Langenhove,** white, striped with rose, very double; *Madame Iris Lefebvre,* deep orange-carmine, shaded bright violet and blotched brownish red (F.S. 18:1862, 1863);
- **Madame Jos. Verouw,* large, pink and white, similar to *Veroutine,* Madame Pietrick, bright rose, very early; *Madame Van der Cruyssen,* pink, fine form (A.F. 12:1003);
- **Madeleine,* white, large, semi-double; *Niobe,* white, fine form; *Pharailde Mathilde,* white, spotted cherry-red (R.B. 13:145);
- **Princesse de Walle,* bright rose, upper petals spotted yellow and striped crimson; *President Oswald de Kerchove,* pink, bordered white, blotched carmine; *Raphael,* white; *Sakunatala,* white, very free-flowering; *Simon Mardner,*
large, rose, very double and very early; Sow. du Prince Alberi, rich rose, single, broadly margined white, very free-flowering (F.M. 4:201). 1e. Az. 24); Theodore Retmer, lilac; Veraneeana, rose, bordered white, sometimes striped salmon (Gn. 52, p. 137. C.L.A. 5:116. J.H. 31:423); Veraneeana alba, white (R.H. 1906:424); Vugitaeana, deep crimson, "hoso-rose."

The varieties now chiefly imported and considered the best for forcing are the following (those marked with an asterisk are adapted for early forcing):

**Single-flowered:** *Emil Liebig, Haere's Lorraine;* *Hece, Professor Wolters.


Plants grown in Germany are preferred for early forcing, because they are grown in pots over summer before shipping, while the Belgian plants are grown in the open field. Generally the Belgian plants are more compact, while the German-grown plants are of more open growth, because they do not travel well.

Augustin, 9.

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The varieties now chiefly imported and considered the best for forcing are the following (those marked with an asterisk are adapted for early forcing):

**Single-flowered:**
- *Emil Liebig, Haere's Lorraine;* *Hece, Professor Wolters.

1. michænium, Turcz. Shrub, to 8 ft.; lvs. lanceolate or oblanceolate, obtuse or acute, glabrous above, densely ferrugineous-lepidote beneath, \( \frac{3}{4}-1 \frac{1}{2} \) in. long; fls. in dense many-fl. clusters, white, campanulate, \( \frac{3}{4}-\frac{3}{4} \) in. across, lobes oblong or oval, longer than tube; stamens longer than corolla, glabrous; style shorter than stamens; sepals lanceolate, ciliate, \( \frac{3}{4} \) in. long. June, July. Manchuria to W. and Cent. China. B.M. 8198.-Very distinct species, resembling L. with its dense clusters of small white fls. and exerted stamens and with its small lvs. It has proved perfectly hardy at the Arnold Arboretum and is very floriferous even as a small plant.

2. ferrugineum, Linn. Shrub, 2 ft. high, glabrous; lvs. elliptic to oblong-lanceolate, acute, densely lepidote beneath, 1-2 in. long; calyx-lomes short, obtuse; corolla funnelform-campanulate, with the tube about twice as long as limb, pink or carmine, about \( \frac{3}{4} \) in. across. June-Aug. Mountains of Cent. Eu. L.B.C. 1:65. Gn. 29, p. 385. G. 8:610.—Dwarf, hardy shrub, handsome for rockeries. Var. album, Sweet, has white fls.

3. hirsutum, Linn. Shrub, 3 ft. high, with hirsute branches; lvs. oval to oblong, ciliate, light green and glanular-lepidote beneath, \( \frac{1}{2} \) in. long; clusters many-fl.; calyx-lomes short, obtuse; corolla funnelform-campanulate, with the tube about as long as limb, pink or carmine, about \( \frac{3}{4} \) in. across. June-Aug. Mountains of Cent. Eu. L.B.C. 1:65. Gn. 29, p. 385. G. 8:610.—Dwarf, hardy shrub, handsome for rockeries.

4. arbutfilum, Hort. (R. daphnoides, R. Hammondii, and R. clearifolium, Hort. R. Wilsonii, Hort., not Nutt.). A hybrid of R. ferrugineum and R. minus. Dense shrub, 4 ft. high; lvs. elliptic to elliptic-lanceolate, acute at both ends, \( \frac{1}{2}-1 \frac{1}{2} \) in. long; fls. similar to those of R. ferrugineum, but larger. June, July.—Of garden origin. Handsome hardy shrub, perhaps known by the name of R. Wilsonii; this name, however, had been given previously to another hybrid between two Himalayan species and should not be used for this plant.


6. minus, Michx. (R. punctatum, Andr. R. Cuthbertii, Small). Straggling shrub, to 10 ft.; lvs. elliptic to elliptic-lanceolate, acute at both ends, sometimes acuminate, glabrous above, glandular-lepidote beneath, \( \frac{1}{2}-1 \frac{1}{2} \) in. long; clusters many-fl.; calyx short; corolla funnelform-campanulate, about 1 in. across, rosy pink, the upper lobe spotted greenish, lepidote outside; tube nearly cylindric, longer than the ovate crisped lobes. June, July. N. C. to Ga. and Ala. B.M. 2285.—Fls. appear with or after the new lvs. Var. Hardisonii, Rehd. Fls. larger, \( \frac{1}{2} \) in. across, in dense, about 10-fl. heads. Ga. Handsomer than the type.

7. carolinianum, Rehd. (R. punctatum, Small, not Andr.). Shrub, to 6 ft., usually low and compact; lvs. oval to oblong, acute or acuminate, acuminate, broadly cuneate at the base, glabrous above, ferrugineous-lepidote beneath, often very densely so, 2-3 in. long; fls. in dense 5-10-fl. heads, broadly funnelform-campanulate, about \( \frac{1}{2} \) in. across, pale rosy purple or rarely white, not or only slightly spotted; tube gradually widened, as long or shorter than the ovate lobes, glabrous or nearly so outside. May, June. N. C. B.R. 37. G. 31:619 (as R. punctatum).—On account of its compact habit and larger fls. superior as an ornamental plant to the preceding.

8. keiskei, Miq. Low, sometimes procumbent shrub; lvs. elliptic to lanceolate, acute, dull green above, lepidote beneath, \( \frac{3}{4}-1 \) in. long; clusters 2-5-fl.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes; pale yellow, \( \frac{1}{2} \) in. across; stamens much exerted. May. Japan. B.M. 8390.

9. Augustini, Hemsl. Shrub, to 20 ft.; branchlets pubescent when young; lvs. elliptic-ovate to oblong-lanceolate or lanceolate, acute or acuminate, broadly cuneate at the base, pale green beneath and lepidote and hirsute on the midrib and petiole, \( \frac{3}{4}-2 \) in. long; fls. 3-6; calyx-lomes short, ciliate; corolla broadly campanulate, \( \frac{1}{2} \) in. across, pale purple or rosy pink, rarely nearly white; lobes much longer than tube; stamens as long or slightly shorter than corolla, style longer. Cent. and W. China. B.M. 8497. G.C. III. 52:14. F.S.R. 3:162. R.H. 1909, p. 18.


12. racemum, Franch. Shrub, to 6 ft.; lvs. elliptic to ovate or obovate, obtuse or acute, rounded or broadly cuneate at the base, glabrous, glaucous and below and lepidote, \( \frac{3}{4}-\frac{3}{4} \) in. long; fls. 1-3, from axillary buds usually crowded at the end of the branches, sometimes along the branches; corolla funnelform-campanulate, \( \frac{3}{4} \) in. across, rose-pink, lobes oblong, about as long as tube; stamens and style exserted. B.M. 2285.—Fls. appear with or after the new lvs. Var. Harbisonii, Rehd. Fls. larger, \( \frac{1}{2} \) in. across, in dense, about 10-fl. heads. Ga. Handsomer than the type.


14. dahuricum, Linn. (Azalea dahurica, Koch). Shrub, to 10 ft.; lvs. deciduous or sometimes partly
rhododendrons; it requires a warm greenhouse.

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RHODODENDRON

Section 2. LEIORHODIUM.

A. Under side of lvs. tomentose or pubescent.

B. Ovary tomentose; branches tomentose or nearly glabrous.

c. Flowers small; calyx-lobes nearly as long as pedicels; corolla campanulate, leaves much shorter than tube; pedicels about 2/3 in. long; tall shrub or tree, tender.................................. 17. arboéreum

17. 

Arboeaeum, Smith. Fig. 3383. Large shrub or tree, attaining 40 ft.; lvs. oblong to lanceolate, acute, rugose above, distinctly veined and whitish or ferrugineous-tomentose beneath, 4-6 in. long; clusters dense; pedicels short; calyx minute; corolla campanulate, blood-red, pink, or white, usually spotted, 1-1½ in. across; ovary ferrugineous-woolly or mealy, usually 7-9-celled. March-May. Himalayas. B.R. 890. B.M. 77; B. R. 1982. Var. Kingianum, Hook. (R. Kingianum, Watt). Shrub: lvs. broader, more robust, very dark lvs. deep scarlet; filaments rose-colored; calyx larger. G.C. III. 20, 306. B.M. 7096. Var. nilagiricum, Clarke. Fls. white-colored to deep crimson, spotted: lvs. ferrugineous-brown beneath. B.M. 4381. G.C. 30: 54. Var. purpureum, DC. Fls. purple or scarlet: lvs. white beneath. Var. Windsorii, Voss (R. Windsorii, Nutt.). Fls. deep crimson-scarlet; calyx with elongated lobes: lvs. white beneath. B.M. 5096.—This species is tender and suited only for warmer temperate regions, but has been crossed with hardy varieties and its blood is recognizable in many of our most beautiful hardy hybrids.

18. Smirnovii, Trautv. Shrub or small tree, to 20 ft.; young branchlets whitish or grayish woolly: lvs. elliptic-oblong, acutish, narrowed at the base into a short petiole, revolute at the margin, dark green with yellow midribs above, densely felted grayish white or pale brown beneath, 3-5 in. long; lvs. many, in a compact head; calyx small, tomentose; corolla campanulate-funnelform, rosy red, 3 in. across; lobes oval, longer than tube, with crispied darker rose-colored margin, upper lip spotted brownish; stamens 10, curved; ovary

RHODODENDRON

CC. Corolla funnelform-campanulate; pedicels 3½-8 in. long.

d. Lvs. acute at both ends.

B. Tomentum of lvs. beneath and of branchlets whitish or pale brown

ee. Tomentum of lvs. beneath and of branchlets deep brown.

P. Corolla 5-lobed, spotted greenish

ff. Corolla 8-10-lobed, spotted yellow-purple

DD. Lvs. obtuse or obtusish at both ends

BB. Ovary and branchlets glabrous.

AA. Under side of lvs. glabrous or pubescent only when young.

BB. Plants with coriaceous persistent lvs.

c. Ovary glabrous or glandular only.

D. Pedicels puberulous;

d. Calyx-lobes much shorter than ovary.

e. Pubescence of ovary rusty hirsute; pedicels glabrous...

f. Calyx-lobes nearly as long as ovary: lvs. acute at both ends.

BB. Plants with rather thin bark, falling off the second sprig: hybrids between this and the following section 28. azaleoides

17. arboeaeum, Smith. Fig. 3383. Large shrub or tree, attaining 40 ft.; lvs. oblong to lanceolate, acute, rugose above, distinctly veined and whitish or ferrugineous-tomentose beneath, 4-6 in. long; clusters dense; pedicels short; calyx minute; corolla campanulate, blood-red, pink, or white, usually spotted, 1-1½ in. across; ovary ferrugineous-woolly or mealy, usually 7-9-celled. March-May. Himalayas. B.R. 890. B.M. 77; B. R. 1982. Var. Kingianum, Hook. (R. Kingianum, Watt). Shrub: lvs. broader, more robust, very dark lvs. deep scarlet; filaments rose-colored; calyx larger. G.C. III. 20, 306. B.M. 7096. Var. nilagiricum, Clarke. Fls. white-colored to deep crimson, spotted: lvs. ferrugineous-brown beneath. B.M. 4381. G.C. 30: 54. Var. purpureum, DC. Fls. purple or scarlet: lvs. white beneath. Var. Windsorii, Voss (R. Windsorii, Nutt.). Fls. deep crimson-scarlet; calyx with elongated lobes: lvs. white beneath. B.M. 5096.—This species is tender and suited only for warmer temperate regions, but has been crossed with hardy varieties and its blood is recognizable in many of our most beautiful hardy hybrids.

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3383. Rhododendron arboeaeum. (X ½)

19. caucasicum, Pall. Dense low shrub, 2 ft. high, often with procumbent branches: lvs. oval-oblong or narrow-elliptic, acute, dark green above, ferrugineous-tomentose beneath, 2-4 in. long: clusters 7-10-fld.; pedicels short; calyx minute; corolla funnelform-campanulate, with emarginate rounded lobes, pink to yellowish white, spotted greenish within, 1½ in. across. June, July. Caucasus. B.M. 1145.—A dwarf, quite hardy species; late-flowering. Var. flavidum, Regel. Fls. straw-colored, spotted greenish within. G.W. 16: 560. Var. stramineum, Hook., is similar, but with fulvous spots. B.M. 3422. Var. rösco-álbium, Brit., with blush fls., changing to white, and var. splándens, Brit., with deep pink fls., are said to bloom very early and may be hybrids. R.H. 1868:311. Also "Coriaceum" and "Rosa mundi" (see p. 2932) are apparently forms of this species.


23. pónticum, Linn. Shrub, 10 ft. high: lvs. elliptic to oblong, acute, pale green beneath, 3-5 in. long: clusters many-fld.; pedicels longer than fls., puberulous; calyx-lobes as long as ovary, the lower ones half as long; corolla funnelform-campanulate with oval lobes, purple, spotted brownish within, about 2 in. across; ovary glandular. May, June. Spain, Portugal, Asia Minor. B.M. 650.—This species is less hardy than the two preceding and now rarely found in cult. in its typical form. Var. álbum, Hort., has white fls. There are also varieties with variegated and one with purplish lvs.

24. sutchuenense, Franch. Shrub, to 15 ft.: lvs. oblong-oblancoate, usually obtuse, narrowed at the base, dark green above, paler and glabrous beneath, 4-10 in. long; pedicels stout, 3-½-1½ in. long; fls. many, in a dense head; pedicels glabrous; corolla funnelform-campanulate, 2½-4 in. across, rose-colored, spotted below the base of the upper lobes, lobes broad, rounded, shorter than tube; stamens 18-19, shorter than the corolla, anthers purple-black; style glabrous, as long as the stamens; ovary glabrous. W. China. B.M. 8362. —Blooms freely as a small plant 2 ft. high.

25. californicum, Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous: lvs. oblong, shortly acuminate, pale green beneath, 3-6 in. long, sometimes crowded beneath the fls.: clusters many-fld.; calyx minute; corolla broadly campanulate, with oval crisped lobes, rosy purple or pink, paler toward the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers; ovary with appressed silky hairs. May, June. Calif. to Brit. Col. B.M. 4583. —R. macrophilium, Don, and R. washingtoniánum, Hort., are probably not different.


3384. Rhododendron brachycarpum. (X½)

3385. Rhododendron catawbiense. (X½)
27. *maximum*, Lindl. GREAT LAUREL. Fig. 3387. Shrub, or small trees, attaining 35 ft.; lvs. mostly alternate at base, narrow-oblong or lanceolate-oblong, acute or shortly acuminate, whitish beneath, 4-10 in. long; clusters many-flowered; pedicels viscid; calyx-lobes oval, as long as the corolla, glandular; stamens 10, Rocky Mts. B.M.3670, pedicels; corolla white, 5-cleft, about 1 in. broad; midrib beneath, slightly ciliate; fis. nodding, on short branchlets strigose and glandular when young: lvs. Azaleastrum albiflorum, var. album, Pursh (R. Pärshii, Don), with white fis.; var. purpureum, Pursh (R. purpureum, Don), with purple fis., and var. roseum, Pursh, with pink fis. This species and the following are now often extensively used in park-planting and taken by the carloads from the woods. If properly handled and taken from a turfy soil with a sufficient ball of earth around the roots, they are usually successfully transplanted.

28. *azaleoides*, Desf. (*R. frâgrans*, Lodd. *R. odoratum*, P. At.). Hybrid between *R. minus* and *R. nudiflorum*. Shrub, a few feet high: lvs. leathery but thin, elliptic to oblong, acute at both ends, dark green above, paler beneath, sometimes pubescent when young; fis. funnel-form-campanulate, pinkish or whitish, fragrant, June, July. Nova Scotia and Ont. to Ga. B.M.914. Em. 2:435. Mn. 1:1 and 3, p. 22. C.L.A. 3:32; 4:105. G.W.15, p. 823.—This is one of the hardest species, being hardy as far north as Que. and Ont. Three varieties have been distinguished: var. album, Pursh with white fis.; var. purpureum, Pursh with purple fis., and var. roseum, Pursh with pink fis.

29. *occidentale*, Gray (Azalea occidentalis, Torr. & Gray. *A. californica*, Durand). Shrub, 2-6 ft.: branches strigose and glandular when young: lvs. oblong, pale green, appressed-strigose above and at the midrib beneath, slightly ciliate: fis. nodding, on short pedicels; corolla white, 5-lobed, about 1 in. broad; calyx glandular; stamens 10. Rocky Mts. B.M.3670. Var. plenum, Rehd. A very handsome double form found wild, but not yet in cult.—The species is hardy, but difficult to cult.; will probably succeed best on a rockery in a cool and shady place.

Section 3. AZALEA.

Subgenus II. AZALEA.

3386. Flower-bud of Rhododendron catawbiense. These buds are formed in the fall. Unless these large terminal buds are produced, the bush will not bloom the following spring. (X 3/4)

Section 4. PENTANTHERA.

A. Stamen longer than the limb; corolla-tube long and narrow, usually glandular outside.

B. Color of fis. white or pink.

C. Fis. with or after the lvs., white.

D. Corolla soft-pubescent outside, with yellow stripes on the upper lobe: branchlets glabrous or finely pubescent... 30. occidentale

DD. Corolla kirsche, with stalked glands.

E. Lvs. beneath and branchlets glabrous... 31. arborescens

EB. Lvs. strigose beneath on the midrib and branchlets striose...

32. viscosum

OC. Fis. before the lvs., pink, rarely white.

D. Lvs. not glandular; corolla usually not glandular...

33. nudiflorum

DD. Lvs. grayish soft-pubescent beneath: corolla glandular outside...

34. canescens

NB. Color of fis. yellow to flame-red.

C. Ovary not glandular; stamens much longer than corolla: lvs. generally obovate...

35. calendula...

CC. Ovary glandular; stamens little longer than corolla: lvs. generally oblong...

36. luteum

AA. Stamen shorter than the limb: corolla-tube short, funnelform, finely pubescent outside, not glandular.

B. Under side of lvs. soft-pubescent: corolla yellow...

37. sinense

DD. Under side of lvs. only strigose on the veins: corolla brick-red to orange...

38. japonicum

31. arboréscens, Torr. (Azalea arbóricaens, Pursh). SMOOTH AZALEA. Fig. 3388. From 8–20 ft.; branchlets glabrous; lvs. obovate or obovate-oblong, acute, ciliate, glabrous, green or glaucous beneath, 2–4 in. long: fls. white or tinged rose, 2 in. long, fragrant; style and stamens red. June, July. Alleghany Mts. G.F. 1:401. (adapted in Fig. 3388). C.L.A. 11:496. Gn.M. 5:219. L.B.C. 17:1632 (as A. verticillata).


34. canescens, Don (Azalea canescens, Michx.). Shrub, 1–3 ft.: similar to the preceding; lvs. oval to elliptic or obovate, soft-pubescent beneath, at least when young, 1½–3 in. long; pedicels glaucular: fls. pink to nearly white, 1½–2 in. broad, glandular outside, very fragrant; stamens slightly exerted. April, May. N.H. to Fla. and La.


37. sinense, Sweet (R. mólle, Don. Azalea sinénsis, Lodó. A. mólus, Blume). Shrub, to 5 ft.; young branchlets glaucous and often setose: winter buds grayish pubescent: lvs. oblong to oblong-oblancoate, obtuse and mucronate, cuneate at the base, ciliate and often revolute at the margins, soft-pubescent beneath, 2½–3½ in. long; fls. in many-fl. heads; pedicels puberulous; calyx-lobes short, rounded, ciliate; corolla campanulate-funnelform, yellow, upper lobe spotted greenish, 2 in. across; stamens shorter than limb. April, May. China. B.R. 1253. L.B.C. 9:885.—Tenderer than the following species with which it has been confused. It has entered largely into the parentage of the so-called Ghent azaleas, and some of them, particularly Anthony Koster, are little different from true R. sinense.

38. japonícum, Suring. (R. mólle, Miq., not Don. Azalea japoníca, Gray. A. mólus, Hort., not Blume). Fig. 3392. Shrub, to 6 ft.; young branchlets glaucous, sometimes setose: winter buds glabrous: lvs. ovate to oblong-oblancoate, obtuse and mucronate, cuneate at the base, ciliate, glabrous or sparingly setose above, glaucous below except setose on the midrib, 1½–3 in. long: fls. in dense heads; pedicels setose; calyx-lobes ovate, setose; corolla campanulate-funnelform, 2 in. across, salmon-red, brick-red, or carmine; stamens shorter than limb. April, May. Japan. F.S. 19:2032–6. B.R. 433; 2383 (var. albíflora). C.L.A. 11:495. G. 27:15. Gn. 29, p. 550. G.M. 36:500.—A very fragrant and free-flowering species, not common in cult. Nearly all varieties referred to this species in nursery catalogues are hybrids and belong to the so-called Ghent azaleas, and some of them, particularly Anthony Koster, are little different from true R. sinense.

3389. Rhododendron nudiflorum, (X.10).

3390. Capsule of Rhododendron nudiflorum.
Section 5. Rhodora.

A. Stems 10: corolla rosy purple, not spotted
B. Lvs. deciduous, lanceolate, acute
C. Sepals obtuse, ciliate, not glandular
D. Stems 7-10, anthers purple; sepal ovate to lanceolate: lvs. elliptic, acute, persistent

39. canadense
40. Vaseyi

39. canadense, var. album, Rehd., but this is not quite so beautiful as the type.


48. obtusum, Leveille (Azalea obtusum, Kuntze). Spreading shrub, 1-3 ft. lvs. chartaceous, subpersistent, narrow-elliptic to elliptic-lanceolate, or lanceolate at the end of the branchlets, dark green above and usually sparingly strigose, paler beneath and strigose on the veins, 1-1/4-2 in. long: fls. 1-3; the inner scales of the calyx viscid; sepals 1/4-1/2 in. long, ovate-oblong, strigose and long-ciliate; corolla funnel-form-campanulate, pale lilac-purple, spotted purplish brown on the upper lobes, about 2 in. across; stamens 10, anthers purple. May. Korea.—Has proved perfectly hardy at the Arnold Arboretum and flowers freely as a small plant; the purple-lilac color of the fls. is unique among the hardy azaleas. Var. yodogawa, Rehd. (Azalea yodogawa, Hort.). Fls. double, rosy lilac, spotted dark purple: lvs. elliptic-lanceolate. G.W. 15:163. R.H. 1908:426.

ties of this species are the following: Var. album, Sweet.


47. Kaempferi, Planch. (R. indicum var. Kaempferi, Maxim.). Fig. 3393. Shrub, to 12 ft.: Ivs. membranous, deciduous, broadly elliptic to elliptic-ovate or nearly rhombic, acute at the ends, bright green above, paler beneath, stigose on both sides, with rufous hairs on midrib and petiole, 1½-2½ in. long: fls. 2-4 with or before the leaves; sepals ovate to oblong-ovate, obtuse, long-ciliate, striate or obscure; corolla broadly funnel-form, 1½-2 in. across, bright orange-red to pink; stamens yellow. April, May. Japan. S.I.F. 2:61. C.L.A. 11:496. M.D.G. 1902:417. S.T.S. 2:113.—Very handsome; hardy in New England.


Great numbers of names of rhododendrons are to be found in current literature, but the plants may be unknown in the American trade. The following list will explain most of these names. The number in parenthesis after the name refers to the section to which Carr viewed them.

3393. Rhododendron

Kaempferi. (×59)

348. japonicum, Sweet (See Azalea japonica, Lindl.). Fls. white, G.F. 9:395. Var. calyciflorum, Sweet (Geert. Ic. Az. 18); G. 1880:89. Var. narcissiflorum, Maxim. Fls. double, white, rarely purple. F. 1880:89. Var. rhombic, acute at the ends, bright green above, paler and less glandular; Ivs. 1½-2 in. long; fls. usually solitary; sepals small, ciliate; corolla funnel-form, 2-3 in. across, rosy purple to pink; stamens 5-10; anthers purple. April, May. B.R. 32:37. G.C. II. 25:585. R.H. 1876:370. Gn. 67, p. 190. Var. album, Sweet (Geert. Ic. Az. 18); G. 1880:89. Var. rhombic, acute at the ends, bright green above, paler and less glandular; Ivs. 1½-2 in. long; fls. usually solitary; sepals small, ciliate; corolla funnel-form, 2-3 in. across, rosy purple to pink; stamens 5-10; anthers purple. April, May. B.M. 4728. F.S. 9:985. G.C. III. 23: fig. 125. A.G. 15:373; 18:568. G.C. 2:385; 3:257. Possibly a hybrid of this species and R. sublanceolatum. Var. album, Sweet (Geert. Ic. Az. 18); G. 1880:89. Var. rubescens, Sweet (Firefly), deep crimson. In Japanese gardens a large number of named varieties of R. obtusum, varying in shades from white to deep crimson, are grown; one of the best known of them is Hinokigiri, with brilliant crimson fls.

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rhododendron

lepidote beneath, 3½ in. long: fls. oval, oblong-lanceolate, pale brown or greenish buff, 1-2 in. across. Himalayas.

Ciliolate, obtuse, bifid, acuminate, pale to rusty brown and white, 2½ in. across. Himalayas.

Elliptic, acute at both ends or auriculate at the base, white, with a dark purple blotch within, 1-2 in. across. Himalayas.

Petioles slender, glabrous, 1½ in. long; fls. white to pink, 1-2 in. across. Himalayas.

Fls. in a loose, elongated, cylindrical, pedunculate spike, 1 in. across. Himalayas.

Fls. 3-5, white to rosy red, broadly campanulate, 1½-2 in. across. China.

Fls. 7-10, slender-stalked, funnel-campanulate, 1½ in. across; stamens about 20; ovary glabrous. W. China.

Fls. 3-6, white, spotted red, broadly campanulate, 2 in. across. W. China.
2946.

RHODODENDRON

RHODODENDRON

Hong-Kong. B.R 33:3.-R. jastig,atum, Franch. (1). Very dwarf,
sides, sil,:ery beneath, 34'-~i!l' long: fis. 3-5, rosy purple, funnelf10wermg when only 4 in. high: Ivs. closely crowded, ovate, }3-Y2m.
form, Y2m across. W. Ohma. B.M.8163. G.C. III. 41:26!.
long, covered wIth rusty dots: fis. bright hIae-rose, Y2-11n. across.
W. China.-R. jastuosum var. jlore-pleno, Van Houtte. Hybnd of
feet hIgh, glabrous. Ivs. oblong to oblong-Ianceolate, pale beneath,
F.S. 2.143. Almost hardy.-R. jlav,dum, Franch. (R. pnffiullnum,
3-4 In. long: fIs. many, funnelform-campanulate, 1 Y2 In. long,
Hems!.) (1). Shrub, to 6 ft.: Ivs. ovate-oblong, densely lepidote on
both surfaces, -Y2-%in. long: fls. 3-5, yellow, rotate-campanulate,-. Jackso",i, Hort. (G. 28: 183) lssald to be the same as R venustum.1)i in. across; stamens lO. W. China. B.]\L S326. G.C. III.
long, acute,ID1nutely lepidote beneath, 3-61n long: fis. many, funnel~
Shrub, to 15 ft. or small tree: Ivs. lanceolate, acute at both ends,
form, orange-yellow to bnck-red, 2 In. across. WInter. l\Ialayan
shghtly bullate, whIte or graYIsh tomentose beneath, 3-5 in. long:
Archipelago and PellIn. B.M.4336. F.S. 3.293, 294,6:576. PM.
fis. 8-12! rese-colored, 1.7'2 in. across. W. Chlna.-R. F6rdtt,
15::<17. Var. tub,jlorum, Hook. Lvs. smaller fls. smaller and WIth
Hems!. (2). Shrub: Ivs. obovate-Ianceolate, glabrous, 2-3 in. long:
longer tube, sahnon-pmk. B.]\L 6850.-R. J enktnsti, Nutt.=R.
fis. few, whIte, flushed pInkIsh outsIde, 1 Y2 In. across. S. ChIna.
Maddenii.-R. kamt8chdt,eurn, Pall. (Azalea kamtschatica, Kuntze).
B M. 8111.-R. jormo8um, Wall. (R. Glbsonii, Paxt.). (1). Slender
Belongs to the sectIOn TherorodlOn, characterized by the fis. bemg
shrub, 8 ft. high: lvs. oblong-obovate, cihate, puose above, glaucous
borne at the end of the young branchlets. Prostrate undershrub:
and lepldote beneath, 1-2 Y2 In. long: fis. few, funnelform-campanulvs. deClduous, obovate or spatulate, obtuse, clhate, 174"-27'2 In.
late, whIte, tinged pmk, n~-2 m. across. Himalaya Mts. B.l\L
long: fls. 2-3, in termmal racemes, rotate-campanulate, 1 ~2 in.
44: 128. G.W. 13, p. 554. Hardy, but dIfficult to cult.-R. EenFortun .. , Lind!. Sltrub, 12 ft. high, wIth stout branches, glabrous:
drtcktt, Nutt. (2). Large shrub: lvs lanceolate, acumInate, glabrous.
lye. oblong, acute, glaucous beneath, 5-7 in. long: fis. many, broadly
pale beneath, 4-7 In. long. fis. many, campanulate, brIght scarlet,
cJ.mpanulate, 7-1obed, rosy lilac; stamens 14. Cent. ChIna. B.l\L
2 In. across. HImalayas. Var. latt!ohum. Hoole. Lvs. broader,
5596. Aimost hardy. Var. Houlstonn, Rehd. & WIlson. Lvs. naroblong-lanceolate, glandular pubescent beneath when young. B.M.
5129.-R. Kesselring,i, Wolf. Hybnd between R. pontic urn and R.
rower, smaller: pedIcels more glandular.-R. jragrans, MaXIm. (1).
Smunovll. Low shrub: Ivs. soon glabrous beneath: fis. rosy purple
Low shrub: Ivs. ovate-elliptIc, ferrugineous-lepidote beneath, 72-1
ianum and R. Hookeri. :Fls. large, in loose heads, cnmson, pmk or
stamens 5. E. Siberia.~R. jrdorans, Lodd., see No. 28, R. azaleoides.-R. jTagrantiss~mu,m, Rurb. Supposed hybrid bet"t,'lrcen
R. ciliatum and R. Edgewortiui. Fls. large, white, faintly tlll~cd
G.M. 44:356; 50:211.-R. Keysit, Nutt. Belongs to the section
Keysia characteflzed by the tubular corolla With short erect lobes.
Shrub, 2-6 ft. h,gh, With ferrugmeous branches: Ivs. elliptIcAllied to R. campanulatum, but smaller: fls. deep blood-red, in a
lanceolate. glabrous, pale and sparmgly scaly beneath, 3--4 In. long
iensehead. HImalayas. B.l\f. 5317. F.S. 8'789. Gn.67 376.-h.
fis. many, tubular, Wlth short erect lobes, brIck-red, I in. long
bly R. pontI cum. Fls. pale flesh-color, changing to white, 4 m.
106.-R. Kotschy" Siffionkai (R. myrtlfohum, Schott & I';:otsehy,
across. G. 32: 131; 34.701.-R. gemm!ferum, Bean. Hykld
deciduous or half-evergreen, oval to elliptIc, obtuse or acuhsh,
late, shIning above, ferrugineous-Iepidote beneath, ;1-1 In. long:
mucronulate, loosely vtllous on both sides, 1 H-2 in. long: fls. b;-::,t
fls, few, tubular-funnelform, With the tube outside pubescent,
inside VIllous, carmIne, ~ain. long; style shorter than ovary.
carmIne, funnelform-campanulate, tube somewhat longer than the
lobes, 13:1 in. across; stamens 5-10; style exsertcd, glabrous; ovary
tic-ovate, brownish tomentulose beneath, 5-10 in. long: fIs. In
Gibson;i, Paxt.=R. formosum -R. glaucum, Hook. f. (1). Small
shrub, 3 ft. hlgh: Ivs. ellIptIc-oblong, lepldote, glaucous beneath, 2-4
dense heads, broadly campanulatc, ~-lobed, white, I in. across.
in. long: fls. 5-8; campanulate, rose-colored, 1 Y2 m. across. HimalYunnan. B.M.8372. R.H. 1912, pp. 375, 376.-R. lanaturn, HOOle
f. (2). Shrub or small tree: Ivs. obovate to obovate-oblong, with
Sweet. Alhed to R. azaleoides and supposed to be a cross between
tawny woolly tomentum beneath, and also above when young,
3-5 in. long: fls. 6-10, broadly campanulate, yellow, spotted red
a hybrid evergreen rhododendron and R. 'nudifiorum or R.
viscosum: lvs. oblong-Ianceolate, pubescent on both sides while
Almost hatdy.-R. Zane,/oltum, Moench=R. ponticum.-R. lane,;
young: lis. purplish pink; calyx-lobes Imear.-R. grande, WIght (R.
argenteum, Hook. f.). (2). Tree, to 40 ft.: Ivs. oblong-obovate, acute,
glabrous, whIte beneath, 8-12 in. long: fis. in a dense head, carnDepressed shrub; lvs. oval or oblong, obtuse, Y.l'-72 In. long: Hs.
panulate, 5-8-lobed, rosy at first, changmg to 'WhIte, 2-3 m. across,
3-6, broadly campanulate, purple, Y2m. across; stamens 5-8. July
1910'136. Hardy.-R. lepidOium, Wall. (R. el::eagnoides, Hook. f.)
green, lepidote beneath, Y:rl Y2 in. long: fis. 1-3, sometimes many,
slender-pedlCelled, broadly campanulate, yellow or dull purple,
Shrub, 8 ft. high, glabrous: Iv•. oblong, pale beneath, 6-12 in. long:
spotted within, )1m. across; stamens usually 8. HImalayas. B.l\!.
fIs. 4-6, broadly campanulate. white, fragrant, 3 in. across or more.
Hook. (R. sahgnum, Hook. f.). Fls. greenish or pale yellow, spotted
Auckbnd,i, Hook. Fls. 7 m. across. B.M.5065. Gn.20:328
greenish: Ivs. narrow. Var. obovdtum, Hook. Fls. dark purple,
Remarkable for Its very large lIs.-R. hmmatochilum, Cralb=R.
larger: Ivs. obovate.-R. linearijoltum, Sieb. & Zucco (Azalea hnearI~
foha, Hook,) (6). Alhed to R. ledlfolium. Lvs. hnear-Ianceolate:
oreodoxa.-R. Halopeilnum, AndI·e. Hybrid of R. arboreum and
corolla pInk, deeply diVIded into 5 linear-Ianceolate segms. Japan.
num, Hemsl. (1). Shrub, to 3 ft.: Ivs. obovate to elliptic-Ianceolate,
allied to R. malayanum: Ivs. elliptic-oblong: fls. almost salveracute, lustrous above, fulvons beneath, minutely scaly, 1-3 m.
long: fis. many, in dense heads, yellow, campanulate-funnelform,
shaped, with slender, curved tube. brightcnmson. WInter. Born~o.
%ID. across; Stamens 10. W. China.-R. Hdrnsti, Hort. Hybnd
The R. Lobbianum, Moore (F.M. 1: 10), belongs to R. Brookof R. arboreum and R. Thomsonii. Fls. deep crimson, spotted
eanum.-R. Loden, Hort. Hybnd between R. :Fortunel and R.
within.-R. HarrovuLnum, Hemsl.=R. polylepls.-R. H 6d{}soni~,
Griffithianum. Fls. whIte to soft rose, 6-lobed, 5-6 In, across, fraH0a!<. f. Shrub or small tree, attammg 20 ft .. Ivs. narrowly obovategrant. G.C. III. 50:30,51'360. Not to be confused WIth Loder's
oblong, whitish or broWnIsh tomentose beneath, 8-18 in. long: lis. in
hybrId which is a cross of unknown origIn, apparently also of H.
a . dense head, broadly campanulate, pale purple, 2 1n. across.
Gnffithianum.-R. longesquamatum, Schneid. (R. Brettii, Hems!.)
(2). Shrub, to 15 ft.: scales of H.-buds persistent, elongated: Ive.
-R. Hooken, Nutt. (2). Shrub, 14 ft. hIgh: Ivs. oblong-oval, glaobovate-oblong, acute, rounded at the base, glabrous beneath
brous, glaucous below and spanngly chaffy on the veins: fis. camexcept the villous midrib and petiole, 2Y:r51n. long fis. 6-15, rosy
panulate, deep crimson, 1-1 % In. across; calyx cup-shaped. Himpink, campanulate, 2 in. across. W. Chma.-R. longistylum, Rehd.
oblanceolate or oblong-Ianceolate, sparingly lepldote beneath, 1· 2%
Shrub, to 15 ft.: Ivs. oblanceolate or oblong-Ianceolate, acummate,
in. long: fls. 10 or :nore, white, funnelform-campanulate, ~2m.
,glabrous above, white-tomentose. beneath, 3-472 in. long' fIs. many,
white, spotted J broadly campanulate, 2 In. across. W. China.-R.
232, 233.-R. Zucidum, Franch =R decorum.-R. Lusc6mbet, W.
hypogZaucum, Hemsl. (2). Lvs. elliphc, acute, 2-3 in. long: corolla
catum, Hort. Apparently a hybrId of R. pontlCum With a hardy
(1). Allied to R. racemosum. Lvs. lanceolate or ovate-Ianceolate,
speCles of the same group. Dwarf, very compact shrub: Ivs. crowd~d,
long-acummate, sparingly lepidote, hght green beneath. fls. 1-3,
oblong, obtuse, glabrous, lustrous, convex and somewhat bulhHe
from l axillary heads, 1 in. across, yellow; stamens 10, exserted. W
above, 1 y"..2)1 in. long: pedicels puberulous; fls. pale lilac-purple"
Chma. R.H. 1914: 324.-R. macrocarpos, Griff.=R. Dalhousire.2 in. across; style and the sometimes petaloid stamens short; ovary
R. macro8epalum, Maxlm. (Azalea macrosepala, Kuntze) (6).
glabrous. Ongin unknown. Hardy at the Arnold Arboretum.Shrub, to 2 ft.: branchlets villous: lvs. deciduous or subpersistent,
elhptlC, 1-2 Ill, long: fls. umbellate, rose-hlac, spotted, 2 in. across;
oblong, acute at both ends, lustrous above. grayish tomentose
beneath, 3\6-5 m. long: fls. many, pink to white, broadly camAzalea 'dIanthifiora, Carr. (R.H. 1891: 60) is pOSSIbly a double-fld.
panulate, 1 H-2 in. across; stamens 14 or more. W. China.form of this specles.~R: macrostemon, Maxim. (6). Low halfR. intermedium, Tausch. Hybrid between R. ferrugmeum and, R.
evergreen shrub: Ivs. oblong-elliptIc, pubescent, about Yzin. long: tis.
hirsutum and intermediate between the two. Has been found
pinkish, ~-I in. across; stamens tWIce as long as corolla. Japan.
occaSIOnally "ith the parents.-R. ,nttictitum, :Franch. (1). Shrub,
-R. Maddeni., Hook. f. (1). Shrub, to 8 ft.' 1,,8 .bart-stalked,
to 3 ft.: Ivs. elliptic or ovate, obtuse, densely lepidote 00. both
elhptic-lanceolate, ferrugineous-lepidote beneath, 4-7 In. long: fls




ALFRED REINER.

ROHDEOLÉA (Greek, rose and smooth; alluding to rose-like fls. and smooth st.). Hamamelidáceae. Small tender trees; lvs. evergreen, glabrous, long-stalked: fls. about 6 to 8 together in a compact head, having the appearance of a simple fl. surrounded by bracts, hermaphroditic; petals of each fl. turned toward the circuit of the head; stamens 7-10; ovary of 2 carpels united at base: caps. several-seeded. Two species. One is from China and the other from Java and Sumatra.

Chambéonié, Hook. A tender tree: lvs. shining, coriaceous, usually ovate, 4-5 in. long; petals 1½-2 in. long: fl.-heads resembling a semi-double cleome, 1½ in. across. White, bright pink, each head surrounded by several rows of bristly bracts; petals 15-20 to each fl.-head. China. B.M. 4509. J.F. 1:4.-Formerly in cult. in S. Calif.

F. W. BARCLAY.

RHDÓMÝRTUS (Greek, rose-myrtle, from the rose-colored flowers). Myrtáceae. Small tender trees and shrubs, one of which, R. tomentosa, is of slight economic importance in southern Asia, where it is native, and which is grown to a limited extent in California and Florida.

Leaves opposite, 5- or 3-nerved: fls. rather large, axillary; calyx-tube turbinate, the lobes persistent; petals 5 or 4; stamens numerous, free, in many series; berry globose or ovoid, with few to many seeds. - Species about 80.-The genus differs from Myrtus in having 2–3 locules in the ovary, each of which is frequent with spurious partitions or divided into numerous 1-ovulate suposed cells; while the lvs., in place of being pinnately veined, have 3 or 5 prominent nerves. The species is indigenous to India, Ceylon, Malaya, and S. China. The other species are Austral. and not cult.

tomentosa, Wight (Mýrtus tomentosa, Ait.). DOWNY MYRTLE. HILL-GOOSEBERRY. Small shrubs, up to 5 ft., the young branchlets tomentose: lvs. elliptic or obovate; obtuse, 1½-2½ in. long, hoary below; petals short: fls. 1-3 on slender peduncles about half the length of the lvs., rose-pink, ½-¾ in. broad; calyx tomentose, 5-cleft, the lobes unequal; petals downy outside, shortly clawed; berry globose, ½ in. broad, dull purple, to 3½ in. thick, covered, with numerous small compressed seeds in each cell. B.M. 250.—This plant seems to be best known in S. India, where it occurs commonly in the mountains. It is said by Macmillan to succeed in Ceylon only at high elevations. In S. China the fr. is sometimes offered in the market as a substitute for Flora. W. China.

flórida, Webb. (more properly Consólvulus flóridus, Linn. f.) Evergreen shrub: lvs. persistent, alternate, lanceolate, 6-9 ft. high, which bears white fls. something like a morning-glory. The blossoms are about an inch across and last only a day, but a succession is maintained (in S. France) from early June till Aug. A striking feature of the plant is its terminal, panniced inf. These panicles are often a foot high, 10 in. wide at the base and contain at one time as many as 20 full-blossomed fls. and 100 buds. Intro into S. Calif.

—The wood of this species is hard and white, with radiating stripes. Intro. into S. Calif. by S. Amer.

WILHELM MILLER. F. TRACY HUBBARD.

RHODÓPSATHA (Grec, rossé et spathe, referring to the color of the spathe in some species). Aráceae. Climbing shrubs suitable for the warmhouse: branches often rooting: lvs. distichous, elliptic-oblong, acuminate: spathe cymbiform, beaked and deciduous; spadix shorter than the spathe, cylindrical, densely flvd., the fls. all perfect or the lower pistillate; perianth none, stamens 4: berries small, oblong, truncate, 2-celled, many-seeded.—About a score species, Trop. Amer. See Engler, Pflanzenreich, IV. 23 B.

Forgetti. N. E. Br. St. climbing: lvs. spreading; blade oblong-lanceolate, 16-20 in. long; the petiole about 12 in. long: peduncle 6 in. long; the spathe broadly elliptic, 6 in. long, a dirty pale rose-white outside and dirty rose inside. Costa Rica.

RHÓDOSFÉRA (Grec, red and globe; referring to the reddish globose fr.). Anacardiaceae. A tree from Austral., closely related to Rhus but differing chiefly in the 10 stamens and in the very short free radicle of the embryo: lvs. odd-pinnate, subcoriaceous: fls. polygamo-dioecious, in terminal and axillary panicles, red; stamens 10; styles 3, free; fr. a globose drupe. In its native country the wood is esteemed for cabinet-work and used as a yellow dye and therefore called "yellow-wood." It is also a handsome foliage tree and is cult. in Calif. The only species is R. rhodanthema, Engl. (Rhus rhodanthema, F. Muell.). Evergreen tree to 60 or 70 ft., glabrous: lvs. 7-9, short-stalked, oblong-ovate, to 1 ft.: lvs. cuneate-oblong, acute, setosely ciliate, silky-pubescent beneath when young, 17–2 1/2 in. long: fls. purplish pink, to 1 in. across. May. Alps of E. Eu. B.M. 488. L.B.C. 15:1491. P.M. 3:169. F.S. 19:1062. F.W. 1857:321. G.C. III. 33:293. ALFRED REHDER.

RHODÓSTACHYS (Greek, rhodon, rose, and typos, type; alluding to the resemblance of the flowers to those of a single rose). Rosáceae. Ornamental shrub, grown chiefly for its large white flowers and for the handsome bright green foliage. Leaves deciduous, opposite, stipulate, short-petioled, serrate: fls. solitary, short-peduncled; sepals large, half as long as petals, outside with 4 small alternate bracts; petals 4, orbicular; stamens numerous; carpels usually 4, developing into black dry 1-seeded drupes, surrounded by the large persistent calyx.—One species in Japan. A handsome and distinct shrub, hardy as far north as Mass., with bright green foliage, conspicuous by its white fls. in spring and by its shining black fr. in autumn and winter. It thrives well in any good soil. Prop. by seeds and by greenwood cuttings under glass in summer; also by hardwood cuttings.


RHÉEO (name unexplained). Commelínaceae. One species, from Mex. and the W. Indies, R. discolor, Hance, known also as Tradescantia discolor, L. Her.
the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, sometimes proves satisfactory, and always interesting as the seedlings vary greatly. The seed germinates easily, and if started early the plants become fully large and strong the same season. The seedlings may be started in any good clean garden soil. Sow seed in early spring, in rows a foot apart and not over an inch deep. Thin the plants promptly to stand a few inches apart in the rows, and give the same thorough tillage allowed to other garden crops. In the following fall or spring take the seedlings up, and set them in the well-prepared permanent patch, not less than 4 feet apart, each way, and till frequently the entire season. In spring of the next year the stalks may be pulled freely.

From ten to twenty good plants should supply the needs of the usual family, and probably with something to spare for the neighbors. Sometimes an early supply is secured by placing a bottomless barrel or box over the plant and piling warm horse-manure about it. If the barrel, keg, or box is not too broad, the petioles will be made to a straight upright growth and will be partially blanched and very tender. Victoria and Linneas are the leading varieties.

**Forcing of rhubarb.**

In the winter and early spring months, the forcing of rhubarb in the vicinity of many city markets is a profitable industry. The plant may be forced either in the field where the roots were grown or lifted and placed in hotbeds, under greenhouse benches or in cellars. The bulk of the rhubarb forced for market and sold during the winter months is grown in cheap structures placed over the plants in the field. These houses may be of the lean-to type, although they are more commonly even-span post and rafter construction, the roof being covered with hotbed sash which is not needed for other purposes at the time. The eave walls are 4 to 5 feet high, made of rough boards and covered with cheap building-paper. The even-span houses are mostly 24 to 36 feet wide and the lean-to house half that width. Heat is usually applied in an overhead system, steam being the most popular, although late in the season if the sun is depended upon to supply the required amount of heat. When forced in the field in limited quantities, coldframes are often used, the outside walls being well banked with hot manure and the surface of the ground within the frames covered with 3 to 6 inches of the same material.

Beds intended for early spring forcing should be thoroughly cultivated in the fall and an application made of high-grade commercial fertilizer of 800 to 1,000 pounds to the acre. When growth starts, a dressing of nitrate of soda at the rate of one-half pound to a crown should be given. In field forcing, the moisture of the soil is usually sufficient so that no water is applied. When in the intention to use field for forcing for several years, the plants are usually set 2 by 3 feet and the land fertilized heavily each spring with a compost, one made from cow- and hog-manure being preferred. The sash are placed upon the first houses as soon as the roots have been frozen, five to seven weeks being necessary to bring the plants to maturity.

In field forcing, the cost of production is often greatly reduced by growing spinach or dandelion between the rows, the price obtained for these fillers usually being sufficient to pay labor and maintenance costs. The stalks are usually pulled twice, returning to the grower from $1 to $2 a sash, depending upon the season when placed upon the market.

Roots for forcing in the dark should be healthy and vigorous; the larger the roots the more satisfactory the results as a general rule. Crowns three to five years of age are mostly used, although satisfactory results are often obtained from one-year-old plants which have been grown on very rich land and have made an unchecked growth during the season. The roots should be dug early in the fall before the ground freezes and allowed to remain exposed to the weather until they are frozen solid when they should either be removed to a shed or covered with litter in the field to prevent alternate freezing and thawing. Thorough freezing is necessary, whatever the method of forcing, if the best results are to be obtained. With one-year roots very satisfactory results are sometimes secured if the roots are thoroughly dried before forcing. Anesthetics have been tried as a substitute for freezing but with unsatisfactory results. When used upon frozen roots they stimulate growth, resulting in the production of earlier and larger stalks with greater total weight of product. If the greatest benefit is to be derived from the anesthetic, it must be used in the early part of the resting-period. The most satisfactory results have been obtained by the use of 10 cubic centimeters of sulfuric ether to a cubic foot of space, exposing the roots to the fumes for forty-eight hours. Well-grown two-year-old roots seem to respond to this treatment in the most satisfactory way.

As soon as the roots are placed in position, whether it be under the greenhouse benches or in the cellar, all spaces should be filled with soil or ashes to prevent evaporation. If placed on a concrete floor, 2 or 3 inches of soil should be placed under the roots and sufficient material should be added completely to cover the roots. The bed as soon as completed should be thoroughly watered, the plants kept supplied with an abundance of moisture, which will necessitate water being applied about once a week. Care should be taken to guard against over-watering as this will result in the production of light-colored stalks, lacking in flavor and texture. In order to obtain the most attractive product, rhubarb should not be forced in full light or total darkness. If grown in diffused light, the development of the leaf-blade is very slight and the color of the stalk, instead of being green, is a beautiful dark cherry-red, giving to the product a very attractive appearance. In quality the product is superior to that forced in light, being more tender, less acid, with a skin so thin and tender as to make it unnecessary to peel the stalks. The temperature may range from 45° to 75°, the lower the temperature the greater the yield and higher the quality of the product. The time required for bringing a crop to maturity in darkness is practically the same as that required for forcing in the field.

**Local market demands to a certain extent govern the method which is used in growing this crop for the winter market.** When grown by any method which
requires the lifting of the roots, it must be remembered that they are worthless after having produced a crop. Therefore, this method cannot be practised with as great profit upon expensive land as can the method of field forcing or when roots were used for forcing which otherwise would be destroyed. Rhubarb-forcing in house cellars should receive more attention, as it adds at slight expense a pleasing vegetable to the winter dietary.

Whatever the method practised, success will be attained only when healthy well-developed roots, which have been allowed to freeze, are used. G. E. ADAMS.

Rhus (ancient Greek name). Anacardiaceae. Sumac. Ornamental woody plants, grown chiefly for their handsome foliage, often assuming brilliant autumnal colors, and some species also for showy fruiting panicles. See also Cotinus.

Deciduous or evergreen shrubs, sometimes climbing by aerial rootlets, or trees, with milky or resinous juice: lvs. alternate, without stipules, simple, 3-foliate or odd-pinnate; fls. dioecious or polygamous, small, in axillary or terminal panicles; calyx 5-parted; petals 5; stamens 5, inserted below a broad disk; ovary superior, with 3 styles: fr. a small 1-seeded dry drupe, smooth or hairy.—About 150 species in the temperate and subtropical regions of both hemispheres. Foliage and bark of most species are rich in tannin and are used for tanning leather, particularly the lvs. of R. coriaria in S. Eu. From R. verniciflua lacquer is obtained in China and Japan, used in the manufacture of lacquer-ware; R. succedanea yields a vegetable wax, used for candles in Japan, and also exported for various purposes. R. verniciflua and some other S. African species are valued for their timber.

The sumacs are shrubs or trees with handsome simple or usually compound foliage assuming in most deciduous species brilliant autumnal colors, and with small comparatively inconspicuous flowers in usually large panicles, followed by small fruits which are deep red and showy in many species. The only species with rather showy flowers of creamy white color appearing in late summer is R. javanica, while R. typhina, R. glabra, and R. copallina are chiefly valued for their large pinnate leaves coloring scarlet in autumn and also for the conspicuous panicles of deep red fruits remaining almost unchanged on the plants during the winter; they are well adapted for mass-planting on barren ground and dry hill-sides. Also R. verniciflua, R. succedanea, and R. verniz have handsome large foliage, but are poisonous like R. Toxicoidea, and for this reason are not recommended for extensive planting. The deciduous native species are hardy North, and occasionally to 30 ft.; lvs. short-stalked, oval, obtuse or acute, 1-2 in. long, very rarely 3-foliolate: panicles hoary: fr. hairy, red. 

D. Length of lvs. 1-2 in., apex usually obtuse: fr. yellow. 1. integrifolia
  2. americana
  3. littoralis
  4. mollis

B. Lvs. pubescent or glabrous. 5. laviqata
  6. lutea

C. Fr. pubescent, red. 7. trilobata

D. Length of lvs. 2-3 in., apex acute: fr. yellow. 8. canadensis

CC. Fr. glabrous, white. 9. diversiloba

DD. Lvs. in loose panicles: fr. glabrous, white. 10. toxicoidea

D. Apex of lvs. obtuse, margin crenate. 11. vernix

E. Length of lvs. usually 8-10 in., base cuneate. 12. verniciflua

DD. Under side of lvs. more or less pubescent, at least white, pale green; texture thin; pairs of veins usually 10-12. 13. succedanea

CC. Fr. pubescent: fr. glabrous, white. 14. Potaninii

DD. Under side of lvs. glabrous, grayish green, rarely green; texture firm;' with usually 18-20 pairs of veins. 15. diversiloba

DD. Fructing panicles pendulous: fr. hairy, red. 16. coriaria

CC. Fr. glabrous, white. 17. javanica

DD. Margin of lvs. crenate. 18. capallina

EE. Number of lvs. 5-7, rarely 9; rachis terete. 19. Potaninii

EE. Number of lvs. 7-15; rachis narrowly winged in the upper part. 20. punjabensis

DD. Under side of lvs. glabrous, grayish green, rarely green; texture firm; with usually 18-20 pairs of veins. 21. glabra

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2. *ovata*, Wats. Shrub, to 10 ft.: lvs. short-stalked, ovate or acute, acuminate, entire or rarely sparsely toothed, 2–3 in. long; fls. in dense spikes ½ in. long, sometimes crowded into terminal panicles, light yellow; fr. ovate, flattened, dark red, ¼ in. long. Spring. S. Calif., Ariz.

3. *laurina*, Nutt. (*Lithraea laurina*, Walp.). Aromatic, glabrous shrub: branchlets purplish; lvs. oblong-ovate to lanceolate, acute and mucronulate, rounded at the base, entire, 2–3 in. long; petals ¼–½ in. long; fls. in dense panicles, to 4 in. long, greenish white: fr. ovoid, beaked, ½ in. long, whitish, with a waxy covering. Summer. S. and Low. Calif.—Will thrive in the hottest and driest places; very handsome with its dark green glossy foliage.

4. *mollis*, HBK. Tall shrub: branchlets tomentose; lvs. oval or ovate, rounded and mucronate at the apex, rounded or subcordate at the base, pubescent above, more densely so beneath, 1½–2½ in. long; petiole very short: fls. in dense pubescent panicles, about 1 in. long: fr. subglobose, pilose. Mex.

5. *levigata*, Linn. Glabrous shrub or tree: petiole 2–3 in. long; lfts. sessile or short-stalked, ovate, acuminate, cuneate at the base, entire or sometimes with 2–6 teeth, lustrous above, 2–3 in. long; panicles loose, axillary and terminal; fls. minute, whitish, slender-pedicelled: fr. globose, glabrous, lustrous, about ¼ in. across. S. Afr. Sim. For. Fl. Cape Colony 45.

6. *lactida*, Linn. Glabrous shrub, to 6 ft.: branchlets sometimes puberulous: petiole ¼–½ in. long, narrowly winged; lfts. sessile, obovate, obtuse or acuminate, entire, rarely slightly toothed, lustrous distinctly veined, 1–2½ in. long; panicles terminal and axillary, about as long as lvs.: fr. globose, glabrous, about ¼ in. across. S. Afr.

7. *triloba*, Nutt. (*Schmettisia triloba*; Small). Skunk-Bush. Ill-scented Sumac. Offensive-scented shrub, to 3, rarely to 6 ft. high: lvs. petioled, 1–2 in. long; lfts. sessile or nearly so, oval or obovate, obtuse, crenately toothed, puberulous while young, soon glabrous, the terminal one usually 3-lobed: fr. greenish, in clustered spikes before the lvs.: fr. subglobose, red, hairy, ¼ in. across. Mo. to Wash., Calif., and Texas.

8. *canadensis*, Marsh. (*Schmettisia aromatica*, Desv. *R. aromatica*, Ait. *Schmettisia crenata*, Greene). Aromatic shrub, to 3 ft., with ascending or diffuse branches: lvs. petioled, 2–4 in. long; lfts. pubescent, the terminal one ovate or obtuse, acute or acuminate, cuneate at the base; the lateral lfts. ovate, unequal at the base: fls. and frs. like those of the preceding species, but fls. yellow and frs. slightly larger. Ont. and Vt. to Minn. and south to Fla. and La.—A good cover plant for dry rocky banks; conspicuous in early spring by its yellow fls. B.B. (ed. 2) 2:482.

9. *diversifolia*, Torr. & Gray. Poison Oak. Upright shrub or sometimes climbing by rootlets: branchlets pubescent: lfts. ovate, elliptic or obovate, usually obtuse, coarsely crenate-serrate or 3-lobed, sparingly pubescent while young, 1–3 in. long; fls. yellowish green, in peduncled panicles: fr. white, ¼–½ in. across, falling soon after maturity. Brit. Col. to Calif.—Poisonous like the following and not to be recommended for planting.

10. *Toxicodendron*, Linn. (*Toxicodendron vulgare*, Mill. *R. radicans*, Linn. *R. Toxicodendron var. radicans*, Torr.). Poison Ivy. Poison Oak. Fig. 3088, p. 2728. Suberect and scrambling over walls and fences or high-climbing by aerial rootlets: lvs. ovate or rhombic, obtuse or short-acuminate, entire or sparingly dentate or sub acute, more or less pubescent beneath, 1–6 in. long; fls. greenish, in loose axillary panicles 1–3 in. long: fr. whitish, subglobose, ½ in. across, remaining on the plant: during the winter. Spring. Nova Scotia to Fla. west to Minn., Neb., and Ark. Em. 577.—It colors beautifully scarlet and orange in autumn, but is very poisonous to many and therefore should not be planted near places where persons are likely to come in contact with it; in such places it should rather be extirpated. It is, however, very difficult to eradicate, for it spreads by suckers and each piece of root left in the ground sprouts again. The plant described above is by some called *R. radicans*, Linn., and the name *R. Toxicodendron* is restricted to an upright shrubby form with pubescent crenate or crenately lobed lvs., native to the S. Atlantic states, also called *R. quercifolia*, Steud.; also several other closely related species have been distinguished.


12. *vernifolius*, Stokes (*R. vernifola*, DC.). Varnish-Tree. Lacquer Tree. Tree, to 60 ft.: lfts. usually 11–15, short-stalked, ovate-oblong to oblong-lanceolate, acuminate, rounded or broadly cuneate at the base, entire, more or less pubescent beneath while young, 3–6 in. long: fr. whitish, in slender axillary panicles about half as long as the lvs.: fr. broader than long, compressed, straw-yellow, smooth, ½ in. broad. Mav. Japan, China, Himalayas. S.I.P. 1:57. I.T. 6:201. Gn. 34, p. 158.—From this tree the lacquer used for the highly polished woodenware is obtained in Japan and China; the fr. yields a fatty oil. The tree is poisonous like the preciding species.

13. *succedanea*, Linn. Wax-Tree. Shrub or small tree, to 30 ft.: lfts. 9–15, short-stalked, elliptic-oblong to oblong-lanceolate, long-acuminate, broadly cuneate at the base, entire, lustrous above, usually grayish green or glaucous beneath, quite glabrous, usually with 15–20 pairs of veins prominent beneath, 2–4 in. long: fls. yellow-green, in axillary slender panicles: fr. broader than high, compressed, whitish, ½–⅓ in. broad. May
Japan, China, Himalayas. S.I.F. 1:57. R.H. 1863, p. 130.—From the fr. of this tree a wax-like substance chiefly used for making candles is expressed in Japan. The tree is poisonous.


15. punjabensis, Stew. Tree. To 40 ft.; branchlets densely velvety-hairy: lfts. 11-31, oblong-lanceolate, pointed, serrate, glaucous beneath, 2-5 in. long: fls. greenish, in dense terminal panicles: fr. crimson, hairy. June, July; fr. Aug., Sept. Em. 571. S.S. 3:102, 103. Gw. 54, p. 505. G.W. 2:343 (adapted in Fig. 3398). Que. to Ont., south to Ga., Ind., and Iowa. Var. laciniosa, Wood. Lfts. and bracts deeply and lacinately toothed and the inf. sometimes partly transformed into contorted bracts. Var. dissécta, Rehd. (var. laciniosa Hort.). Fig. 3399. Lfts. pinnately dissected. M.D.G. 1900:211. G.M. 53:827. R.H. 1907, pp. 10, 11. A very handsome form with finely cut foliage. R. typhina foliacea, Sprunger, is probably not different.—The staghorn sumac grows in the driest soils and is a very desirable plant on account of its brilliant fall coloring, which in dry localities begins to show in Aug., and with its crimson fr.-clusters persisting through the winter. Trained in tree form it is very picturesque, but is short-lived.


R. cotinoides, Nutt.—Cotinus americanus.—R. Cotinus, Linn — Cotinus Coggygria.—R. Delavayi, Franch. Allied to R. succedanea. Glabrous shrub: lfts. 5-7, elliptic, 1-2 in. long, light green beneath;

3398. Rhus typhina.—Staghorn sumac.

3399. Young plants of Rhus typhina var. dissecta.
Rhyncanthus (Greek,_'beak and flower,' referring to the peculiar shape of the fls.). Zingiberaceae. Slender glabrous perennial herbs with tuberous roots, suitable for the warmhouse: sts. erect, leathery, the lvs. sessile: fls. sessile, borne in a terminal, few-fld., spike, bracts solitary, elongate, and colored; calyx tubular, cylindrical; corolla funnel-shaped, the lobes ovate-lanceolate, the inferior about half as long as the standard: legume constricted between both seeds, tomentose or glabrous: seeds black, with a scarlet-yellow ring around the hilum. Panama to Brazil, W. Indies and Galapagos Isls.

Alfred Rehder.

Rhynchospermum (Greek, 'beak and seed,' referring to the form of the seed). Apocynaceae. Now referred to Trachelospermum. R. jasminoides, Lindl.—Trachelospermum jasminoides, Lem., which see. There is, however, a good botanical genus named Rhynchospermum, but it belongs to the composite family. It has only one species, R. verticillatum, a plant not in cultivation.

Rhynchostylis (Greek, 'beaked column or style'). Orchidaceae. Epiphytic herbs closely related to Saccobium and usually sold under that name. Stems monopodial and 2-ranked: lvs. crowded, leathery or fleshy; fls. in dense racemes from the axis of the lvs., medium-sized; dorsal sepal and petals subequal, lateral sepals broader, dehiscing along the column; labellum firmly joined to the base of the column; labellum ovate-lanceolate or ovate, pointed, the lip being also crimson. Var. gigantea, Hort., very much like the type. Var. alba, Hort. Fls. entirely white. Var. Dáyi and var. superba are offered.

Violacea, Reichb. f. (Saccobium violaceum, Reichb. f.). Lvs. 10-12 in. long: racemes 1-2 ft. long; fls. many-flowered; bracts rather few: corolla-tube pale yellow-green, lobes green; ovary puberulous. Bur. B.M. 6861. F. Tracy Hubbard.
Harrisoniunum, Hort. (Saccolabium Harrisoniunum, Hook.). Lvs. distichous, oblong, obliquely bident at the apex; raceme dense, cylindrical, pendulous; fls. white, fragrant; sepals ovate-oblong, somewhat incurved; petals narrower, oblong-spatulate; labelllum oblong-obovate, with a thick blunt apex, securate toward the apex; spur blunt; disk with a single thickened line. Malay Isls. B.M. 5458. F.S. 22:242.—The racemes grow to a length of 2 ft.

coléstis, Reichb. f. (Saccolabium coléstis, Reichb. f.). St. rather stout: lvs. 4-6 in. long, flatly, peduncles erect, bearing a dense raceme: fls. crowded, 3⁄4 in. across; sepals and petals similar, oval-oblong, obtuse, white with a blotch of indigo at apex; lip obvate-oblong, white at base, bright indigo at apex. Siam.

HEINRICH HASSELEBING.

GEORGE V. NASII.

PHYTIGLOSSA (Greek, wrinkle and tongue, the palate of the lower lip is wrinkled). Acanthaceae. A genus in which about 75 species have been described, now referred to Diaspere, which see.

RIBES (probably derived from ribas, the Arabic name for Rheum Ripes, or by some supposed to be the Latinized form of ribes, an old German word for currant). Currants and Gooseberries. Woody plants partly grown for their edible fruits and for their handsome flowers, fruits, or foliage.

Unarmed or prickly shrubs with deciduous or rarely evergreen foliage: lvs. alternate, oval-fascicled, simple, usually palmately lobed and mostly plaited in the bud. fls. perfect or in some species dioecious, 5-merous, rarely 4-merous, in many-fl. to few-fl. racemes, or solitary; calyx-tube cylindric to rotate, like the sepals usually rather small or medium-sized usually lobed leaves, with rather yellow; the fruits also are often attractive and either black, purple, scarlet, yellowish or greenish. The flowers appear in spring with the leaves, and the fruits ripen in June or July, but in R. fasiculatum they do not mature until September and remain on the branches all winter. Most species are hardy North except the evergreen ones; also R. sanguineum, R. Roelli, R. Lobii, R. viscinosum are not quite hardy North. The tender R. speciosum with fuchsia-like bright red flowers is perhaps the most attractive species of the genus, though also R. sanguineum, R. odoratum, R. Gordoniiunum, R. Roelli, R. Lobii, R. pinetorum, R. cereum, R. inbrans, R. nivum, and others are handsome in bloom, while some, as R. alpinum and R. fasiculatum, have fragrant, scarlet fruits. They are well adapted for borders of shrubberies and, particularly the procumbent kinds, for planting on slopes. R. alpinum is excellent for shady places and as undergrowth. R. alpense, a strong-growing and very spiny gooseberry from western Asia, may prove valuable as a hedge-plant. Many species bear edible fruits; the most important are the domestic currant, R. vulgare, and the European gooseberry, R. Grossularia; of less importance are the black currant, R. nigrum, the Buffalo or Missouri currant, R. odoratum, the European R. rubrum and some of the American gooseberries, as R. hirtellum, R. Cyanothali, R. oxyacanthoide, R. setosum, R. inermis. These plants are mostly of easy cultivation; they grow in any moderately good loamy soil, the gooseberries preferring as a rule drier and sunnier positions, while the currants like more humidity and grow well in partly shaded situations. Propagation is by seeds which germinate readily; also by hardwood cuttings in autumn and by greenwood cuttings in spring. In Europe, the plants are matured high on R. odoratum trained to one stem, to form little standard trees. See also Card's Bush Fruits, 444-84, figs. 2956 RHYNCHOSTYLIS

3401. Flower of garden currant, to show structure. (X 4)


INDEX.


KEY TO THE SPECIES.

A. Brances unarmed (or 2 small prickles below the fl. in No. 19) fls. usually in racemes; pedicels not jointed.
B. fls. tubular, red, yellow, or white.
C. Color of fl. yellow; 3. glabratus; lvs. consolute in bud.
**RIBES**

D. Calyx-tube about twice as long as sepals; sepals resolve or spreading.

DD. Calyx-tube 1–1½ times as long as sepals.

C. Color of fls. red or white; lvs. planted in bud.

D. The fls. red or red and yellow, rarely white.

E. Lvs. glabrous or nearly so beneath; fls. pale yellow and red.

EE. Lvs. white-tomentose beneath; fls. red, rarely white.

DD. The fls. white, pink, or greenish; lvs. glabrous or pubescent and green beneath.

E. Plants glandular-viscid; raceme short.

FF. Fr. black; calyx-tube cylindric-campanulate; lvs. 2–3 in. broad.

GG. Fr. white or greenish subfuscid; lvs. resinous-dotted beneath.

EE. Fr. orange, purple, or reddish.

FF. Fr. yellow; sepals reflexed.

E. Petals spatulate or flabellate: stamens about as long as sepals; style and calyx-tube inside pubescent.

G. Fr. smooth or glabrous-bristly.

H. Ovary glabrous.

I. Sepals longer than tube; stamens slightly shorter than sepals.

II. Sepals shorter than tube; stamens slightly shorter than sepals.

III. Ovary pubescent or glabrous; stamens about half as long as sepals.

CC. Color of fls. orange, purple, or bright red.

D. Fls. in racemes; sepals broader than long; stigmas broadly flat.

DD. Fls. 1–4; sepals longer than broad.

E. Stamens as long as sepals or longer.

F. Pistil 2–4; sepals yellowish brown.

G. Ovary glabrous; calyx-tube about as long as sepals; style and calyx-tube inside pubescent.

H. Stamens longer than the purple.

I. Fls. 1–4; sepals red or nearly so beneath.

II. Fls. red; style exserted.

III. Fls. red; stamens as long as sepals.

CC. Color of fls. orange, purple, or bright red.

D. Fls. 5–merous.

E. Stamens shorter than sepals.

F. Pistil 2–4; sepals purple and stamens shorter than sepals.

G. Ovary glabrous; calyx-tube about as long as sepals; style and calyx-tube inside pubescent.

H. Stamens longer than the flower.

I. Fls. 4–merous; bright red; stamens 2–4 times as long as sepals.
Section 1. RIBES. Currants.

1. odoratum, Wendl. (R. longiflorum, Nutt. R. fragraei, Lodg. R. satyrum, Thory. R. aureum, Hort. (as R. sanguineum, not Pursh. R. missouriense, Hort. Chrysobrota ramosa, Spach). Missouri currant. Buffalo currant. Golden currant. Fig. 3402. Shrub, to 6 ft.; young branchlets pubescent: lvs. ovate to orbicular-reniform, cuneate or truncate at the base, deeply 3-5-lobed and coarsely dentate, glabrate, 1-3 in. broad; petals pubescent, shorter than blade: racemes 5-8-fld.; rachis pubescent; bracts ovate to oval, foliaceous; fls. yellow, fragrant, tube about $\frac{3}{4}$ in. long, stout; sepals oblong, scarcely half as long as tube, spreading or revolute; petals nearly half as long as sepals, more or less red: fr. globose or ovoid, about $\frac{1}{2}$ in. across, black. East of Rocky Mts., S. D. to Texas, east to Minn. and Ark. L.B.C. 16: 1533. B.R. 125. L.D. 5: 301. H.F. 1872: 225 (as R. aureum).—A handsome shrub with yellow fragrant fls. appearing early in the spring with the lvs. A form with large berries nearly $\frac{3}{4}$ in. diam. is sometimes cult. for its frs. as the Cascade.

2. abrum, Pursh (R. tersiflorum, Lindl. R. jasminiflorum, Agardh. Chrysobrota intermedia and C. Lindleyana, Spach). Similar to the preceding species, but smaller and slenderer in every part; young shoots glabrous or pubescent: lvs. orbicular-reniform to obovate, 3-lobed and slightly crenate-dentate, cuneate to subcordate at the base, 1-2 in. broad, pubescent or glabrous; petals about as long as the blade: racemes 5-15-fld.; rachis oblong to ovate; fls. yellow, fragrant or slightly fragrant; calyx-tube slender, $\frac{3}{4}-1$ in. long or slightly longer; sepals $\frac{1}{2}$ to nearly $\frac{3}{4}$ in. long, spreading, upright in the fading fl.; petals shorter than the sepals; fr. globose, red or black, $\frac{1}{2}-1$ in. thick. Wash. to Calif., west to Assiniboia, Mont., Colo., and N. Mex. B.R. 1274. Var. chrysococcus, Rydb. Fr. yellow. Var. leiobrya, Zabel (R. leiobrya, Koehne). Of the glabrous, glandular while young; sepals recurved, calyx-tube longer.—The shrub cult. as R. aureum is usually the preceding species which has more showy and fragrant fls.


5. viscosissimum, Pursh. Shrub, to 3 ft.; young growth and infl. glandular-pubescent and viscid: lvs. grayish green, reniform-orbicular, 5-lobed, with rounded crenately dentate lobes, glandular-pubescent on both sides, 2-3 in. broad; petals short, yellowish green, puberul-pubescent: fls. fragrant, greenish white or pinkish, in 3-8-fl. racemes; ovary glandular; tube cylindrical-campanulate, about $\frac{3}{4}$ in. long; sepals about as long as tube: fr. black, not bloomy; glandular-hair. Brit. Col. to Mont., Colo. and Calif.

6. cereum, Douglas. Much-branched, upright shrub, to 4 ft.; young growth puberulous and glandular: lvs. reniform-orbicular, 3-5-lobed with obtuse crenulate lobes, puberulous-glandular beneath, often glabrous or nearly so above, ½-1½ in. broad; racemes few-fl., pendulous; bracts cuneate-ovate, toothed at the rounded or truncate apex; fls. white or greenish; calyx-tube pubescent, $\frac{3}{4}-1$ in. long, sepals ovate, about as long; petals minute, orbicular; ovary glandular or smooth; style usually very short. Fls. bright red, about $\frac{3}{4}$ in. across. Brit. Col. to Calif., east to Mont., Idaho, Utah, and Ariz. B. M. 3008. B.R. 1263.—Early leafing and conspicuous with its pale grayish green foliage studded with numerous white or pinkish fls.; also the bright red frs. are ornamental. Var. farinosum (var. farinosum cereum, Janetz.). Branchlets violet: lvs. whitish-puberulent: fls. bright pink.

7. inebrians, Lindl. (R. Spachtiana, Koehne). Fig. 3403. Similar to the preceding species in habit and
foliage: racemes few-fld.; bracts rhombic, usually acute, entire or occasionally with a lateral lobe; fls. usually pink; style glabrous; ovary with stalked glands; fr. bright red, usu. smaller than glandular. S. D. and Mont., Calif., Ariz. and New Mex. B. R. 1471. B. B. (ed. 2) 2:238.—A hybrid between this and the preceding species is R. Berlandieri, Janz.

8. americannum, Mill. (R. frondosum, L’Her. Pennsylvanicum, Lam. R. missourienne, Hort.). AMERICAN BLACK CURRANT. Upright shrub, to 6 ft., with rather slender arching branches; young shoots slightly pubescent and glandular; lvs. suborbicular, cordate or nearly truncate, 3-5-lobed with acute, or sometimes obtuse, dentate lobes, 3-4 in. long, sepals obtuse, longer, pubescent; ovary and calyx pubescent and glandular; calyx-tube broadly campanulate; petals minute, obtuse: fls. globose, black with whitish bloom, resinous-dotted, edible. Alaska to N. Calif. B. R. 1471. B. B. (ed. 2) 2:237.—Foliage with the peculiar heavy odor of the following species, turning crimson and yellow in autumn.

ribes nigrum, Linn. EUROPEAN BLACK CURRANT. Upright shrub, to 6 ft., with rather stout branches, of strong disagreeable odor: lvs. suborbicular, cordate, 3-5-lobed, with broad, acutish irregularly serrate lobes, sparsely pubescent and resinous-dotted beneath, to 4 in. broad, 3-5-ftd.; bracts small, much shorter than the pedicels; ovary and calyx pubescent and glandular; calyx-tube broadly campanulate; sepals oblong, recurved; petals reddish or whitish, about half as long as sepals: fr. black, subglobose, 7/2-8 in. thick. Eu., N. Asia and boreal N. Amer., south to Maine and Vt. B. B. (ed. 2) 2:237. Var. albinervium, Michx. Lvs. glabrous or nearly so beneath. N. Amer., south to N. H., Mich. and Wis.

11. glandulosum, Grauer. CALIFORNIAN BLACK CURRANT. Decumbent shrub with prostrate or spreading reclining sts. and ascending branches; young growth sparingly pubescent and sparsely glandular: lvs. thin, felted, orbicular, cordate, deeply 5-7-lobed, with ovate-acute or acutish, doubly serrate lobes, glabrous above, pubescent on the veins beneath, 1½-3 in. broad; racemes ascending, 8-12-ftd.; pedicels filiform, glandular, much longer than the narrow bracts; fls. whitish or pinkish; ovary glandular-hispid; calyx-tube cup-shaped; sepals short, spreading, glabrous outside: fr. red, glandular-bristly. Newfoundland to Brit. Col.; south to Mich. and Minn. and in the mountains to N. C. B. B. (ed. 2) 2:238.

12. triste, Pall. SWAMP RED CURRANT. Low shrub with creeping or ascending, often rooting sts.; young growth sparingly pubescent and sparingly glandular: lvs. thin, suborbicular, 3-5-lobed, with acute or obtuse, coarsely serrate lobes, dark green and glabrous above, pubescent or whitish-tomentose beneath, 2-4 in. broad: racemes drooping, 1½-3½ in. long; pedicels longer than the ovate bracts; fls. purplish; calyx-tube square-shaped; sepals spreading, obtuse; petals reddish: fr. red, smooth. N. Asia and boreal N. Amer., south to Maine and Vt. B. B. (ed. 2) 2:237.


14. multiflorum, Kit. Upright shrub with stout branches: winter buds large: lvs. roundish, subcordate or truncate, 3-5-lobed with acutish or obtusish, crenately dentate lobes, pubescent beneath, to 4 in. broad: racemes pendulous, dense, to 6 in. long, sometimes about 50-ftd.; pedicels short; fls. greenish yellow; calyx-tube square-shaped; sepals reflexed; petals minute;

19. *ascendens*, Pall. (R. saxatile, Pall.). Upright shrub, to 6 ft.; branches glabrous, slender, upright, with paired small slender prickles at the nodes or unarmed: lvs. oval or ovate-ovoblate, 3-lobed with sparingly dentate, obtusish lobes, glabrous, lustrous, with obsolete veins, 3/4-1 ½ in. long; petals about ½ in. long: fr. dioecious, small, greenish, in upright racemes, the staminate about 1 ½ in. long, the pistillate ½-¾ in. long; stamens very short: fr. subglobose, scarlet. N. Asia. — Like the preceding species desirable for its bright green more lustrous foliage and for its scarlet fr., but habit upright, not spreading.


Section 2. GROSSULARIA. Gooseberries.

21. *neveum*, Lindl. (Grossularia nivea, Spach). Shrub, to 8 ft., upright or ascending: branches reddish brown, with stout brown prickles ½-2 in. long, without bristles: lvs. suborbicular, thin, 3-5-lobed, with few-toothed obtusish lobes, sparingly pubescent or glabrous, 3½-1½ in. long: fr. 1-4, white, on slender peduncles: bracts ovate, small, much shorter than the filiform pedicels; ovary glabrous; tube campanulate; style slenderly lancedolate, ¾-1 in. long; stamens slightly longer than the sepals, with pubescent filae-

22 curvatum, Small (Grossularia curvata, Cov. & Brit.). Diffusely branched shrub, to 3 ft., with slender reddish brown or purplish branches, spines slender, about 6 mm. long; lvs. suborbicular, cuneate to subcordate, with obtuse, toothed lobes, sparingly pubescent, 1–2 in. across; fls. 1–5, white, on slender peduncles; bracts ovate, often 3-lobed, ciliate, much shorter than the slender pedicels; ovary glandular or pubescent; tube, broadly campanulate; sepals linear-spatulate, about 1/8 in. long, revolute; petals small, lanceolate, toothed; stamens conspicuous, as long as the sepals, with villous filaments: fr. globose, greenish, 1/4–1/3 in. across, glabrous. Ga. to La. and Texas.—Graceful little shrub, similar to the preceding species, but slenderer and more spreading; perfectly hardy at the Arnold Arboretum.

23. missouriense, Nutt. (R. gracile Pursh not Michx. R. rotundifolium, Janz., not Michx. Grossularia setosa, Cov. & Brit.). Shrub, to 6 ft., smooth or sometimes bristly, grayish or whitish branches: spines about 1/3 in. long or shorter: lvs. suborbicular, broadly cuneate to subcordate at the base, deeply 5-loved, with coarsely dentate obtuse lobes, pubescent; tube, 1 1/2–2 in. broad; fls. greenish white, 2–3, on slender peduncles 1–2/3 in. long; pedicels slender, much longer than the bracts; ovary glabrous; calyx-tube cylindric-campanulate; sepals linear, about 3/4 in. long; filaments glabrous, nearly twice as long as sepals; style pubescent below: fr. globose, 1/2–2/3 in. across, purplish, glabrous, subacid. Ill. to Minn., S. D., Kans., Mo. and Tenn. B.B. (ed. 2) 2:240.

24. oxyacanthoides, Linn. (Grossularia oxyacanthoides, Mill.). Low shrub with slender, often reclining branches, usually more or less bristly and with spines about 1/4 in. long, sometimes nearly wanting: lvs. suborbicular, broadly cuneate to subcordate at the base, deeply 5-loved with coarsely dentate obtuse lobes, slightly pubescent or nearly glabrous, 1–2 in. broad: pedicels short, scarcely exceeding the bud-scales, 1–2-fid.; pedicels short: fls. greenish white; sepals narrow-oblong, little longer than the tube; stamens somewhat shorter than the sepals: fr. globose, smooth, red, slightly hairy, about 3/4 in. broad; lvs. suborbicular, broadly cuneate to subcordate at the base, usually 3-loved, with coarsely dentate obtuse lobes, pubescent; tube, 1 1/2–2 in. long, sometimes bristly, grayish or whitish branches: spines subulate small spines less than 1/6 in. long, sometimes unarmored, rarely with a few bristles: lvs. suborbicular, cuneate to truncate, rarely broadly cuneate, 3–5-loved, with dentate lobes, finely pubescent and usually somewhat glandular, 1/4–1/3 in. wide; fls. 1–4, white; calyx-tube cylindric-campanulate, glabrous, about twice as long as the sepals; petals half or two-thirds as long as the sepals, as long as the stamens; style pubescent below: fr. red to black, glabrous or somewhat bristly. Idaho to Assinibois, S. D., and Wyo. B.B. (ed. 2) 2:243.

25. setosum, Lindl. (R. saximontanum, E. Nelson. Grossularia setosa, Cov. & Brit.). Shrub, to 5 ft., with reddish brown usually bristly branches: spines about 1/3 in. or less long: lvs. suborbicular, cuneate to truncate, rarely broadly cuneate, 3–5-loved, with dentate lobes, finely pubescent and usually somewhat glandular, 1/4–1/3 in. wide; fls. 1–4, white; calyx-tube cylindric-campanulate, glabrous, about twice as long as the sepals; petals half or two-thirds as long as the sepals, as long as the stamens; style pubescent below: fr. red to black, glabrous or somewhat bristly. Idaho to Assinibois, S. D., and Wyo. B.B. (ed. 2) 2:243.

26. hirtellum, Michx. (R. saxidiv. Hook. R. gracile, Janz., not Michx. R. oxyacanthoides of many authors, not Linn. Grossularia hirtella, Spach). Fls. 3405. Shrub, to 4 ft., with slender branches, usually unarmored, sometimes with subulate small spines, only at the base of vigorous shoots bristly: lvs. suborbicular, usually cuneate, incisedly 3–5-loved, with dentate, acute lobes, glabrous or sparingly pubescent, 1–2 in. broad; pedicels often with long hairs: fls. 1–3, greenish; bracts much shorter than pedicels; ovary glabrous, rarely with stalked glands; calyx-tube narrowly campanulate; sepals oblong, often purplish, glabrous; stamens as long as sepals, petals half as long; style pubescent: fr. globose, smooth or rarely with stalked glands, purple or black, edible. Newfoundland to Pa. and W. Va., west to Man. and S. D. B.M. 6892 (as R. oxyacanthoides). B.B. (ed. 2) 2:241.—This is the most important of the edible American gooseberries and there are in cult. several hybrids with R. grossularia, designated as R. xrueticum, Janz., to which such varieties as Downing, Houghton, and Smith are thought to belong, while Pale Red appears to be of pure R. hirtellum parentage.

27. rotundifolium, Michx. (R. triflorum, Willd. Grossularia rotundifolia, Cov. & Brit.). Shrub, to 3 ft., with slender green branches, or the younger ones gray; spines small, sparse, rarely over 1/2 in. long; lvs. suborbicular, broadly cuneate to subcordate at the base, usually 3-loved, with coarsely dentate obtuse lobes, minutely pubescent or nearly glabrous, 1–2 in. broad; fls. 1–3, purplish; pedicels slender; pedicels much longer than the small bracts; fls. greenish purple; calyx-tube campanulate; sepals linear, about twice as long as tube; petals obovate; stamens somewhat longer than the sepals; fr. globose, smooth, purplish. L.B.C. 11:1094. G.O.H. 3. B.B. (ed. 2) 2:241.—This species is rare in gardens; usually the following species is cult. under this name.

28. divaricatum, Douglas (R. divaricatum var. Douglasiae, Janz. R. irriguum, Koehne, not Douglas. Grossularia divaricata, Cov. & Brit.). Shrub, to 10 ft.; branches gray to brown, with stout spines 1/4–1/2 in.; lvs. suborbicular, broader, cuneate to subcordate at the base, usually 3-loved, with coarsely dentate obtuse lobes, pubescent beneath along the veins or glabrous, 1–21/2 in. broad; fls. 2–4, greenish purple; pedicels slender; bracts ovate, small; ovary glabrous; calyx-tube campanulate; sepals oblong, longer than tube; stamens slightly longer than the sepals; fr. globose, smoon, black or dark purple. Brit. Col. to Calif. B.R. 1359. Var. pubiflorum, Koehne (R. divaricatum var. silvorum, Zabel). Lvs. pubescent: fls. smaller: vigorous sts. bristly. Var. montanum, Janz. Low shrub with almost prostrate branches, smaller in every part. Calif.

29. inermé, Rydb. (R. hirtellum Purpurisii, Koehne. R. oxyacanthoides var. nevadense and var. irriguum, Janz. Grossularia inermis, Pursh, not Douglas. R. hirtellum, Cov. & Brit.). Shrub, to 6 ft.; branches with few small spines less than 1/2 in. long, sometimes unarmored, rarely with a few bristles: lvs. suborbicular, cuneate to truncate at the base, 3–5-loved with crenate-dentate obtuse lobes, glabrous or sometimes pubescent, 1–21/4 in. broad: fls. 1–4, green or purplish; bracts small; ovary glabrous; calyx-tube narrowly campanulate; sepals oblong, slightly shorter than tube; stamens shorter than sepals; fr. purplish red, smooth, edible. Mont. to Brit. Col. to Calif. and New Mex.

30. Grossularia, Linn. (Grossularia reclinata, Mill.). Shrub, to 3 ft.: branches ascending or reclining, with stout spines, about 1/4 in. long, mostly in 3’s, sts. sometimes bristly: lvs. suborbicular, cuneate to broadly

3406. Rhabdos Cyrobius. (X1/4)

31. *Cynädbati*, Linn. (*R. gracile*, Michx. *Grossularia Cynädbati*, Mill.). Fig. 3406. Shrub, to 5 ft., but usually lower, with spreading branches; spines slender, 1-3, $\frac{1}{2}$-3 in. long; bristles few and weak or none; lvs. orbicular, truncate or cordate, deeply 3-5-lobed, with crenately or incisely dentate lobes, usually pubescent beneath, $\frac{3}{4}$-1$\frac{1}{2}$ in. broad; fls. 1-3, on slender stalks, green, ovary setose; calyx-tube broadly campanulate; sepals shorter than tube; petals about half as long; stamens little longer than petals: fr. globose or ovoid, vinous-red, prickly, edible. New Bruns. to N. C., west to Man., Mo. and Ala. B.B. (ed. 2) 2:239. Var. *inerme*, Rehd. Fr. without prickles, smooth. Val. *glabratum*, Fern. Lvs. glabrous or only sparingly pilose on the veins.

32. *alpestre*, Decne. Upright shrub, to 10 ft.; branches with stout spines to $\frac{3}{4}$ in. long and usually in 3's, often bristly; lvs. cordate to truncate, 3-5-lobed, with incisely dentate, obtusish lobes, 1-2 in. broad; fls. 1-2, short-peduncled, greenish or sometimes reddish; far north as Mass.; in W. China, E. H. Wilson found hedges 6-8 ft. high so thick and spiny that a yak, an animal as strong as an ox, could not break through them.

33. *pinetrum*, Greene (*Grossularia pinetrum*, Cov. & Brit.). Shrub, to 6 ft., with spreading and reclining branches, without bristles; spines 1-3, $\frac{1}{2}$-1 in. long or less; lvs. suborbicular, thin, cordate, usually 5-angled, with obtuse irregularly incised-dentate lobes, dull green and glabrous above, puberulous beneath at least on the veins, $\frac{3}{4}$-1$\frac{1}{2}$ in. broad; fls. solitary, orange-red; bracts small, ciliate; ovary bristly; calyx-tube campanulate, pilose; sepals spatulate, reflexed, nearly twice as long as tube; petals orange, only one-third shorter than the sepals; stamens as long as petals: fr. globose, prickly, purple. Ariz., New Mex.—Hardy at the Arnold Arboretum; very striking on account of the unusual orange-red color of the fls.

34. *Roezlii*, Regel (*R. amietum*, Greene. *R. druidum*, Greene. *R. Wilsonidnum*, Greene. *Grossularia Roezlii*, Cov. & Brit.). Shrub, to 5 ft., with pubescent branchlets; bristles wanting; spines slender, about $\frac{1}{2}$ in. long; lvs. thin, reniform-orbicular, truncate or subcordate, 3-5-lobed with incisely crenate-dentate lobes, finely pubescent on both sides or glabrous above, $\frac{1}{2}$-1 in. broad; fls. 1-3, purple; bracts longer or sometimes shorter than pedicels; ovary bristly and usually white-hairy; calyx-tube cylindric-campanulate, pubescent; sepals lanceolate, longer than tube; petals white or pinkish, nearly half as long as sepals; stamens slightly longer than sepals; anthers sagittate: fr. globose, prickly, purple. Cent. and S. Calif. Gt. 28:1182, figs. 1-3. R.H. 1908, p. 32.—Very handsome in fl., particularly on account of the contrast between the purple calyx and the white petals.

35. *Lobbii*, Gray (*Grossularia Lobbii*, Cov. & Brit.). Fig. 3407. Shrub, to 7 ft.; branches pubescent, rarely with a few bristles; spines 3, $\frac{1}{2}$-3 in. long; lvs. thin, suborbicular, cordate or subcordate, 3-5-lobed, with crenate-dentate obtuse lobes, sparingly pubescent when young and glandular, or glabrous above, $\frac{3}{4}$-1$\frac{1}{2}$ in.


R. aciculare, Pursh (R. fuchsioides, Moc. & Sess.). Grossularia speciosa, Fig. 3408. Evergreen shrub, to 12 ft., with stout sts.; branches usually bristly; spines 5, stout, 1/2-3/4 in. long; lvs. coriaceous, orbicular to obovate, rounded to broadly cuneate, 3-5-lobed or crenate-dentate, glabrous or sparingly glandular-hairy, lustrous above, 1/2-1 1/2 in. long; fls. 2-4, bright red, on slender pedunculous peduncles, 4-merous; tube broadly campanulate; sepals upright, parallel, about 3/4 in. long, as about the scarlet corolla petals; stamens 2-4 times as long as petals: fr. ovoid, glandular-bristly, red. Calif. B.R. 1557. B.M. 5530. Gn. 9, p. 586; 31, p. 333; 34, p. 230. G.C. III. 34:71. R.H. 1900:98; 1908, p. 29. J.H. III. 51:407. One of the most showy gooseberries, but not hardy.

glabrous or hirsute. N. W. China.—R. pedemontanum, Mill. Allied to R. sanguineum. This species has recently been added to the genus, which see.


Herbaceous, or becoming small trees in the tropics, glabrous or rarely subspinose, branching repeatedly from below the flower-clusters; leaves large, alternate, peltate, palmately 5-12-lobed, the lobes dentate or serrate; petiole with conspicuous glands; flowers monocious, in terminal or apparently lateral racemes or subpaniculate, without petals or disk; calyx 3-5-parted, valvate; staminate flowers short-peduncled, in the upper part of the raceme; stamens many, filaments much branched, no rudimentary pistil; pistillate flowers below, longer-peduncled; styles 3, plumose; capsules generally covered with soft spinose processes, 3-celled, 1 ovule in each cell, explosively separating into 2-valved cocci when ripe; seeds ovoid, with a large aril; seed-coat crustaceous, variously marked and colored; endosperm fleshy and oily; cotyledons broad, cordate or oval. Hundreds of forms are known, many so well marked as to deserve specific rank, were they not so thoroughly connected by intermediate forms and hybridizing so freely when brought together. Most botanists follow Mueller (De Candolle’s Prodromus, vol. 15, pt. 2:1061, 1866) in referring them all to the one species. Probably a native of Africa, but now cult. and wild in most tropical and temperate lands.

Castor beans have been cultivated from the earliest times for the oil of the seeds. The Hebrew name indicates that perhaps this is the plant referred to in the Book of Jonah as a gourd. The oil (castor-oil Oleum Ricini) is used in medicine and in the arts and in some places in the preparation of food. The seed contains a poisonous principle, ricin. For the cultivation of castor beans as a field crop, see “Cyclopedia of American Agriculture,” 2:229. The chief castor-oil-producing region is in India, but some is grown in the United States, especially in Oklahoma.

Ricinus is one of the best plants for giving a tropical effect in beds and borders or planted singly. It thrives in rich well-drained sandy or clay loam, but is not suited for stiff clay or very sandy soil. For garden decoration the seeds may be planted in May where they are to grow, or sown indoors in small pots, two or three seeds each, in early spring, and after germination thinned to one plant to a pot. As they grow they may be transferred to larger pots and finally planted out. The castor beans have practically no insect or fungous enemies of importance. They have been erroneously supposed to keep away moles and malaria.

**Ricinus communis.** Linn. **CASTOR BEAN. CASTOR-OIL PLANT. PALMA CHUSTI.** Figs. 3409-3411. Three to 15 ft. high when grown as an annual, 30-40 ft. in the tropics. The various varieties are distinguished by the size, color, and outline of the plant and leaves, the glands of the petiole, the number and size of the processes on the caps., the shape of the cotyledons, and especially the size, form, color, and markings of the seed, which show variations sufficient to distinguish individual plants, and even separate branches of the same plant. So far as the forms commonly in cult. are concerned, the species may be subdivided as follows:

- **A.** Markings of seed-coat marbled, distinct from the ground-color; seed less than twice as broad as thick; cotyledons elliptical or oblong, nearly truncate at base, petiole-glands various.
- **B.** Seeds small to medium, brown-marked; petiole-glands flat, not projecting. This includes most of the oil-producing varieties and the typical *R. communis* (illustrations, variety not designated: B.M.2209. A.G. 17:363. F.W. 1858:98. G.F. 1, p. 541; 9, p. 460. G.F. 24, p. 281; 31, p. 20. Mn. 7, p. 223. R.H. 1861, pp. 9, 10. V. 2:224); also the following varieties: *giganteus* (lividus, Willd., pruinosus, f.), glaucous foliage *(V. 16:148); arboreus; major; minor; éridia, st. and lvs. green; inermis, fr. smooth; purpurascens; africana; elegantissimus; speciosus.*
- **BB.** Seeds medium to large, reddish to reddish-brown; glands of petiole large, projecting; plant usually red; st. often more hollow, short-lived and early-fruiting. The typical form is var. *sanguineus* (Oberminni, lividus, Jacq.) *(Gn. 5, p. 349. R.H. 1858, pp. 602, 603); *macrocarpus (V. 16:148); purpureus (tricolor); atropurpureus; anguinalentus; macrophyllus* *(V. 16:148); *macropurpureus; pulcherrimus.*
- **BBB.** Seeds as in BB, but dark brown to black: otherwise as in B. **Bourboniensis,** and its var. *nanus* and *arboreus* *(V. 16:148).**

- **AA.** Markings of seed-coat rather straight, slightly raised above the ground-color and distinct from it; seeds...
medium size, more than twice as broad as thick; coryledons ovate, rounded at the base, glands small, flat; foliage red to almost black. Contains var. Glabrous, dwarf, dark red with metallic lustre; Glabrous coccinea; Glabrous mirabilis, bright carmine fr.; Glabrous mica, very dark foliage; hybrida paniculata, large, dark and glaucous, a cross with zanxBeran&phispphenus.

AAA. Markings of seed-coat of fine bright red mottle, diffusing into the ground-color (gray or brown in some of the hybrids); seeds large, flat; coryledons coriaceous; glands many, large, projecting at the apex and deciduous; plants large, generally without much red color, of any. Contains var. zanxBeran&phuispphenus (A.G. 16, p. 383. G. C. III. 14:783. Gn. 44, p. 563. Gn. 43, p. 69. I.I. 41:100) and its varieties, which seem to be crosses with some of the previous groups. (G. 44, p. 77.)

Other names in the trade, but not classified above, are: ceruleus, Bismarckiana, and insignis.

J. B. S. Norton.

RIGIDÉLLA (Latin, somewhat rigid; referring to the pedicels, which after the petals fall become erect and stiff). Irídácce. Half-hardy bulbs allied to Tigrídia and useful for planting in the garden.

Leaves broad, plicate, with channeled petiole: flos. fugitivus, bright red, pedicelled; perianth-tube none; segms. very unequal, outer oblong, convolute in a cup in the lower third, then spreading or reflexed; inner small, erect, ovate, with a narrow claw.—About 3 species. Mex. Distinguished from Tigrídia by the very small inconspicuous ovate and erect perianth-segms., those of Tigrídia being larger, fiddle-shaped and spreading.

fílamea, Lindl. St. 3-5 ft. high: lvs. broadly equitant, plicate and shawding the st. below: flos. in terminal fascicles, between the 2-valved spathe; peduncles recurved but becoming erect in fr.; perianth 3-foliate, the limb concave and revolute, bright scarlet striped with brown, black at the throat, spirally twisted after anthesis: the limb concave and revolute, bright scarlet striped with brown.

fílamea, Lindl. St. 3-5 ft. high: lvs. narrowly lanceolate, acute, about as tall as the scape: flos. bright crimson, not marked with black; perianth-segms., those of Tigridia being larger, fiddle-shaped and spreading.

R. Pseudacacia Linnaeus. St. 5-7 ft. high: foliages composite, simple or singularly or very finely branched: lvs. alternate, narrow: cymes terminal, Engler’s Pflanzenreich, 4ft. 39), native of Trop. and Subtrop. Amer., but intro. into Asia and Afr.


Leaves alternate, slender-petioled, ovate, ovate-lanceolate or cordate-ovate; stipules minute and caducous: inflorescence axillary or rarely terminal; fls. small, perfect; perianth 4-parted; stamens 4: berry red, pea-like.—Species 3 (Walker, Engler’s Pflanzenreich, hft. 39), native of Trop. and Subtrop. Amer., but intro. into Asia and Afr.

humilis, Linn. (R. kivési, Linn.). ROUGE PLANT. Fig. 3412. St. with spreading branches, 3/2-2 ft. high: lvs. 1-3 in. long: racemes slender, pedicelled, in axillary racemes, as long as the lvs.; fls. white, 1-1/2 in. long; calyx pale rose: fr. 1-1/2 in. long. S. Fla. B.M. 1781. S. H. 2:111. Gn. 22, p. 68.—Variable.

F. TRACY HUBBARD.

ROBINIA (after Jean and Vespasian Robin, herbalists to the king of France in the sixteenth and seventeenth centuries). Leguminosae. LOCUST. Ornamental woody plants grown chiefly for their handsome white, pink, or purple flowers and the graceful foliage.

Deciduous trees or shrubs: branches without terminal bud, often with stipular spines; lvs. alternate, stipulate, petioled; pedicels, which after the petals fall become erect and stiff, nodding, sometimes spreading; stamens 5; ovary 4 distinct lobes; seeds large, flat; cotyledons ovate-oblancolate, dehiscent. Contains R. hispida, R. pseudacacia, R. viscosa, R. villosa, R. alata, R. foveolata, R. pennsylvanica; R. viscosa are hardy as far north as Ontario, and most other cultivated species as far north as Massachusetts. They are not particular as to the soil and they do well even in poor sandy soil and dry locations. They stand transplanting well and grow rapidly while young. Some species, particularly R. hispida, spread by suckers and may for this reason become a nuisance in lawns and mixed groups. R. pseudacacia, on account of its heat- and drought-resisting qualities, together with its ornamental beauty, has become a favorite street tree for cities, particularly in Europe; in this country it is not so much planted, as it is liable to the attacks of the borer and therefore short-lived; it stands severe pruning well. Propagation is by seeds sown in spring and germinating readily; they
may also be increased by suckers and some, particularly R. hispida, grow readily from root-cuttings. Varieties and usually grafted, either on young seedling stock in the house or outdoors in spring or on pieces of root in the greenhouse; some dwarf forms, as R. Pseudacacia var. Rehderi are propagated by division, and other varieties, particularly var. Bessoniana, by cuttings of mature wood. Some varieties, as var. Decaisneana var. monophylla, may be raised from seed, as a large percentage comes true.

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A. Fls. white (light pink in one variety): branchlets glabrous or slightly pubescent: pod smooth.

1. Pseudacacia, Linn., Falsae ACACIA. BLACK LOCUST. Yellow Locust. Fig. 9413. Tree, to 80 ft., with deeply furrowed dark brown bark and prickly branches: lfts. 7; 10, oval or elliptic, rounded or truncate and mucronate at the apex, glabrous or slightly pubescent while young; fls. 1; 2 in. long; fls. white, very fragrant, about ½ in. long, in pendulous puberulous racemes 4; 5 in. long; pod linear-oblong, reddish brown, 3; 4 in. long. May, June; fr. in Aug. and Sept., become extensive naturalized in Eu. S.S. 3:112, 113. F.E. 32:393. Gn. 6:1. 61. G. M. 45:513. H. W. 3: 58. p. 104. —Many varieties are in cult., of which perhaps the following are the best known. Var. umbraculifera, DC. (var. inermis, Kirchen, not DC.). Forming a dense subglobose head, with unarmed branches: rarely flowering. Much used in Eu., when grafted in formal plantations and as ornamental street tree. M.D.G. 1903: 630. Var. Bessoniana, Nichols., with slenderer branches forming a less dense head, and var. Rehderi, Kirchen, a low subglobose form, usually grown on its own roots (G.W. 2, p. 217), are forms of var. amorphifolia, Lou., not DC. (var. inermis, Kirchen, not DC.). A slow-growing form with short pendulous branchlets: lfts. 9; 11, ovate or long-oval, acuminate, grayish pubescent beneath, ½; 1 in. long; pod oblong, densely covered with purple glandular hairs, 1½; 2 in. long. May, June. N. C. M.D. 8213. G. C. III. 41:427; 47: 391; 58:72. J. H. 36, p. 153, fig. 134. G. 33: 461, 463. M. D. 1910, p. 101. Addisoma 1:8.—Very hardy, and graceful, the purple frs. are also attractive.

2. Elliottii, Ashe (R. hispida var. rosea, Elliott). Shrub, to 5 ft.: branches with short spines; young branchlets grayish or whitish tomentose: lfts. 11; 15, elliptic, grayish pubescent beneath, ¾; 1 in. long; racemes 5; 10-fl.; peduncles, pedicels, and calyx glabrous; corolla rose-colored or purple and white: pod linear, hispid. May, June. N. C. to Ga.—A very handsome species easily distinguished by the dense grayish pubescence without glands or bristles.

3. Kelseyi, Bean. Shrub, to 10 ft.: branches with slender prickles; branchlets glabrous: lfts. 9; 11, oblong-lanceolate, acute, rounded at the base, glabrous, ¾; 1½ in. long; racemes 5; 8-fl.; racemes 5; 8-fl.; peduncles, pedicels, and calyx sparingly pubescent, or with glandular hairs; corolla rose-colored or purple and white: pod linear, hispid. May, June. N. C. to Ga.—A very handsome species easily distinguished by the dense grayish pubescence without glands or bristles.

b. Fls. pink or purple.

c. Pod smooth.

5. hispida, Linn. (B. rosea, Marsh.). ROSE ACACIA. Fig. 3414. Shrub, 1; 3 ft., rarely higher; st., branchlets, and peduncles and often the petioles hispid: lfts. 7; 13, suborbicular to oval, obtuse and mucronate, glabrous or nearly so, ¾; 1¼ in. long: fls. rose-colored or pale purple, 1 in. long, in short, 3; 5-fl.; racemes: pod rarely developed, densely hispid, few-seeded. F.S.R. 2, p. 57. J. H. 111, 53: 183. G. 4: 429. Var. macrophylla, DC. (var. inermis, Kirchen.). Branchlets and pedicels nearly destitute of bristles: lfts. and fls. often somewhat larger. Gn. 77, p. 208. G. M. 45:512.—This species spreads much by suckers, particularly in sandy soil; sometimes grafted high to form a small standard and as such displaying its large fls. to greater advantage.

6. nana, Spech (R. hispida var. nana, Elliott). Shrub, about 1 ft. high, in cult. sometimes higher: stbs.
Robinia hispida. (x½)

cc. Peduncles and branchlets glandular-hairy or viscid: Ifts. usually more than 15.

d. Branchlets and peduncles glandular-hairy.

7. neo-mexicana, Gray. Shrub or small tree, to 25 ft.; branches spiny; branchlets pubescent and glandular; Ifts. villous; Ifts. 15–21, elliptic-oblong, rounded and mucronate, silky pubescent beneath at least while young, 1–1½ in. long; racemes many-fl., dense, more or less hispid; peduncles and branchlets glandular-hairy; corolla pale rose-colored or sometimes nearly white, 2–3½ in. long. May, June. N. and S. C. to Ala.; naturalised elsewhere. S.S. 3: 115. B.M. 7726. S.S. 3: 114. F.S.R. 2: 56. G.t. 41: 1385.


8n. Rhochis of Ifts. densely covered with stalked glands.

9. Hārtwigii, Koelne. Shrub, to 12 ft.: branchlets, Ifts., petioles, leaf-rachis, and peduncles puberulous and densely covered with stipitate glands: Ifts. 13–23, elliptic to lanceolate, mucronate, grayish pubescent beneath, 1–1⅓ in. long; racemes dense; calyx pubescent and glandular-hairy; corolla rosy purple, ⅓ in. long; pod oblong, densely glandular-hispid, about 2 in. long. June, July. N. C. to Ala.

d. Branchlets and peduncles viscid.


Rubinsia (derivation not known). Legeninimum. Twining shrubs, with trifoliolate Ivs. and elongated axillary racemes: Ifts. somewhat fasicated; calyx 2-lobed; corolla papilionaceous, standard somewhat rounded, sulate at the base, wings oblong, obtuse, keel incurved, obtuse; stamens diadelphous: pod compressed, 2-valved, linear-longate.—Two or 3 species, Mex. The genus is now usually included in Pachyrhizus. R. gerriniflora, Hort., is apparently botanically unknown. U.U. 2, p. 291.

Rocambole (Allium Scorodopraefus, Linn.), is a humble member of the onion tribe, the underground bulbs of which are used abroad like garlic, known in America amongst the Canadian French and perhaps elsewhere. The plant is a hardy perennial, with a stem twisted spirally above and bears at the top an umbel of flowers, some or all of which are changed to bulbils. The presence of these bulbils distinguishes the plant from garlic. The species can be propagated by the bulbils, but quicker results are secured from the cloves of the underground bulbs. In mild climates, the bulbs should be planted in autumn or not later than February; in cold climates, plant in spring. In the autumn when the leaves decay, the bulbs are lifted, dried in the sun, and stored.

Rocambole is a native of Europe, the Caucasus region, and Syria. It has flat or keeled leaves, short spathe, bell-shaped six-parted perianth, and the three inner stamens broader than the others, three-deft, and not longer than the perianth. Good seeds are rarely produced.

- Rochea (named after de la Roche, French botanist). Syn., Kaloeodraehes, Crassulaceaef. Succulent shrubby plants suitable for the greenhouse.

Leaves opposite, ciliate at the base, oölone-obvate or lanceolate; Ifts. rather large, aggregated in corymbose-captate cymes, white, yellow, rose, or red; calyx 5-parted or 5-dept; corolla salver-shaped, the elongated claws of the petals connate with the calyx-tube, limb spreading; follicles many-seeded.—About 4 or 5 species, S. Afr.

Rocheas are amongst the showiest of our summer-flowering greenhouse plants, and are very easy to propagate. If plants are desired from a single root, cuttings about 4 inches long should be selected in March, and potted singly in sandy peat. The small pots should be placed near the glass, in a night temperature of 50°. Do not keep them too wet, as they are of a flabby nature, and are liable to rot. In a few weeks, the plants will be rooted and the points may be cut out to encourage breaks. A few days after they are cut back, repot into a pot two sizes larger, using two parts fibrous loam, one of sand, and one of broken charcoal, adding a sixth part of sheep-manure. After they are rooted, keep them near the glass, in a night temperature of not over 40°, when this is possible.
XCVII. A rock-garden.
When all danger of frost is past, set them outdoors on a bed of ashes in the full sun, making some provision to protect them from rainstorms, so as to prevent water lodging in the points of the shoots, which is liable to bring about conditions favorable to disease. Toward the end of September, have the plants housed in their winter quarters; all that is necessary during the winter is to keep them from freezing. In spring, the points of the shoots may be cut out again to encourage them breaks and soon after they may receive another shift. Treat them as advised above, and when the pots are well filled with roots, they may be watered with manure-water as advised for ixoras. Rochas may be flowered the second summer after the cuttings are struck, and after flowering the plants may be cut back to 6 inches above the pot. These cut-back plants may be shifted along, after they break, and be grown into large specimens. Fine plants of rocha may also be grown in the following manner: Take a 10- or 12-inch pot, and fill it with the compost advised above, the last 2 inches being pure sand. Insert the cuttings as thick as they can be pricked into the pot. The cuttings may be secured from a plant that has flowered. Breaks will start all over the stems of such plants, and in the fall after flowering they will be large enough to use for cuttings. In eighteen months this pot of cuttings will come in flower and will have more than doubled the number of shoots. Aphides are the only insect pests that molest the rochas, and these may be destroyed by fumigating with tobacco in some of its forms. These plants require at all times abundance of fresh air, and if this is not given, they will be attacked by fungous disease. (George F. Stewart.)

A. Clusters usually 2-fld.

jasminea, DC. (Crassula jasminia, Ker-Gawl). St. subshrubby, 4-12 in. high, decumbent, branched, flowering part erect: Ivs. fleshy, oblong-oval or spatulate, ½-2½ in. long: fls. white, tinted with crimson, sessile, not fragrant, ½ in. long. Cape B.M. 2178. L.B.C. 11:1040.—Hybrids with K. coccinea are figured in A.F. 5:433.

AA. Clusters many-fld.

coccinea, DC. (Kalosanthus coccinea, Haw. Crassula coccinea, Linn.). Plant robust, shrubby, 1-2 ft. high: Ivs. very closely imbricated, ovate-oblong or ovate, 1-1½ x ½-1 in.: fls. bright scarlet, 1½-2 in. long, fragrant, borne in summer. Cape. Gn. 46, p. 360. B.M. 495.—Showy; hybrides are in cult.

R. falcata, DC.—Crassula falcata. —R. hybridra albitora is said to be a hybrid of R. coccinea and R. odoratissima.—R. odoratissima, DC. Somewhat shrubby, 12-20 in.: Ivs. acute, erect-spreading, linear-lanceolate or subulate: fls. 1 in. long, fragrant, pale yellow or cream-colored. Cape

L. H. B.

ROCK-GARDEN. An ornamental planting in very rocky places or in areas on which rocks have been placed for the particular purpose to make congenial conditions for certain classes of plants and also to lend interest and variety to a part of the grounds; a rockery. Figs. 3415-3419. See, also, Alpine Plants, Vol. I.

Nature in time will make a garden even on the broken surface of a rock, by sending in with lith, lichens, alge, and mosses of many exquisite forms having much variety and often striking brilliancy in coloring. If there are soil-filled cracks and pockets, then ferns and flowering plants will find a place. At low elevations, however, these flowering rock-plants are comparatively few, for soil accumulates rapidly and strong-growing herbs, shrubs, and trees, aided by favorable climatic conditions, soon cover the rock surface or furnish so dense a shade that only mosses, lichens, and ferns will thrive.

The ideal rock- or alpine gardens are within that region on mountain summits between the limits of tree-growth and the edge of perpetual snow, and in the corresponding regions toward the poles, where the plants are protected from the rigors of a long winter by blankets of snow and are quickened into a short period of rapid growth by a comparatively low summer temperature. Here, where there are deep cool moist rockcrevices and pockets filled with fragments of broken stone and porous decayed vegetable matter, are the favorable conditions wherein the real alpine plants can multiply their neat and dainty cushions, tufts, and rosettes of dense and matted foliage and their abundance of exquisitely formed and brilliantly colored flowers. A successfully grown collection of these plants in contrast with ordinary garden flowers would be like a collection of cut gems as compared with one of rough minerals and rocks, for they have an exquisiteness of finish and depth of coloring that gives them as unique a place in the vegetable kingdom as they have in the plan of nature. Surely there are men and women who, if they knew these plants well, would be fired with an ambition to excel in their cultivation; and in so doing they may enter a comparatively untrdden path if they will limit their work chiefly to the alpines of this continent. They are represented in the New England mountain region by such species as Arenaria granulatca, Leioselaria procumbens, Silene acutis, Diaspasia lapponicum, Arctus alpinus, Vaccinium caespitosum, Saxifraga Aizoon var. sieularis, Veronica alpina, Geum radiatum var. Flacks, Sibbaldia procumbens, Rhododendron lapponicum, Phylloclode coccinea, Primula farinosa, Saxifraga oppositifolia, S. Aizoon, and S. aizoides, Alser polyphyllus, and Woodsia glabella; and in the Rocky Mountains and Pacific Coast ranges by Bisorger uniflora, E. lanatus, and E. urastus, Actinella Brandegii and A. grandiflora, Arctemia borealis, A. scopulorum, and A. alpina, Sericoi Solidanella, S. Fremontii, S. petraus, S. uniflora, and S. wernertii, Crepis nana, Campanula uniflora, Phyllodec coccinea, Phyllodioc coccinea, A. septentrionalis, Gentiana protonora, G. frigida, G. Newberryi, G. Parryi, and G. simplex, Parkh phryoides and P. cespitoso, Pulmonium coniferum, Cassiope Mertensiana, Phylloclode Breverdi, Draca streptocarpa, D. Parryi, and D. nudiculosa, Arabis Lylitii and A. platysperma, Smelovskia calycina, etc.
species that have been long cultivated there. Here alpines have been but little undertaken. A very few easily grown European kinds, as *Andromeda dotoidea*, *Achillea tomentosa*, *Campanula carpatica*, and *Arabis alpida*, are offered by American nurseries and cultivated in the open border. On a few private places small rock-gardens have been established, or advantage has been taken of favorable local conditions to cultivate some additional species, and in one or more botanic gardens considerable collections have been at times maintained, chiefly in frames. Generally what has passed for rock-gardens have been rockeries—mere piles of cobbles raised from the surface of turf or piled against dry banks in such a manner as rapidly to disperse instead of slowly conserve all soil-moisture. Even the most self-assertive weed fails to thrive in such a garden.

In general, we have a smaller rainfall, less humidity and a larger proportion of sunny days than in England, to which we must look for careful instruction in the cultivation of alpine plants. This must be regarded in the arrangement of our rock-gardens. Every precaution should be taken to secure the full advantage of rainfall and any natural water-supply, and there should also be a liberal and constant artificial water-supply. It must be kept in mind, also, that at low elevations the long hot summers do not allow the period of rest that such plants require. This condition must be met by devices, methods, and locations that will retard the growth in spring, check it at an early period in autumn, and keep the plants fully dormant in winter, such as shade, mulching, and, in the case of particularly difficult plants, the protection of frames. It is essential that conditions be provided that will enable the roots to extend for a long distance, often many feet, in narrow crevices and pockets between rocks to depths where there can be no possible internal supply of moisture and have an equable temperature, for frequent freezing and thawing and stagnant water are fatal. These cavities should be filled with such loose material as fragment of rock mixed with decayed vegetable matter, without manure, and arranged to provide for the free passage of hair-like roots, for perfect drainage and the free access of air. To provide these unusual conditions on the average private place in a large way would be so difficult and so expensive that it is not to be recommended. A small collection, comprising a few easily cultivated alpines and the similar rock-plants referred to in a later paragraph may, however, be successfully grown on reconstructed stone walls, on ledges, in small rock-gardens and in the open borders of almost any country or city place. People who desire a more extensive collection of true alpines should seek a situation where favorable natural or existing conditions may be taken advantage of. Such locations are likely to be found at the seashore and in rocky and hilly regions—such regions, for example, by many persons for summer homes. A ledge, a natural mass of boulders or an abandoned quarry will often provide them. Pockets and crevices of ledges may be cleared of unsuitable material, and if they are not deep enough to hold moisture and have an equable temperature their depth may be increased by the judicious use of wedges, bars, and explosives. Boulders can be arranged in such a manner as to secure suitable deep pockets and crevices of soil, springs can be diverted to supply a constant flow of water, underground pipes can be carried from an artificial source of supply to various points where conditions require them. However favorable the conditions are, it will be found that much can be done to advantage in different localities to meet the special requirements of different groups of plants. In such work, however, it should be kept constantly in mind that there are plants that will grow in all sorts of surroundings, and that it will often be much better to seek such as are adapted to existing conditions than to go to the expense of radically modifying such arrangements.

If an artificial rockery is to be constructed, it should be borne in mind that it is not for the purpose of displaying a collection of curious rocks fantastically arranged, but to provide a place for growing a class of plants that can be well grown elsewhere. To do this properly, it would be better never to think of securing mountain, valley, and rock effects in the disposition of the material to be used, but only to think of providing many varied conditions and situations as regards exposure to sun and shade, depth of pockets and crevices, the character and depth of soils, subterranean and surface water-supply, and whether it be permanent or fluctuating. Digging and arranging the rocks, freshly broken raw faces should not be exposed, but rather such faces as are already covered with a growth of lichens for sunny places and with mosses for shady spots. To take full advantage of surface water, pockets and crevices should have a decidedly downward direction from the exposed surface and not be sheltered by overhanging rock. That this does not apply in all cases, those who are familiar with the habitats of rock-plants know full well. The natural habitat of *Pellaea gracilis* in the upper Mississippi bluffs is in horizontal crevices, but it is absolutely protected from all surface water. *Pellaea atropurpurea* will grow in narrow cracks and small pockets on the face of dry limestone boulders where there can be no possible internal supply of moisture. These examples go to show that the general principles that will apply to such plants as a class will not apply to all species, and it simply gives emphasis to the importance of trying a plant under all sorts of conditions before assuming that it can not be grown. The writer remembers well an attempt to grow that most exquisite alpine flower, *Gentiana verca*, in the open border on a little pile of rocks to give it suitable drainage. It was transplanted a number of times to places where it came continually to be killed at the same, and finally a situation was secured, where, instead of barely holding its own, it increased and produced a number of its great deep blue flower-cups.
The making of a rock-garden.

A rock-garden must of necessity often be "artificial" in the sense of made by man, because few gardens or grounds contain a natural rocky slope or even a natural bank upon which one might be constructed, and if they did the position may not be an ideal one. A southern slope would be too hot and dry in this climate, unless it was shaded by tall trees. A bank with a northern or northeastern aspect free from the roots of trees would suit this class of plants much better, and very attractive it can be made, especially if the bank is on the outer edge of a garden, or skirts a lawn. There is no form of gardening in which one has more opportunity to give expression to his natural taste than in the construction and planting of a rock-garden. But since all grounds or gardens do not have a natural bank or slope upon which an "open" rock-garden might be constructed, a depressed rock-garden may be made in grounds that are perfectly level, and some of the best rock-gardens in the world are what are known as "underground," for example, the one in the Royal Botanic Gardens, Kew, London, England. Before this rockery was constructed the ground was perfectly level. A cutting was begun at one entrance, at first shallow,
but gradually deepening till a depth of some 5 or 6 feet was reached, and an average width of about 10 feet at the bottom. At all the soil taken out was placed on the top of the slopes, thus still further increasing the height. The cutting was made in a wincing manner, not formal or zigzag, but in such a form that when completed, not only would a variety of aspects be secured to suit the requirements of different plants, but each turn should seem to possess a peculiar charm of its own. The whole cutting is perhaps some 200 yards in length. The rocks are placed in the banks in such a manner as to seem possible to place them; now they stand out boldly, almost perpendicular with the edge of the path, then again they recede into hollow recesses. There are not too many rocks, nor yet too few. In one place a cascade falls over the rocks into a small pool, which on not only provides a habitat for aquatic and bog-plants, but also adds greatly to the beauty of the rockery. For the convenience of the public, a broad gravel path runs through the whole rockery. Rhododendrons and other shrubs are planted on top of the banks in groups, and not in straight lines, while behind these, for protection and shade, are planted pines and other conifers, as well as some deciduous trees. The rocks were placed in most cases so as to form "pockets" of good size into which the plants could be placed, and the soil made in the pocket to suit the requirements of the different plants. With such a variety of aspects and conditions, this rockery is able to accommodate one of the largest collections of alpine and rock-plants in the world. Deep carpets of mossy saxifrages, subroses, arabis, cerastium, sedum, and the like, hang over projecting ledges of rocks, while in fissures and holes in the rocks are growing those dainty rosette-making saxifrages, S. longifolia, S. Cotyledon, S. crassica, and S. ericoides, as well as the charming androsaces. In the smaller recesses of the rockery, are to be found the gentians from the tiny blue gentiana septemjida, while foxgloves, ver-
May they may be planted out permanently. Seeds may also be sown in a shaded frame in spring and the plants transferred to the rockery in autumn.

In planting a newly made rock-garden, it is a mistake to plant too thickly. Each plant should be given sufficient space for a reasonable growth, and to show its true character. Compact-growing and tufted plants may be planted closer than those of a spreading habit. All variegated-leaved varieties and plants having an aggressive habit or that cannot easily be kept within reasonable limits should be rigorously excluded from a rock-garden. The whole rock-garden should be replanted and fresh soil placed in the pockets about every four or five years. In dry weather a thorough watering should be given at least once in two days, and, as in other parts of a garden, weeds will insinuate themselves wherever they can gain a foothold; these, of course, should be removed as soon as they appear. In winter, the plants in the most exposed positions, such as those which overhang ledges of rocks, should be protected by branches of hemlock or pine laid lightly over them, and a light covering of half-decayed leaves or manure placed between most of the plants, especially on a southern exposure, protects them from excessive thawing and freezing. The general care required is usually much less than for an ordinary flower-garden, but the pleasure to be derived from a well-constructed and well-plant ed rock-garden is very much more.

EDWARD J. CANNING.

RODGÉRSIA (named in honor of Commodore Rodgers, United States Navy). Saxifragaceae. Hardy herbaceous perennials suitable for garden planting, with showy terminal flower-clusters.

Rootstocks horizontal, thick and black; lvs. alternate, large, petulate or digitately or pinnately compound, usually deep green; infl. tall and variously compound, paniculate; fls. very numerous, small; calyx-lobes 5; petals usually none; ovary 2-3-celled. About 8 species, China and Japan. Botanically Rodgersia is close to certain species of Astilbe, having 10 stamens and no petals; it differs in having connate carpels, scorpoid infl., and 5-cut rather than thrice-ternate foliage.

Perhaps the best-known species is R. podophylla, as it was the first introduced into cultivation. It grows to 4 feet high, and the leaves are finger-shaped, the five lobes being bold in outline, angled, and serrate. In the spring the foliage is light green; in summer it assumes a metallic bronzy hue. The plant is a vigorous grower, and under favorable circumstances has been known to make a clump 9 feet in diameter, the largest leaves being a yard across and borne on stalks 3 feet long. The flowers are borne in midsummer on stalks 4 to 5 feet high. The general style of inflorescence is that of the popular astilbe, to which it is closely allied. The flowers are very small, but make a feathery spray of white bloom. The panicle is a foot or more long and as wide at the base. Technically the flowers have no petals; what seem to be petals are the white calyx-segments. As a flowering plant it has been said by enthusiasts to be superior to astilbe, but the bloom is scantier, rather greenish at first, and perhaps does not last so long. It may not be so amenable to forcing. Rodgersia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardens. Although any deep soil will do, it is said to prosper in a moist peaty soil. It should be placed in a sunny position, with plenty of room, where high winds cannot damage it. Easily propagated. (Wilhelm Miller.)

3420. Rodgersia pinnata.

RODRIGUEZIA (Emanuel Rodriguez, Spanish botanist and apothecary). Including Bulingtònia, Orchidáceae. South American epiphytic orchids, a few of which are cultivated for graceful racemes of delicate flowers.


strobilifolia, Hems. About 2-3 ft. high: basal lvs. 9-15 in. long, long-petioled, bright green; lfts. in 3-5 widely separated pairs with an odd one at the top; the caulescent lvs. solitary or 2 uneven pinnate, 9-11-folliate; lfts. subsessile, subopposite and oblong-lanceolate; infl. small, terminal, densely cymose, paniculate; fls. white, small, and inconspicuous; sepals fleshy, ovate, subacute. China. G.C. III. 54: 131.


F. TRACY HUBBARD.
sheathing lvs. at the base; racemes erect or pendulous; dorsal sepal and petals similar, free, erect; lateral sepals united, concave but scarcely saccate; labellum spurred or saccate, with a long claw parallel to the column, and a spreading blade usually exceeding the sepal; column slender. Robert Brown's genus Gomesa (sometimes written Gomeza), founded on *G. recurva*, is by some referred to *Rodriguezia*. See *Gomeza*. The fls. are nearly always fragrant. The plants vary somewhat in habit. Some species form neat, compact tufts, while others, like *R. decorata*, have long, straggling rhizomes difficult to keep within the limits of a block or a basket.

Rodriguezias should be grown in very shallow pots filled with tough peat, and well drained. Rest them in a temperature of 50°, giving little water. The growing temperature should be from 65° to 75°. Give plenty of moisture and shade from direct sunshine. The stronger-growing kinds will need thicker potting material in baskets; they do well wired on tree-fern stems. During growth, syringing is necessary. (Wm. Mathews.)

AA. Fls. small, deep rose or spotted red.

secunda, HBK. Fig. 3421. Pseudobulbs bearing several thick, linear-oblong lvs.: raceme erect, second, 6 in. high; fls. deep rose; sepals erect, ovate convex, the lower pair keeled and gibbous; petals like the dorsal sepal; labellum obovate-oblung, emarginate, scarcely longer than the sepals. Aug. Trinidad, Guana. B.M. 1854. B.R. 930. L.B.C. 7:676 (as *R. lanceolata*).

crispa, Lindl. Pseudobulbs elongate-ovate: lvs. oblong-lanceolate, spreading, undulate; labellum pendulous, rather dense; fls. green, with yellowish borders; seeds all free, undulate-crisp; petals similar; labellum lanceolate, sigmoid. Brazil. B.R. 26:54.

AAA. Fls. greenish.

planifolia, Lindl. Pseudobulbs clustered, compressed: lvs. lanceolate: raceme long, drooping; fls. greenish yellow, fragrant; sepals oblong, waved, acute, the lower pair united except at the end; petals like the dorsal sepal; labellum broadly oblong, acute, reflexed, shorter than the petals. Feb. Brazil. B.M. 1745 (as *Gomesa recurva*) 3304. L.B.C. 7:660 (as *Gomesa recurva*). See also p. 1354.

HEINRICH HASSELBRING.

ROTTLEIRA, also spelled Rottleri. Chirita.

ROGIÉRA: Rondetia.

RÖHDEA (Mich. Rohde, physician and botanist of Bremen). Sometimes spelled *Rhodesia*. A monotypic genus of Japan and China, essentially a fodder foliage plant with numerous radical lvs. 6–15 in. long: fls. borne among the lvs. in short thick dense spikes a few inches high; perianth globular-bell-shaped; anthers sessile; stigma peltate; style nearly wanting; fr. a globular, usually 1-seeded berry. Rohdeas are excellent plants for dwelling-house decoration, doing well in the cooler positions. They are perfectly hardy at Washington.

japonica, Roth. Root a long nearly cylindrical root-stock with fleshy fibers: lvs. typically green, 9–12 in a rosette, erect, oblong-lanceolate: berry about the size of a small olive, with a red pulp. B.M. 808 (as *Orontium japonicum*). Gm. 30, p. 541. The following varieties, which differ in shape and color of the lvs., have been offered by Dutch bulb-growers: Vars. *auro-striata*, *falcata*, *latiscutulata*, *macrophylla*, *marginata minor*, *pygmaea*, *zebrina*.—This plant known as *Omato* or *Munenevi* is a favorite among the Japanese, and fine specimens often bring as much as $500, even when only a few inches high. The seven standard varieties of Japan are *Hinomoto*, *Nagashima*, *Kiyosugi*, *Shikami*, *Bunyoi*, *Hida*, and *Akitashiba*. Retired persons of means often spend their declining years in the culture of this interesting plant, of which hundreds of named varieties are known to Japanese fanciers. A number of very beautiful books have been written on this plant, and it has an extensive literature. This plant is well known in China and was adopted by the Manchus as their national flower. L. H. B.†


Fruits fleshy, compound, subglobose, resembling those of Annona, but with fls. very distinct in form from those of Annona: corolla genipetalous with the lobes corresponding to the outer petals of Annona pro-
duced into 3 rounded wings or obtuse spurs, in some species horizontally projecting, in others curved upward and inward, in others outward and downward; lobes corresponding to the 3 inner petals, alternating with the winged or spurred lobes, reduced to minute scales, almost closing the opening above the essential parts. The type species is *R. dolabripetala.*—The genus, including about 50 species, ranges from Mex. and the W. Indies southward to Argentina and Peru. It is well represented in Brazil and Paraguay. In some of the species the frs. are highly prized for the table and rival the cherimoya, for which they have sometimes been mistaken. Several have been intro. cult. through the Miami (Fla.) Station by the Office of Foreign Seed and Plant Introduction, U. S. Dept. of Agric. Much confusion has resulted from the fact that in many original descriptions of species of *Rollinia,* the frs. were not included, and that edible frs. in the markets unaccompanied by lvs. or fls. have in many cases been botanically misidentified. It is impossible here to give a key to all the species. The principal ones may be grouped according to the form of the fl. into sections or subdivisions, as indicated in the accompanying illustration (Fig. 3422).

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1. *dolabripetala,* St. Hil. (*Annona dolabripetala,* Rodd. *Rollinia longifolia,* St. Hil.). *Hatchet-lobed Rollinia.* A small tree, 16½–23 ft. high: young branches, together with the lower surface of the young lvs., their petioles, and the fls. ferrugineus-tomentose: vegetative lvs. oblong-lanceolate or oblong, 1–6 in. long and about 1½ in. broad, those of the flowering branches much smaller, acutish or acute, or sometimes subacuminate at the apex, obtuse at the base, glabrous above, rufous-pubescent beneath, with the midrib prominent beneath, ferrugineous, with 20–28 lateral nerves; petiole about 3 in. long, grooved above, persistently ferrugineous-tomentose: peduncles solitary or rarely in pairs, ferrugineous-tomentose, bracteolate at the base, ½–1½ in. long: calyx-divisions cordate-ovate or suborbicular; corolla-wings rather fleshy, 1 in. long, ferrugineous-tomentose, laterally compressed in the form of a hatchet or broad knife with its blade in a vertical plane, at first ascending, at length broadly spreading: fr. (immature) globose, squamous, pubescent, with the areoles slightly convex; seeds compressed, somewhat cuneate, testa reddish yellow, thin, showing the wrinkles of the inclosed ruminate endosperm. This species, the type of the genus *Rollinia,* was first collected on Mt. Corcovado, near Rio de Janeiro, Brazil, where its fls. appeared in Feb. and its fr. in May. 

2. *rugulosa,* Baill. (*Annona rugulosa,* Jacq.). *Cachiman Montagne.* A small tree intro. by Jacquin from specimens growing spontaneously in the forests of Martinique, and said by him to be rarely cult. In habit it bears a close resemblance to the common custard-apple, *Annona reticulata,* lvs. oblong, pointed at the apex and base: corolla gamepetal in the form of a roundish body from which 3 oblong lobes spread outward in such a way that it not inaptly represents a tricorn hat: areoles of fr. gibbous (convex) not papillose nor aculeate: fleshy pulp very viscous and not very well flavored.—*R. Sieberi* has been referred to this species, but Père Duss, in his *Flora of the French Antilles* has kept the two species distinct.

3. *Sieberi,* A. DC. *Cachiman Montagne.* A small tree first described and figured from the island of Trinidad and erroneously referred by its collector to the common custard-apple, *Annona reticulata,* to which its fr. and lvs. bear a certain resemblance: lvs. oval-oblong, acute at apex and base, usually 3–5 in. long and 2–3 in. broad, thin, above puberulous with the nerves pilose, beneath paler and more pilose, narrowed at the base into plosely petioles ½ in. long, some of them at the base of the branches broadly ovate and obtuse, about 1 in. long: peduncles if-opposed, 1-fld., 1–1½ in. long, bearing 2 small ovate-acute bracteoles, one near the base, the other about the middle: corolla-wings laterally compressed, linear-oblong, rounded at the apex, diverging, straight or curving slightly upward: fr., according to Père Duss, usually larger than that of *Annona squamosa,* the surface divided into pronounced raised squamose


3423. *Rollinia deliciosa* (X 3/4)
areoles rounded at the tips; pulp fleshy, nearly white, melting in the mouth, slightly viscous, with a sugary agreeable flavor. Type collected by Sieber (No. 90), in the De Candolle Herbarium.

AA. Corolla-wings laterally compressed, widely spreading and more or less decurved. (Fig. 3423, b.)

4. deliciosa, Safford. BIRIBA. Fig. 3423. A tree yielding a delicious, large, juicy fr., resembling the cherimoya: vegetative lvs. obovate-oblong or elliptical, rounded at the base and normally acuminate at the apex, blades 5-11 in. long and 3-4 in. broad, membranaceous, when young sparsely canescent-puberulous above, densely so beneath, especially along the midrib and nerves, at length glabrous above and beneath except along the midrib and primary nerves (18-22 on each side), these reddish brown and slender but prominent beneath; petiole about ½ in. long: lvs. on flowering branches smaller, the lowermost ones relatively shorter and broader, sometimes broadly ovate or orbicular, 1½-2½ in. long and 1½-2 in. broad; peduncles If-opposed, often in pairs, sometimes solitary, rarely in 3's, 1-1½ in. long, bearing a small ovate sessile bracteole near the middle, strigillose with reddish hairs, like the petioles and nerves of the lowermost lvs. (prophylla) beneath: calyx and corolla canescent-puberulous; corolla-wings compressed laterally, widely diverging and decurved, rounded at the extremity; stamens numerous, closely crowded, the expanded conical-ovate, terminated in an obtuse beak; peduncle nectaries forming a pavement above the pollen-sacs; endosperm.—The type of this species, in the U. S. National Herbarium, is from a fr.-bearing tree cult. in the experiment station, Miami, Fla., grown from seeds sent by C. F. Baker from Para, Brazil (No. 25212) in 1908. Baker describes it as the finest annonaceous fruit of Trop. Amer. It was incorrectly referred to R. orthopetalta, but it is readily distinguished from that species by the decurved wings of its frs.

5. Pittièri, Safford. A tree resembling R. deliciosa, but with lvs. more abruptly acuminate and glaucous beneath, the vegetative ones 6-8 in. long and 5-6½ in. broad, midrib and primary nerves (18-22 on each side), reddish brown beneath: lvs. on flowering branches smaller (with 10-12 primary nerves): peduncles often in clusters of 3 or 4, graduated in length, the longest 3½ in. long, fleshy, minutely puberulent, never hairy like those of R. deliciosa, bracteolate near the middle: corolla-wings ½-¾ in. long, calate, horizontally extended and decurved, rounded at extremity, and narrowed at the base, very finely puberulent, appearing under the lens as though composed of olive-gray felt; fr. not observed.—A beautiful species with elliptical or obovate lvs. remarkable for the pale color of the lower surface and the sharply outlined lateral nerves. These correspond with the description of R. rufinervia, Triana and Planch., but the corolla-wings are decurved, not "divergent ascending," as in that species. The type, in the U. S. National Herbarium, was collected near Puerto Obaldia, Panama, by Henry Pittier (No. 4358, in whose honor the species is named).

6. Jimenezii, Safford. ANONILLA. Fig. 3424. A small tree of Costa Rica resembling R. mucosa but with lvs. in clusters of 2 or 3, having the corolla-wings horizontally spreading and slightly decurved, and with fr. resembling that of the common sugar-apple (Annona squamosa), with the component carpels red at the tips when fresh, but more or less beaked when dry: lvs. ovate to oblong-elliptical, acuminate, those of the vegetative branches 7-8 in. long and 2½-3 in. broad, obtuse at the base, with 18-22 primary nerves on each side of midrib, those of the flowering branches smaller with 12-16 pairs of primary nerves and usually rounded at the base; point of acumen either acute or more usually obtuse or reteous; young branches, petioles, and lower surface of young lvs. covered thickly with ferrugineous hairs, lvs. at length glabrous or nearly so except along the midrib and nerves beneath: peduncles If-opposed, in clusters of 2 or 3, graduated in length, the longest about ½ in. long, ferrugineous-tomentose like the ovate-acuminate calyx-lobes: corolla-wings oblong, rounded at the tip, scarcely at all narrowed at the base, widely spreading and usually decurved, never curving upward and inward, fleshy-puberulent: fr. subglobose, about 2½ in. diam., closely resembling that of Annona squamosa, the component carpels loosely adhering, very gibbous, rounded or often reteous at the tip when fresh; pulp white, edible, but not so agreeably flavored as that of Annona squamosa.—This species is based upon specimens in the U. S. National Herbarium, received from Oton Jimenez, of San José, Costa Rica, the frs. collected by him at Nuestro Amo, March, 1912 (No. 427), and the fr. from the same tree, Oct., 1912. The accompanying figure is drawn from type material, the fr. from a field photograph sent by Mr. Jimenez, in whose honor the species is named.

AAA. Corolla-wings linear-oblong or spatulate, ascending or erect and incurved. (Fig. 3425, c.)

7. orthopetala, A. DC. A shrub or small tree with the habit of R. Sieberi, but with the lvs. somewhat longer petioled: lvs. oval-oblong, acute at apex and base, pilose: peduncles in pairs: calyx-lobes smaller than in R. Sieberi; corolla-wings erect and incurved; fr. not described.—This species was described by De Candolle from a specimen in the De Candolle Herbarium collected by Parker near Demarara, British Guiana. The name has been given to several rollinias with edible fr. Of these the principal
ROLLINIA

species, from an economic point of view, is *R. deliciosa* described above, which is readily distinguished from *R. orthophylla* by its widely spreading decurved corolla-wings.

8. *laurifolia*, Schlcht. *Aratitcu mirum*. A shrub or small tree with the new branchlets, petioles, peduncles, midrib, and nerves finely appressed-subfurfuraceous puberulent, the fls. and lower surface of the fl. clothed with dense and deeper clay-colored puberulence: lvs. oblong-obovate to lanceolate, acuminate at the base, obtuse at the base, 3½-5 in. long, 1½-2 in. broad; midrib prominent beneath, lateral nerves 8-10 pairs; upper surface apparently glabrous, but as seen under a lens are covered with white hairs; peduncles solitary or in 2's or 3's; graduated in length, the longest 3 times as long as the petioles (1 in. long), bracteolate at the base, gradually thickening toward the apex: corolla-wings ascending-erect, broadened at the apex, rounded or quite obtuse, ½ in. long and ½ in. broad near the apex, clothed with minute brownish-argillaceous tomentum: fr. subglobose, about the size of a horse-chestnut, composed of many carpels distinctly outlined and containing an edible, white, mucilaginous pulp with a pleasant sweet taste.—This species is based upon 2 flowering specimens collected in Brazil by Sellow (Nos. 809 and 1190).

9. *incursa*, Moore. A diffuse shrub with long branchlets: lvs. short-petioled, lanceolate or lanceolate-oblong, obtuse, rounded at the base, coriaceous, above glabrous, often glossy, beneath paler, minutely puberulous, broad 4-5 in. long, 1½-2 in. broad, often more or less oblique at the base: midrib impressed above, rather prominent beneath, lateral nerves about 12 pairs inserted at a wide angle, undulate near the margin and curving upward: peduncles usually in pairs, sometimes solitary, longer than the petioles (1½ in. long), bracteate at the base, and bearing a small bracteole as the peduncle. *Fl.* yellowish green; calyx-lobes short and rounded, ferrugineous-pubescent, corolla-wings ferruginous-tomentose, spatulate-oblong, ascending and incurved, ½ in. long; stamina numerous, crowded; carpels albo-sericeous: fr. not observed.—This species described by Sower, Moore, was collected in Santa Cruz, Brazil, by the Matto Grosso expedition. Specimens from the type collection are in the Herbarium of the U. S. National Herbarium collected by Sellow in the province of Rio Grande do Sul by Sellow (Nos. 13509).

10. *rugulosa*, Schlcht. A shrub or small tree: lvs. short-petioled, lanceolate or broadly lanceolate, obtusely and shortly acuminate, acute at the base, on both sides glabrous, beneath glossy; young branchlets, petioles, and midrib appressed-puberulous: peduncles usually recurved or pendulous and thickened at the apex, warty and puberulous like the calyx, ½-3½ in. long; corolla-wings obovate, ascending, rounded or obtuse at the apex, narrowed at the base, tomentose-canescens, ½ in. long and ½ in. broad; fr. globose, 1-1½ in. diam., with the component carpels forming 20-30 slightly raised rounded areoles: seeds small, pale brown, conoid, somewhat flattened.—Type collected in S. Brazil by Sellow. Closely related to *R. rugulosa* and with very similar fl. but with longer and narrower lvs. (suggesting those of *R. salicifolia*), is *R. Warmingii*, R. E. Fries, the type of which was collected on Mt. Tijuca, near Rio de Janeiro, by Glaziou (No. 6079).

11. *lanceolata*, R. E. Fries. A small tree with small lanceolate lvs.: fls. acute at the apex and base, above glabrous except along the midrib; beneath densely ferrugineous-villos along the midrib: young branchlets, petioles, and solitary or rarely geminate peduncles fer-

--ROLLINIOPOSI--

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12. *emarginata*, Schlcht. A glabrous shrub, 6½-10 ft., growing in marshy places, with slender branches: lvs. oval or elliptical, obtuse at both ends or acute at the base, emarginate or reflexed at the apex, on both sides subglabrous and opaque: peduncles-usually solitary, slender, about 1 in. long, minutely bracteolate at the base: corolla and calyx silky-hirtellous; corolla-wings obovate-ovaricular, widely spreading, laterally compressed: fl. solid, about 1-1½ in. diam., ovate-globose, with the component carpels scarcely at all raised or distinctly outlined.—This species, very common in S. Brazil and Paraguay, is based upon specimens collected in the province of Rio Grande do Sul by Sellow.

13. *glaucescens*, Sond. A glabrous shrub closely allied to *R. emarginata*, but with the lvs. not emarginate and sometimes acute at the apex: fl.-blades 3½-5 in. long, 1½-2 in. broad, corolla-lobes short, straight and flat: fr. subglobose, about the size of a small apple, pubescent, with the component carpels forming prominent pentagonal areoles; pulp edible, somewhat like that of the cherimoya. W. E. Safford.

ROLLINIOPOSI (Greek derivative, signifying Rolinia-like, from the form of the fl.). *Annonaaceae.* FRUCTA DE MACACO. MONKEY-FRUIT. Shrubs or small trees of Brazil having fragrant 3-winged fls. like those of Rollinia, but with aromatic frs. in the form of a clust of small distinct drupes, instead of a fleshy syncarpium, as in Rollinia.—Only 4 species have thus far been described, all from Trop. Brazil. The type of the genus (R. discreta, Safford), Fig. 3425, has been successfully intro. into cult. in the S. U. S. by the Office of Foreign Seed and Plant Introduction, U. S. Dept. of Agric. (S. P. I. No. 15508). This species, discovered by Dorsett, Shamel, and Popeneo in the vicinity of Januaria, state of Minas Geraes, has orange-colored pear-shaped drupes locally known as Fruta de Macaco (monkey-fruit). The thin aromatic mesocarp surrounding the solitary seed tastes very much like the fl. of certain species of Xylopia, called malaguetas in the province of certain species of Xylopia, called malaguetas in the province of some species of Cymbopetalum. Cymbopetalum pentaliflorum) the spicy petals of which, together with vanilla, were used by the Aztecs for flavoring their chocolate in pre-Columbian times (see Cymbopetalum). The other known species were recently discovered by Rose and Russell, of the Carnegie

ROMANZÖFFIA (named in honor of Count Nicholas Romanzof). Hydrophyllaceae. Low and delicate perennial herbs with the aspect of saxifrage, suitable for outdoor planting.

Leaves mainly radical, alternate, round-cordate or reniform, crenately 7-11-lobed, long-petioled; infl. scapose, racemose or paniculately several-fl.; the pedicles filiform; fls. pale pink or purple, varying white; calyx-lobes oblong-linear or lanceolate; caps. retuse, 2-celled or nearly so.—Ten (?) species, Alaska southward to the coast range of Calif.

ROMNEYA (named for T. Romney Robinson, who discovered it about 1845). Papaveraceae. Tall showy herbs or shrubs used for garden planting.

Stems branching: lvs. petioled, pinnatifid, 2 or 3 pairs of segms.; fls. solitary at the ends of the corymbose branches, large, white and showy, 6 in. across; sepals 3, with a broad membranaceous dorsal wing; petals 6, all alike; stamens very numerous; stigmas numerous, co- nate at base into a little ring: caps. 7-11-celled, dehis- cing to the middle, the valves separating by their margins from the firm persistent pericarp.—Two species, Calif. and Mex. Monographed by Fedde in Engler's Pflanzenreich. hft. 40 (IV. 104), 1909.

Romneya grows wild in California from San Diego to Santa Barbara County and also in Mexico, and in the wild state it blooms chiefly in June and July, but in cultivation the period of bloom is increased from May to August. In the region of Los Angeles, it is said to thrive best on dry rocky soil and needs only the water it obtains from the winter rains. Romneya can be trans- planted safely if cut to the ground before it is lifted and can be raised from seed if the seed is fresh. Raising from seed under artificial conditions is not very satisfactory, however, as it takes a few years between the germination of the seed and blooming of the seedlings.

Romneya is difficult to transplant, due to the scarcity of fibrous roots; in middle California suckers which are produced in great abundance are transplanted without any loss, provided a good firm ball of earth is kept around the stout thick roots in transit, and if the stems are cut well back, almost to the base. At San Francisco it grows luxuriantly in a heavy adobe soil, producing immense flowers. The name Matilija poppy (pro- nounced Ma-til'i-ha) is the favorite in California. It comes from the Matilija Canon, Ventura County, where the plant grows in particular abundance. Miss Parsons writes: "Many people have the mistaken idea that it grows only in that region. It is not com- mon by any means; but it is found in scattered locali- ties from Santa Barbara southward into Mexico. It is very abundant near Riverside, and also upon the southern boundary and below in Lower California, where the plants cover large areas. It not only grows in fertile valleys, but seeks the seclusion of remote canons, and nothing more magnificent could be imagined than a steep tufted-side covered with the great bushy plants, thickly covered with enormous white flowers." Blossoms remain open for many days. (J. Burtt Davy.)
Romneya Coulteri, the Matilija poppy, one of the most showy of California flowers.
In the favorite species (*R. odorata*) the fls. number 10-30 in a cluster, each fl. being fully an inch across; in the other species the fls. may number 150-200 to a cluster, each fl. being less than ½ in. across. *R. cordata* is often said to have a 4-lobed fl., a mistake that dates back more than half a century to a typographical error.

Rondeletias are of slow growth, and not many cultivators of plants care to give time and space to raise them; nevertheless some of the species, e.g. *R. odorata* var. *major*, deserve to be more widely grown. Cuttings from the half-ripened wood may be rooted at any time of the year. Spring, however, is considered the best time, as one has the season's growth ahead, and good plants may be had in the fall. Insert the stem in a 3-inch pot, in a mixture of finely sifted peat and sand and place them in a tight propagating-bed, in a temperature of 70°. Water them thoroughly and shade them from the sun. In a few weeks the cuttings will be rooted, when they may be potted in small pots, in the siftings of the root of the osmundas fern, with enough sand to keep it open. If a good fibrous peat can be procured, it answers the same purpose. A night temperature of 60° is best for these plants. Large plants, however, will winter safely at 50° to 55°.

The advantage of keeping small plants warmer is that they may be grown more quickly. As soon as the young plants have a good hold on their first pot, cut them back to two joints above the soil. Place them close to the glass and syringe two or three times a day. When the sun gets strong, shade them lightly in the middle of the day. As soon as they are well rooted in their first pot, shift them into a 2½-inch pot, in a mixture of finely sifted peat and sand and place them in a tight propagating-bed, in a temperature of 70°. Water them thoroughly and shade them from the sun. In a few weeks the cuttings will be rooted, when they may be potted in small pots, in the siftings of the root of the osmundas fern, with enough sand to keep it open. If a good fibrous peat can be procured, it answers the same purpose. A night temperature of 60° is best for these plants. Large plants, however, will winter safely at 50° to 55°.

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aa. Fls. pink to white.

b. Base of lvs. more or less cordate.
cordâta, Bentli. (Rogierâ cordâta, Planch. R. thyrsi­flôra, Hort., not Roth). Fig. 3427. Lvs. ovate, acuminate, cordate; generally said to have pinkish flesh-colored fls. with a yellow throat (as in F.S. 8: 754), but in R.H. 1878: 230 they are shown as pure white. B.M. 8540. J.F. 2: 122. Guatemala. Possibly also native in Mex.

lattifôlia, Hort. (Rogierâ latifôlia, Decne.). Lvs. large, heart-shaped, acuminate, short-petioled; fls. in corymbose cymes, the tubes pink, the limb white; calyx-lobes oval, obtuse. Guatemala. R.H. 1853: 121.

39. Base of lvs. not cordate.

c. Corolla-lobes ovate: stigmas broadly ovate.
amânea, Hemsl. (Rogierâ amânea, Planch.). Lvs. elliptic, broader than in R. gratissima, and shorter, acuminate, 2-5 in. long; fls. rose-pink, with a conspicuous yellow throat. Guatemala. F.S. 5: 442.—Intro. in Calif. See also R. vericolor, in supplant list below.

c. Corolla-lobes obcordate: stigmas subulate.

aaa. Fls. blue. (Hindisâa.)

longifôra, Cham. (Hindisâa longifôra, Bentli.). Lvs. opposite, entire, lanceolate, more or less oval or sometimes almost linear, petals very short, attitude at the base: infl. terminal corymb; fls. blue; calyx-tube short, lobes linear; corolla-tube very long; segments of lip oval, spreading and acuminate. R.H. 1858, p. 329. H.U. 4, p. 243.—This is now placed in the genus Hindisâa, which differs from Roneleteâia in general appearance and in the form of the corolla which is rather funnel-shaped than salver-shaped, without any callous contraction or beard at the mouth of the tube and by the capsule, which is differently dehiscent. A second species of Hindisâa is R. violettâ, Bentli., from Brazil. B.R. 30: 40.

The following species have been occasionally cult. : R. ameriçsâna, Linn. White-fld. W. Indies and S. Amer.—R. amââeâla, Hort., is an imperfectly known species said to have the lvs. in 3’s, and cori­erâd or deep scarlet fls. with a presumably yellow throat. Habitat (1)—R. Blackweli, Hook, a pink-fld. species from Trop. Amer., is easily mistaken for those mentioned above. It is much longer calyx-lobes, which are pink. B.M. 6300.—R. Pûrdicâ, Hook, a beautiful pale yellow-flld. species from Colombia, has a great pyramidal cluster 5 in. across and 4 in. deep, with an astonish­ing number of fls., perhaps 150-200 in B.M. 8540.—R. vericolor, Hook. (Rogierâ versicolor, Lindl. & Partt.,) is referred to R. amââeâla by Index Kenniâns but seems distinct. The fls. are said to be “remarkable for their play of colors: the tube is yellow; the limb is bud deep rose-color, changing when they expand to pale rose and then to white, with a yellow edge, and having a 2-lobed green spot in the center from the color of the stigmas, which protrude a little beyond the mouth.” B.M. 4579. J.F. 2: 112.

F. TRACY HUBBARD.†

ROOT-GALLS. Abnormal enlargements often appear on the roots of plants. These enlargements are much more frequent than is generally supposed, but from their position under ground are rarely observed. From an economic standpoint they have not received the attention that they merit.

Although the term root-gall is usually applied to the abnormal enlargement of roots due to insects and other animal organisms, it has a much wider application as used by most plant-growers. The presence of nodules or local enlargements on the roots of plants has been discussed by different authors under the names root-galls, root-knots, root-swellings, and the like. In cases in which the cause of the nodules of hypertrophied tissue is known, special names have been assigned to the enlargements. Thus the gall formed by the eel-worm (Heteroderâa radicicola) is known as the nematode root-gall (Fig. 3428); the enlargement on the roots of cabbage and related plants by the myxomycete (Plas­modiophora Brassicæ) is called club-root; the swellings on the roots of the peach, apricot, and many other plants, which are of characteristic appearance and usually appear at the crown of the plant, are known as crown-gall. Root-tubercules are small gall-like bodies found on the roots of many leguminous plants. They are symbiotic in nature, the organism causing them being helpful to the plant. See Legumes.

Abnormal root enlargements are due to the following causes: (1) animal parasites, as in the nematode root-gall (Fig. 3428), the galls formed on the roots of the grape by the phylloxera, woolly aphid galls on apple tree roots, and the like; (2) vegetable parasites, as in the club-root and the crown-gall (Fig. 3429); (3) mechanical injury, causing excessive callous development, root-burls, and so on. In addition to these the causes of these enlargements are often obscure or unknown.

Swellings on the roots of the mulberry are said to be due to the hypertrophy of the lenticels. Some investigators have attributed gall-like root-growth in some instances to the hypertrophy of adventitious buds.

The root-galls caused by the nematode (Heteroderâa radicicola) may usually be readily recognised from other forms of hypertrophied tissue by the numerous knotty enlargements on the smaller roots infested by the worms. By careful search, in most instances, the distended female worms may be found in the infected tissue, where they appear as small nearly spherical pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called eel-worm, feeds upon the roots of a great variety of cultivated plants and is particularly destructive in the South. It is usually injurious in the northern states only to plants growing under glass. However, ginseng and some other outdoor perennials often suffer severely as far north as Michigan and southern Canada. The most effective remedy in the case of field crops is the removal of all rubbish that would harbor the worms during the winter. In greenhouses steam can be forced through the infested soil. When potted plants are badly affected, they may be severely root-pruned and repotted in soil free from worms.

The root-swellings caused by the grape-vine gall-
The crown-gall disease appears to be the most harmful of root diseases affecting cultivated plants in this country. These galls have been reported upon the roots of the peach, apricot, almond, prune, plum, apple, pear, walnut, grape, raspberry, blackberry, cherry, poplar, and chestnut, and without doubt further investigation will find them on other plants as well. The crown-gall disease is now known to be due to a distinct species of pathogenic bacteria \((\text{Bacterium tumefaciens})\). It appears to be the same organism in all the host-plants affected by this disease. Seedlings from one to six months old appear to be most susceptible to this disease; hence it is particularly serious in the case of nursery stock. When the galls appear on young trees, they almost always occur on the side of the main root about a few inches below the surface of the soil, or in the region of the crown. With more mature trees they tend to occur at greater depth on lateral roots. At first the gall has a uniform outer appearance, but later it becomes warted from unequal growth. The tissue of the developing gall is soft and succulent, with nodules of woody tissue scattered through it. The galls vary much in size and may reach a diameter of 10 inches.

But little is known as to remedies for crown-gall. As the disease is primarily a nursery disease, the most effective remedy is in securing stock for planting from a non-infested nursery. This disease is often destructive to the roots of roses and asters in the greenhouse benches. Here the destruction of all diseased plants followed by steam sterilization of the soil is the only remedy.

\[\text{J. W. TOUMEY.}\]

\[\text{H. H. WHITTELL.}\]

**ROQUETTE, or ROCKET-SALAD** \((Eruca sativa,\text{ Mill.})\), a low-growing hardy annual from southern Europe, whose leaves resemble those of radish and turnip, is much used by the French as a spring and autumn salad and pot-herb. The flavor of the young, tender leaves, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown because there are milder-flavored plants that serve the same purpose. See \emph{Eruca}.

The first sowing may be made in early spring, the seed being dropped thinly in shallow drills a foot apart, with successional plantings each second or third week through the season. The soil must be rich and well supplied with moisture, else the leaves will probably be tough and acrid. Inter-culture is the same as for spinach, lettuce, and similar crops. Frequent watering and tillage in hot dry weather to insure rapid vigorous growth should result in succulent mild-flavored leaves. In summer the plants run rapidly to seed; in spring and autumn they will produce abundantly after being cut. The pale citron-yellow flowers emit a perfume resembling that of orange blossoms.

\[\text{M. G. KAINS.}\]
are almost equally distributed through the colder and temperate regions of the northern hemisphere, in Amer, extending to N. Mex., in Afr. to Abyssinia, and in Asia to India. The fls. show a remarkable tendency to become double, and such forms have been known and cult. from time immemorial. These innumerable garden forms, increasing every year, are almost exclusively of hybrid origin and are therefore omitted in the botanical classification of the genus.

Many attempts have been made to subdivde the genus with more or less satisfactory results; the more important are those by A. DeCandolle, Lindley, Regal, and Baker. Nowadays the arrangement proposed by Crepin is considered the most natural and satisfactory and has been followed in the account given below. Now the general monograph has been published since Lindley’s “Monographia Rosarum” (1820), except a rather short one by Regel in 1877. Of the more recent publications the most important are those of Crepin, especially his “Primitiae Monographiae Rosarum.” In consulting his publications one has to bear in mind that the author changed his opinion somewhat respecting the value of the species during his studies of the genus. In his later publications he takes a broader view in regard to the specific value of the rose forms and units under one species many forms which he formerly considered as distinct species. An illustrated monograph valuable for the knowledge of the older garden forms and species is Thory and Redouté’s “Les Roses,” with 160 colored plates (1817–20). It is quoted below as Red. Ros. As the first edition in folio is found in only very few libraries, the smaller edition is cited in parenthesis by volume, groups and the sequence of the plates, neither pages nor plates being numbered continuously in this edition. The most recent book on roses is Miss Ellen Willmott’s “The Genus Rosa,” with about 150 excellent colored and numerous black plates; in this work all the important species of roses, including most of the recently introduced Chinese species and the types of our cultivated garden forms, are described and figured. It is quoted below as W. R. (with the number of the species).

The economic properties of the rose are of little importance. The most valuable product is attar of roses, a highly fragrant essential oil. It is chiefly manufactured in southeast Europe and western Asia from Rosa alba and R. damascena, and of late this industry has been successfully transplanted to Germany. See Perfumery Gardening, page 2547. The fruits of some species, especially of R. villosa and R. canina, are made into preserves.

The roses are mostly low or medium-sized shrubs, usually with prickly stems, often more or less stoloniferous, sometimes climbing or creeping, with small or medium-sized odd-pinnate deciduous or evergreen foliage and with mostly large and showy, solitary or clustered flowers ranging in color from purple, crimson, or pink to white and yellow, and followed by ornamental usually scarlet or bright red fruits remaining on the branches a long time, sometimes through the whole winter. There is probably no flower more popular and better known than the rose. From time immemorial poets have sung its praise, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarkable to note, however, that the rose has played a far inferior part in the horticulture of the Chinese and Japanese. It is probably the first flower known and cultivated in a double state, and it is the double-flowered garden form whose image the word “rose” almost invariably brings to the mind, while to the wild single-flowered roses much less attention has been given. The ornamental value of single roses is rarely fully appreciated. The wild roses have a simple charm and graceful beauty of their own. No doubt the bold and dominating beauty of the double roses has eclipsed the more modest attractions of the single roses. The longer blooming season of the garden roses is also a factor in their favor. Though the wild roses cannot, perhaps, be compared with their more noble sisters of the garden, they are nevertheless fully able to rival other ornamental shrubs for the adornment of park and plot. Most of the species are hardy or almost hardy North; among the hardiest are R. rugosa, R. virginiana, R. carolina, R. acicularis, R. blanda, R. Woodsi, R. heliophila, R. palustris, R. rubrifolia, R. pendulina, R. canina, R. cinnamomea, and R. pomifera. Hardy at least as far north as Massachusetts are R. spinosissima, R. rubiginosa, R. multiflora, R. Helena, R. arvensis, R. setigera, R. gallica, R. setipoda, R. omeiensis, while others, as R. Wichuraiana, R. sempervirens, R. sericea, R. fatica, R. hemispharicosa, require some shelter or protection. Hardy only South are R. Banksia, R. bracteata, R. chinensis, R. lanigera, R. odorata, R. stellata. The recently introduced species from central and western China have not yet been sufficiently tested, but a large percentage appears to be hardy as far north as Massachusetts.

According to the habit peculiar to each species, they can be used for a variety of purposes. Most of the species are shrubby, rarely exceeding 6 or 8 feet, and may be used for borders of shrubbery or for covering slopes and rocky ridges, especially R. rugosa, R. carolina, and various American species. Some kinds, as R. rugosa and R. virginiana, make handsome ornamental hedges. The climbing species are used for covering walls, trelliswork, arbors, porches, or pillars, but perhaps display their beauty to the most advantage when allowed to ramble over shrubs or rocks. The half-evergreen R. Wichuraiana makes a beautiful ground-cover and may also be used for edging groups and flower-beds. The fruits of most species are decorative and
often remain on the branches all winter. The red stems of most of the species of the Carolinas and Cinnamomeae groups are effective in winter also. The foliage of most of the American species turns purple-orangy yellow in autumn, and so does that of R. rugosa, which is, in regard to the foliage with its dark green leathery and glossy leaves, the handsomest of the hardy roses.

With few exceptions the roses are of easy culture and grow in almost any kind of soil, except in a heavy and very sandy one. They are readily transplanted. The wild roses need little pruning; they should only be thinned out and the weak and old wood be removed; long and vigorous shoots should not be allowed to become dry, they usually do not germinate the first year, but if kept in the hips during the winter and allowed to become dry, they usually do not germinate until the second year. Mice are very fond of the seeds. Almost all species grow readily from cuttings of nearly ripened wood in summer under glass. Many species, especially the climbing roses, can be propagated by hardwood cuttings taken in fall and planted in spring. Layering is less often practised, except with a few species, like R. latifolia and R. hemisphaerica, which do not grow readily from cuttings. Some species, especially those of the groups of Cinnamomeae, Carolinas, and Gallicas, can be increased by root-cuttings; the roots are taken up in fall, stored during the winter, and then planted. In spring in drills and covered about 2 inches deep. The species of the last-named groups and some others are also often increased by suckers and division. Budding and grafting is less often done with the wild roses and should be avoided for roses in shrubberies where the individual plants cannot be carefully watched; the stock usually throws up suckers and outgrows the cion, often in a short time. For general notes on culture and varieties, see Rose.

### KEY TO THE GROUPS

For a horticultural classification of roses, founded primarily on garden values, see the article Rose.

Subgenus HULTHEMIA.

**Lvs. simple, without stipules:** *fls. yellow.*

**Section I. SImplicifolllae. Species No. 1**

Subgenus EUROSA.

**Lvs. pinnate stipulate.**

A. Styles exerted beyond the mouth of the receptacle.

B. Exserted styles connate into a column, usually as long as stamens. *fls. usually 8-5.*

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\[34, but slightly exerted in Nos. 65 and 64.

**B. Stipules free or adnate only at the base, small:**

emmanuel or climbing shrubs: *fls. white or yellow.*
c. Branches glabrous: lfts. 3–5, stipules entire or denticulate.

d. Fls. small, unlobed, yellow or white: pedicels and receptacle smooth: stipules subulate, caducous.

Section 4. BANKSIANAE. Species Nos. 15, 18

dd. Fls. large, solitary, white: pedicels and receptacle bristly: stipules denticulate.

Section 14. LEVIGATAE. Species No. 59

cc. Branches tomentose or pubescent: lfts. 7–9; stipules pectinate; fls. 1 or few, white, with large bracts at the base of the short pedicel: receptacle tomentose.

Section 15. BRACTEATE. Species No. 58

bb. Stipules adnate more than one-half of their length.

c. Receptacle smooth or hispid.

d. Lvs. of flowering branchlets 3–5-foliolate, large and firm: sts. usually with prickles and bristles: fls. upright, on long pedicels; receptacle bristly: sepals usually pinnate, reflexed after flowering, caducous.

Section 5. GALLICE. Species Nos. 17–21

dd. Lvs. of flowering branchlets 5–11-foliolate (rarely 3-foliolate, the fls. then short-pedicelled, with smooth receptacle).

Section 6. CANINE. Species Nos. 22–27

kk. Fls. solitary, without bracts, only occasionally intro. from its native country. A hybrid of R. persica, Michx. (R. simplicifolia, Salisb. R. berberifolia, Pall. Lvs. short-petioled, oval to oblong, acute at both ends, serrate, bluish green, pubescent. 3/4–1 1/2 in. long: fls. solitary, yellow, with red eye, about 1 in. across; fr. prickly. June. N. Persia to Siberia. B.M. 7096. B.R. 1261. G.C. II. 6:89, 9, 78. W.R. 1.—This peculiar rose is very rare in cult., since it is very difficult to grow. It has been successfully cult. in a cool greenhouse, exposed to the full sun, kept moist during summer and dry from October to March. The only way to prop. it seems to be by suckers; seeds are occasionally intro. from its native country. A hybrid of this species with R. involucrata is R. hydrogen, Cejus, with 5–7-foliolate lvs. and large yellowish white fls., with a deep orange eye. G.C. II. 24:469. Gn. 19, p. 473. P.M. 10:195. W.R. 2.

Subgenus HULTHEMIA.

Section 1. SIMPLICIFOLIAE. Only one Asiatic species, distinguished from all other roses by the simple exstipulate lvs.

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Subgenus EUROSA.

Section 2. SYSTYLA. A group of about 12 species (one of them American), well marked by the styles being connate into a slender exserted column. Sts. armentae or climbing, with hooked prickles: fls. in corymba, few or many; outer sepals pinnate, rarely entire, reflexed after flowering, caducous.

aa. Stipules pedunculate: prickles usually in pairs. 

bb. Stipules entire or denticulate: prickles scattered

cc. Receptacle prickly.

d. Lvs. on flowering branchlets 3–7-foliolate; lfts. cuneate-obovate, incisely dentate. 

Section 12. MINUTIFOLIAE. Species Nos. 55–57

dd. Lvs. of flowering branchlets 7–10-foliolate; lfts. elliptic or elliptic-oblong, sharply serrate.

Section 15. MICROPHYLLAE. Species No. 60

SUMMARY OF SECTIONS.

Section 1. SIMPLICIFOLIAE. Species Nos. 1–10

Section 2. SYSTYLA. Species Nos. 11–14

Section 4. BANKSIANAE. Species Nos. 15, 18

Section 6. CANINE. Species Nos. 22–27

Section 7. CAROLINAE. Species Nos. 28–32

Section 8. CINNAMOMAE. Species Nos. 33–48

Section 12. MINUTIFOLIAE. Species Nos. 55–57

Section 13. BRACTEATAE. Species No. 58

Section 14. LEVIGATAE. Species No. 59

Section 15. MICROPHYLLAE. Species No. 60

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bb. Stipules entire or denticulate: prickles scattered

cc. Receptacle prickly.

d. Lvs. on flowering branchlets 3–7-foliolate; lfts. cuneate-obovate, incisely dentate. 

Section 12. MINUTIFOLIAE. Species Nos. 55–57

dd. Lvs. of flowering branchlets 7–10-foliolate; lfts. elliptic or elliptic-oblong, sharply serrate.

Section 15. MICROPHYLLAE. Species No. 60
2. multiflora, Thumb. (R. polyanthos, Roессig, R. thyrsiflora, Léveillé, R. intermediá, Carr. R. Wickiana, Koch.) Fig. 3435. Deciduous shrub, with vigorous, long, recurving or climbing branches; lfts. usually 9, obovate to oblong, acute or obtuse, serrate, pubescent, 14-1½ in. long; fls. in many-fld. pyramidal corymbs, usually white, ½ in. across or more; sepals ovate, abruptly acuminate; styles glabrous; fr. small, globular.

June. Japan, China. B.M. 7119. G.F. 3:405 (adapted in Fig. 3435); 4:535; 6:316, 317. A.G. 18:677. A.F. 6:1003. G.C. 5:120, 121.-The typical form which is sometimes distinguished as var. Thunbergiana, Thory, has small single white fls. and is found in Japan and Korea. Var. cathayensis, Rehd. & Wilson. FIs. pink, about 1½ in. across, in rather flat corymbs. China. This is the wild single-fld. form from which the two following varieties have been derived. Var. carnea, Thol'Y (var. pluriflora, Regel. R. floridæ, Poir.). With double light pink fls. B.M. 1059. B.R. 425. Var. platyphylla, Thory, with larger lvs. and larger double, deep pink fls. B.R. 1372.

This is known as Seven Sisters Rose. A form of this with intense red and more numerous fls. is the well-known "Crimson Rambler," one of the best climbing roses (Fig. 3436). A.G. 10:233. Many hybrids have originated in cult.; they usually show their parentage by the pectinate stipules. A hybrid with R. rugosa is R. Poedræ, Sieb., with single, rather small white fls. W.R. 61. Of the same parentage, Makino, with small-pink fls. R. polyanthæ, Hort., not Roессig, is a trade name for hybrids with R. chinensis. Gn. 29:118. G.C. III. 28:135. G. 27:347. J.H. III. 43:425. The Dawson rose, or R. Dawsoniana, is a hybrid with General Jacqueminot. G.W. 7, p. 125. Hybrids with R. setigera, R. gallica, and R. Wickuriana have also been raised.

3. Watsoniææ, Crépin (R. multiflora var. Watsoniææ, Matsum.). Fig. 3437. Deciduous shrub, with sarmentose or recurving branches; lfts. 3-5, linear-lanceolate, with entire wavy margin, pubescent beneath, 1-2½ in. long; fls. in many-fld. pyramidal corymbs, ½ in. across or less, white or pink; style glabrous; fr. small.

June, July. R.B. 14, p. 183. G.F. 3:477 (adapted in Fig. 3437). W.R. 16.-A very curious rose of unknown origin, supposed to have been intro. from Japan, but not known in a wild state. Not quite hardy North.


5. Brunniæ, Lindl. (R. Brownii, Tratt. R. moschata var. nepalénæus, Lindl.). Himalayan Musk Rose. Tall shrub, with arching or sarmentose branches, glabrous or thinly villous while young; prickles scattered, hooked, short and stout; lfts. 5-7, elliptic-oblong to oblong-lanceolate, acute or acuminate, serrulate, soft-pubescent beneath, slightly pubescent or nearly glabrous above, 1½-2½ in. long; petioles and rachis pubescent, usually with scattered prickles; fls. white, fragrant, 1½-2 in. across, in large many-fld. corymbs; sepals lanceolate, loded, much longer than receptacle; pedicels long and slender, pubescent and glandular; styles pubescent: fr. ovate, ½-1½ in. long, glabrous; sepals deciduous. June, July. Himalayas, W. China. B.M. 4990. B.R. 529. F.S. 4:366, 397. Gn. 73, p.
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9. sempervirens, Linn. Evergreen shrub with long and slender, sarmentose, somewhat reddish branches: lfts. 5–7, obovate-lanceolate, acuminate, serrulate, glabrous, shining above, ¾–2 in. long; lfts. in few-fld. or rarely many-fld. corymbs, white, to 2 in. across, slightly fragrant; pedicels glandular-hispid; styles usually pubescent; fr. subglobose or ovoid, orange-red. June,
Lindl. white to purple. W. R. 111. Here belongs probably the A. arvensis, Nichols. (R. arvensis, Lindl.). Deciduous shrub, with sarmentose or creeping sts.: lfts. usually 5, large, of firmer texture: fls. long-stalked, large, usually 5, large, of firmer texture: fls. long-stalked, large, usually 5, large, of firmer texture: fls. long-stalked, large, usually 5, large, of firmer texture: fls. long-stalked, large.

A. Sts. with uniform prickles: lvs. glabrous.
b. Lvs. persistent or subpersistent.
cc. Fls. white, yellowish or light pink, very fragrant: fr. globose or depressed-globose; sepals usually entire: stamens without or with few marginal glands at the auricles.

11. odorata, Sweet (R. indica var. odoratissima, Lindl. R. Théa, Sav. R. chinensis var. fragrans, Rehd.). TEA ROSE. Shrub with long sarmentose often climbing branches armed with scattered hooked prickles: lvs. evergreen or half-evergreen: lfts. 5-7, elliptic or oblong-oblong, acute or acuminate, sharply serrate, lvs. above, glabrous, 1-3 in. long; stipules glandular-ciliate usually only above the middle.

13. Noisettiana, Thory. NOSSETTE ROSE. CHAMPENY ROSE. Supposed hybrid of R. chinensis and R. moschata. Sts. upright to 6 ft., with hooked uniform reddish prickles: lfs. 5-7, usually oblong-lanceolate or oblong-ovate, glabrous: fls. usually many in corymbs, rarely short-stalked, crimson or pink; rarely white, about 2 in. across, not or slightly fragrant; outer sepals usually petaloid: fr. obovate or turbinate, about 3/4 in. long. China. W.R. 26. The wild form recently discovered in Cent. Asia is var. spontanea, Rehd. & Wilson, with single deep red or pink, usually solitary fls. G.C. III. 31:438. The following varieties are garden forms:


Var. minima, Rehd. (R. Laurencianna, Hort. R. pendula var. pincola, Thory). Dwarf shrub, usually not over 1 ft. high, with small rose-red fls. about 1/2 in. across; petals often pointed. There are single- and double-flowered forms. The Fairy Roses belong to this variety. B.M. 1762. Red. Ros. (3:25, 6, 7).

Var. viridiflora, Dipp. GREEN ROSE. With monstrous green fls.; the petals are transformed into small, narrow green lvs. F.S. 11:1136.

Var. Manetti, Dipp. (R. Manetti, Hort.). Fig. 3441. Of vigorous growth, upright; pedicels hispid-glandular; fls. deep pink, single or semi-double. This variety has been recommended as a stock for forcing roses; grows readily from cuttings, but is not quite hardy.

3441. The Manetti rose. Much used as a stock (x1). See No. 12.

14. bourbonica, Morr. BOURBON ROSE. Supposed hybrid of R. chinensis and R. gallica. Upright shrub, with prickly and often glandular-hispid branches; fls. usually 5, ovate or ovate-lanceolate, acute, shining, slightly pubescent beneath; fls. large, on glandular pedicels, double or semi-double, usually purple, blooming in summer and fall. W.R. 114. Originated from a rose intro. about 1819 from the Island of Bourbon where it was found among seedlings of the Bengal rose by M. Périchon and sent by Mr. Breon, director of the botanic garden at Bourbon, to Jacques, gardener to the Duke of Orleans at Neuilly near Paris; this rose, called Rose Edward, by crossing with roses of the Gallica groups has given rise to the Hybrid Bourbon roses and is the origin together with crosses between this and other hybrids of R. chinensis and its varieties and R. damascena of the Hybrid Perpetual or Remontant class.

Section 4. BANKSIANJE. Contains one Chinese species with climbing, sparingly prickly or unarmed sts.: stipules quite free, pubescent, caducous; sepals entire, reflexed after flowering, caducous.

A. Pedicels glabrous; fls. small ............... 15. Banksiae
AA. Pedicels hispid; fls. large ............... 16. Fortunaeana


Section 5. GALlicas Contains one very variable species, native of Eu. and W. Asia. Low, upright shrub; the sts. with usually hooked prickles mixed with bristles; fls. few and often with narrow bracts or solitary on a usually bractless pedicel; sepals reflexed after flowering, caducous, the outer ones persistent; upper stipules not dilated.

A. Prickles very unequal: Lfs. usually doubly and glandular-serrate.
B. Texture of lfs. firm, leathery; pedicels upright ............... 17. gallica
BB. Texture of lfs. thin; lfs. sometimes simply serrate; fls. nodding, usually double ...................... 18. centifolia
AA. Prickles uniform: lfs. sickle-shaped, not glandular. (Supposed hybrids of R. gallica.)
B. Prickles numerous.
C. Receptacle glandular-hispid: Lfs. ovate-oblong, pubescent beneath ...................... 19. damascena
CC. Receptacle usually smooth: Lfs. broadly ovate or broadly elliptic, pubescent beneath ...................... 20. alba
BB. Prickles sparsely on the flowering branches rarely wanting: Lfs. glabrous beneath or pubescent only on the midrib ...................... 21. francofurtana


21. **franconfortana**, Muenchh. (R. *turbinata*, Ait.). Upright shrub, attaining 6 ft.: stns. with straight or hooked prickles: flowering branches almost unarmed: lfts. 5–7, oval, serrate, pubescent beneath, upper stipules much dilated; fls. 1–3, single or double, purple, 2–3 in. across, slightly fragrant; pedicels and receptacle glandular-hispid only at the base; sepals erect after flowering, entire or nearly so: fr. turbinate. June.

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3442. Rosa centifolia var. muscosa.—Moss rose. (X ½)

Section 6. **Canina.** Many species in Eu., N. Afr. and W. Asia. Upright shrubs, with scattered, usually hook-stems and numerous prickles; upper stipes dilated; corollas usually many-fld., with dilated bracts; outer sepals reflexed after flowering and caduceous or erect and persistent.

A. Lvs. pubescent, at least beneath, or glandular.
   a. Prickles slender, straight or slightly curved.
      b. *Lvs. smaller; branchlets purple, more or less pubescent*. June, July. Eu., W. Asia. B.M. 7241. W.R.
     c. *Lvs. broader, partly pubescent*. June.
    b. Prickles hooked, stout.
   a. *Lvs. glabrous*.  
   b. Foliage bright or dark green. 26. *canina*. 
   b. Foliage bluish green, tinged with red. 27. *rubrifolia*. 

22. **pomifera**, Herrm. (*R. villosa*, Linn., in part) Upright, densely branched shrub, attaining 6 ft., with almost straight spines; lfts. 5-7, oval to ovate-oblong, acute or obtuse, doubly glandular-serrate, grayish green, pubescent above, tomentose beneath, rarely glabrescent, 1-2 in. long; lfts. 1-3, pink, 1½-2 in. across, on briefly and glandular-pedicles: fr. scarlet, ovoid or subglobose, about ½ in. long, with persistent erect sepals. June, July. Eu., W. Asia. B.M. 7241. W.R. 141.—Hardy rose, with large ornamental fr. 


24. **rubiginosa**, Linn. (*R. Eglantiera*, Linn.). Eglantine. Dense shrub, attaining 6 ft., with hooked prickles often mixed with bristles: lfts. 5-7, orbicular to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, ½-1½ in. long; lfts. 1-3, on hispid short pedicels; bright pink, 1½-2 in. across; receptacle usually glandular-hispid: fr. subglobose or ovoid, orange-red to scarlet, with upright-spreading, usually caduceous sepals. June. Eu.; naturalized in some localities in the East. B.B. (ed. 2) 2:286. W.R. 146.—A handsome hardy rose of compact habit, with bright green foliage exhal- ing a very agreeable aromatic odor. There are some double forms and hybrids with other species.

25. **dumetorum**, Thullier. Upright shrub with spreading or recurving branches with stout hooked prickles: lfts. 5-7, close, oval-orbicular to elliptic, usually simply serrate, pubescent on both sides or only below on the veins, 1-1½ in. long: lfts. solitary to many, about 2 in. across; pedicels glabrous or stipitate-glandular: fr. ovoid to subglobose, orange-red, about ½ in. long, usually glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities. W.R. 132.—Very close to the following species and chiefly distinguished by the pubescence.


27. **rubrifolia**, Vill. (*R. glauca*, Poupin & Le ruyer, Desgl., not Vill.) Upright shrub, attaining 6 ft., with purplish purplish branches covered with catkin-like bloom: prickles few, hooked or straight: lfts. 7-9, elliptic or ovate-orbicular, simply serrate, bluish green and more or less tinged with red, ½-1½ in. long; lfts. 1-3 or more, pink, 1½ in. across, on usually hispid-glandular pedicles; sepals long, with dilated apex, upright-spreading, tardily caduceous: fr. subglobose, scarlet. June. Mountains of Cent. and S. Eu. B.R. 430. G.W. 7, p. 139. W.R. 133.—A very striking rose on account of its reddish foliage: fls. less conspicuous. Hardy North and prefers partial shade.

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3444. Rosa carolina var. triloba (×3) No. 30.
Section 7. CAROLINA. Contains only American species. Upright, mostly low shrubs: sts. slender, with usually straight prickles, placed in pairs or mixed with bristles: upper stipules usually narrow: corymbs generally few-fld.: sepals spreading after flowering; pubescent, the outer ones entire or with few erect lobs: achenes inserted exclusively at the bottom of the usually depressed-globose receptacle.

b. Lfts. finely many-toothed: prickles usually hooked: stipules convolute. 28. palustris

b. Lfts. coarsely toothed: prickles usually straight and slender: stipules flat.
c. Branches prickly only at the nodes or unarmed, only vigorous shoots bristly.
d. Prickles hooked: lfts. shining above. 29. virginiana
dd. Prickles straight or nearly so: lfts. dull above. 30. carolina

c. Branches densely bristly.

31. nitida

AA. Pedicels very short: lfts. 7-11, small and narrow

32. foliolosa


30. carolina, Linn. (R. humilis, Marsh. R. purpurea, Ehrh. R. virginiana var. humilis, Schneid. R. Ljoni, Pursh.). Fig. 3442. Shrub, 3 ft. or sometimes 6 ft. high, spreading by means of numerous suckers, with slender prickles and usually numerous bristles: lfts. 5-7, resembling those of the former, but narrower, thinner, not shining, usually pubescent beneath: fls. often solitary; outer sepals lobed. June. Maine to Ga., west to Wisc. and Okla. W.R. 64. —Much resembling the preceding, which is often considered a variety of this species. Var. villosa, Rehd. (R. humilis var. villosa, Best.). Lvs. villosa-pubescent beneath, thickish. Var. grandiflora, Rehd. (R. humilis var. grandiflora, Baker.). Fls. 2 in. across: lfts. larger. W.R. 66. Var. triloba, Rehd. (R. humilis var. triloba, Wats.). Fig. 3444. Petals 3-lobed. G.F. 2:77 (adapted in Fig. 3444).

31. nitida, Wild. Low upright shrub, 1 1/2 ft. high: branches covered with straight prickles and numerous bristles: lfts. 7-9, narrowly oblong, acute at both ends, bright green and shining above, glabrous, 1 1/2-1 in. long: fls. usually solitary, 1-2 in. across, on slender glandular-hispid pedicles; sepals entire. June, July. Newfoundland to Mass. B.B. (ed. 2) 2:285.

32. foliolosa, Nutt. Fig. 3445. Low shrub, 1 1/2 ft. high: sts. with rather few slender prickles, sometimes almost unarmed: lfts. 7-9, narrow or linear-oblong, bright green and shining above, glabrous or pubescent on the midrib beneath, 1 1/2-1 in. long: fls. solitary or few, pink, about 1 1/2 in. across; pedicels and receptacle smooth or sparingly glandular-hispid: fr. globose, with rather few achenes. May, June. Ark. and Okla. to Texas. G.F. 3:101 (adapted in Fig. 3445). — Like the preceding, a handsome dwarf shrub with graceful foliage.

Section S. CINNAMOMEA. Many American, Asiatic, and European species. Erect shrubs, with usually straight prickles, in pairs or scattered, and often with numerous bristles: lfts. 5-11; corymba usually many-fld., with dilated bracts; sepals generally entire, upright after flowering, and persistent, rarely deciduous receptacle usually smooth.

a. Branches and prickles tomentose.

AA. Branches and prickles glabrous.

b. Stipules, at least on the shoots, more or less convolute.

34. cinnamomea

bn. Stipules flat.

c. Prickles nearly always wanting (sometimes present in No. 37).

d. Lfts. simply serrate, 5-7.

e. Rachis of fl. puberulous: fls. single. 35. blanda

en. Rachis of fl. glabrous: fls. double. 36. Lheritierann

dd. Lfts. doubly serrate, 7-9: fr. oblong to ovoid. 37. pendulina

c. Prickles present.

d. Lfts. 5-7, only on shoots occasionally 9: calyx persistent.

a. Upper stipules enlarged.

f. Fls. usually several, 1-2 in. across: lfts. generally obovate, 1/2-1 1/2 in. long. 38. Woodsii

ff. Fls. usually solitary, about 2 in. across or more: lfts. 1-2 in. long.

Upright shrub, attaining 6 ft., with stout sts. densely beaet with prickles and bristles: lfts. 5-9, oval to obovate-oval, rugose, shining and dark green above, glaucous and pubescent beneath, thick and firm, 1/4-2 in. long; petioles tomentose and bristly; stipules dilated: fls. solitary or few, purple or white, 21/2-3 1/2 in. across; bracts large; pedicles prickly; receptacle smooth: fr. depressed-globose, brick-red, to 1 in. across. May-Sept. N. China, Korea. Japan. S.Z. 1:28. B.R. 420. Gt. 30:1049; 42, p. 537. G.C. II. 14:372. Gr. 46, p. 52:384; 55, p. 434. 1.H. 18:47. G.g. 1:7; 5:339. A.G. 13:342; 344: 18:507; 5:339. L.A. 2:76: 7:624. F.E. 18:6. I.H. III. 45:159.—Forms of typical R. rugosa, which is sometimes distinguished as var. Thunbergiana, C. A. Mey., are the following: Var. alba, Rehd. (var. albiflora, Koidzumi), with white fls. Gr. 9:356. G. 8:281. Var. álbo-plena, Rehd., with double white fls. Var. roséa, Hort., with pink fls. Var. rubra, Hort., with purple fls. Var. rubro-plena, Rehd., with double purple fls. Gr. 24:846. Geographical varieties, not of garden origin, are the following two: Var. Chamissoniana, C. A. Mey. (R. pubescens, Baker, not Roxby.). Bristles almost entirely absent on the branches: lfts. narrower and smaller, less rugose. A double-flld. form of this variety is sometimes cult. in Cent. China, but apparently not yet intro. into western gardens. Var. kamtschatica, Regel (R. kamtschatica, Vent.). With slenderer less densely armed branches, thinner less rugose lvs. and smaller fls. and frs. B.M. 3149. B.R. 419.—R. rugosa is one of the most ornamental and at the same time hardest of the single roses, valuable for shrubberies; it is very handsome on account of its dark green shining foliage, large fls. appearing during the whole summer, bright red conspicuous frs., and its beautiful orange and scarlet fall coloring. It is also attractive in winter by reason of its stout, densely armed sts. Large numbers of hybrids have been raised. By crossing with double-flld. garden roses, R. rugosa has given rise to a new race of hybrid roses remarkable for their hardness and long blooming season; one of the best known is Mme. Georges Bruant (Fig. 3449), with double white fls., a cross of R. rugosa and the Tea rose Sombreuil. Another cross with a form of R. chinensis is R. calocarpa, Willmott (R. rugosa var. calocarpa, Bruant), with single rose-colored fls. and handsome fr. produced very abundantly. Gr. 46, p. 538; 52, p. 384. R.H. 1895, pp. 446, 447. I.H. 42, p. 13. W.R. 60. Remarkable for its large fls. and large frs. is R. micro­gusa, Henkel (R. rugosa × R. microphila, R. Wil­mottini, Bean). Upright, very spiny shrub: fls. 7-11, small, pubescent: fls. pink, 3-4 in. across: fr. depressed-globose, about 1 1/2 in. across, prickly, orange-red. Gr. 59:1381. R.H. 1905:144. It is of vigorous growth and hardy and will probably make a good hedge plant. Hybrids are also known with R. multiflora (see E.


37. **pendulina**, Linn. (R. alpha, Linn.). Fig. 3432. Sts. slender, 3 ft. high, usually nearly unarmed, rarely prickly and bristly: lfts. 7-9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ½-1½ in. long; fls. pink, usually solitary or 2-5, to 2 in. across; pedicels and receptacle usually smooth: fr. usually nodding, oblong or ovate, with elongated neck, scarlet. May, June. Most of Eu. B.B. 424: J.H. III. 43:9. W.R. 90. —Handsome frec-flowering shrub. Var. pyrenica, W. D. Koch (R. pyrenica, Gouan). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gn. 27:544. Possibly a hybrid of this species and R. spinosissima in R. Moly, Kerner, similar in foliage to R. spinosissima, but with bright red fls. W.R. 100; one of the handsomest of the wild roses.


39. **nutkana**, Presl. Fig. 3452. Sts. stout, 5 ft. high, with usually straight prickles and sometimes bristly: lfts. 5-7, or sometimes 9 on shoots, broadly elliptic to oblong-saccate, generally rounded at the base, usually doubly glandular-serrate, almost glabrous, often glandular beneath, ¾-2 in. long; fls. usually solitary, pink, 2-2½ in. across: fr. globose, without neck. June, July. Alaska to Ore. and Utah. G.F. 1:449 (adapted in Fig. 3452). W.R. 75.—Has the largest fls. of the western species; pink.Var. hispida, Forn., has the receptacle glandular-hispid.

40. **acicularis**, Lindl. Sts. low, densely prickly: lfts. 3-7, broadly elliptic to narrowly oblong, rounded at base, simply or doubly serrate, pubescent beneath, ¾-2 in. long; fls. solitary, deep rose, ½-1 in. long. May, June. Alaska to Ont. and Colo., N. Eu., N. Asia, Japan. B.B. (ed. 2) 2:283. —A very variable species. Var. Bourgeauiana, Crépin (R. Sáyi, Schwein. R. acicularis var. Sáyi, Rehd.). Fig. 3453. Lfts. glandular and pubescent beneath, usually somewhat doubly glandular-serrate: fls. larger, often 2½ in. across; fr. usually globular. Ont. to Brit. Col. and Colo. Var. Engelmannii, Crépin in herb. (R. Engelmannii, Wats.). Fig. 3454. Similar to the preceding: lfts. distinctly doubly glandular-serrate: fl. oblong, to 1 in. long. Colo. to Brit. Col. G.F. 2:277 (adapted in Fig. 3454). Var. nipponensis, Hook. f. Lfts. smaller, ¾-¾ in. long; pedicels bristly: branchlets and

41. **californica**, Cham. & Schlcht. Sts. 8 ft. high, with stout, hooked or straight prickles, often bristly: lfts. 7-9, broadly elliptic to oblong-obovate, sparsely or evenly glandular-serrate, pubescent beneath or on both sides, often glandular, 1¼-1½ in. long; fls. on slender, usually smooth pedicels, over 1 in. across, few or several in dense corymbs; pink: fr. globose-ovate, yellow or brown when mature. May. B.M. 8569. J.H.S. 27:486. -This handsome rose 'has a very showy in June with its ample clusters of large pink flowers and again in fall with the nodding clusters of deep red hips.

45. **macrophylla**, Lindl. Large, upright shrub: flowering branches with few prickles or unarmed: lfts. 9-11, ellipsoid-ovate to elliptico-oblong, acute, sparsely serrate, glabrous above, pubescence beneath, 1½ in. long; stipules glandular-afficate: fls. 1-3, red, about 2 in. across; pedicels and receptacle glandular-setose or naked; sepals lanceolate, long-caudate, entire; fr. oblong-ovoid, red, 1½ in. long. Himalayas. W.R. 40. This species is tender and rare in cult. but several of the allied Chinese species when first intro. were distributed as *R. macrophylla* or varieties of *R. macrophylla*, such as *R. Moesii*, *R. setipetala*, *R. Davidii*, *R. sertata*, *R. persetosa* (see suppl. list for the last three species); to *R. persetosa* belong *R. macrophylla* var. *acicularis*, Vilm., and *R. macrophylla* f. gracilis, Vilm., while *f.* Foëke, belongs partly to *R. sericata* and partly to *R. Moesii*.

46. **Moesii**, Hemsl. & Wilson (R. macrophylla var. rubro-alba, Vilm.; R. Fargesii, Hort.). Densely branched shrub, 5 ft.: branches with scattered short straight prickles: lfts. 7-13, nearly sessile or ciliate to ovate-oblong or sometimes nearly orbicular, closely serrate generally except the slight; ploose midrib beneath, 1¼-1½ in. long; racis pubescent, glandular and bristly; stipules wide, glandular-ciliate: fls. solitary or 2, deep blood-red, 1½-2 in. across; pedicels short, stipitate-glandular like the receptacle, or the latter glabrous; sepals are ovate, abruptly long-caudate: fruit deep orange-red, oblong-ovoid, narrowed into a neck, 2½-3 in. long. June. W. China. B.M. 8585. J.H.S. 27:489. V.F. 95. G. 37:427. Gn. 72, p. 313.

J.H. III. 56:587. G.M. 51:478. —A strikingly beautiful rose; its fls. vary considerably in color, from dark blood-red, the color of the typical form, through deep rose to light pink. The extreme light pink form has been distinguished as *f. rosa*, Rehd. & Wilson.

47. **gymnocarpa**, Nutt. Sts. slender, attaining 10 ft., with straight slender prickles and bristles: lfts. 5-9, broadly elliptic to oblong, doubly glandular-serrate, usually glabrous, ½-1 in. long; fls. solitary on short lateral branchlets, pale pink, about 1 in. across; sepals short: fr. orange-red, globose, small; calyx drops before maturity. June. B.M. 7646. J.H.S. 27:486. —Very pretty rose, not to be confused with *R. Willmottiana*, Lévill., which is *R. longipes* (see suppl. list), nor with *R. blanda* var. Willmottiana, Baker.
Section 9. Pimpinellifolia. Few Old-World species. Upright shrubs, usually low; prickles straight, scattered, usually numerous and mixed with bristles; lfts. very small, usually 2, stipules narrow, with divergent and dilated auricles: fls. solitary, without bracts; sepals entire, erect and persistent.

AA. Flowering branches very prickly:
fls. pink, white, or yellow; fr. black. 49. spinosissima


Section 10. Lutea. Four Asiatic species. Upright or somewhat serpentine shrubs, with scattered, straight or hooked prickles, without bristles; stipules usually narrow, with divergent and dilated auricles: fls. yellow, without bracts; sepals usually pinnae, persistent, upright.

A. Prickles straight: lfts. doubly serrate


Section 11. SERICEAE. Three Asiatic species. Erect shrubs with the prickles in pairs; stipules narrow, with erect dilated auricles; fls. solitary, without bracts; sepals entire, persistent, and upright; petals usually 4; styles somewhat exserted.

a. Lfts. generally ovate or oblong, 7–11; fr. slender-stalked...


54. omeiensis, Rolfe. Fig. 3456. Shrub, to 10 ft.: the young shoots densely bristly: lfts. 9–17, oblong or elliptic-oblong, acute, cuneate at the base, serrate, glabrous, ½–¾ in. long: fls. white, over 1 in. across; petals usually 4; fr. ellipsoid, ½–¾ in. long, red, borne on a yellow or red thickened stalk of about equal length. May, June: fl. in July, Aug. W. China. B.M. 8471.

—A graceful shrub with handsome fern-like foliage, early white fls. and especially attractive in summer on account of the contrasting color of the red fr. and its yellow or red fluffy stalk, a feature which distinguishes it at once from any other cult. rose. Has proved hardy in Mass., while R. sericea is tender.


The large wing-like prickles, which are red and translucent while young, make this rose a conspicuous and striking object.

Section 12. MINUTIFOLLE. Three American species. Low shrubs with slender, scattered prickles; stipules with dilated and divergent auricles; fls. solitary, without bracts; sepals erect, persistent, the outer one pinnate; fr. prickly.


b. Branches globose: lfts. usually 5...55. mirifica

55. mirifica, Greene. Upright shrub, 2–4 ft.; st. green, glabrous, with slender yellowish white prickles and numerous bristles: lfts. usually broadly cuneate-obovate, incised or crenately dentate, the teeth sometimes glandular-serrate, slightly pubescent on both sides or nearly glabrous, light green, ¾–1½ in. long; fls. solitary, deep rose-purple, 1½–2 in. across; fr. irregularly and broadly turbinate, wrinkled, dull red, prickly.

Rosa minutifolia. Engelm. Fig. 3457. Dense shrub, to 4 ft. high: branchlets pubescent with slender brown prickles: lfts. 5–7, ovate to oblong, incised dentate, pubescent, ½–¾ in. long: fls. short-pedicelled, pink or white, about 1 in. across; fr. subglobose, hirsut. April, May. Calif. G.F. 1:102 (adapted in Fig. 3437). J.H. S. 27:456.—Tender.

Section 13. BRACITAVE. Two Asiatic species. Shrubs with erect or sericeous and tomentose or pubescent sts.; prickles in pairs; stipules slightly adnate and pectinate: inf. with large bracts; sepals reflexed after flowering; stamens tomentose.

58. bracteata, Wendl. (R. Macrines, Dum.). MACARTNEY ROSE. Sts. usually procumbent or sericeous, villous-tomentose, with stout hooked prickles: lfts. 5–9, oval to ovate, crenately serrulate, bright green above and somewhat shining, almost glabrous beneath, ⅓–2 in. long: fls. 1 or few, short-stalked, white, 2–2½ in. across; sepals and receptacle densely tomentose. June–Oct. S. China, Formosa; naturalized in Fla. and La. B.M. 1377. B.B. (ed. 2) 2:268. Gn. 70, p. 192.—Handsome half-evergreen climber, not hardy N. There is a double-flowered form.

Section 14. LEVIGATAE. One Asiatic species. Climbing shrub, with scattered hooked prickles: lfts. generally 8; stipules almost free; fls. solitary, without bracts, large, white; sepals erect, entire, persistent.


(Rosaceae.)


**ROSA**

**ROSE**

- **Family**: Rosaceae
- **Genus**: Rosa
- **Species**: Various species and cultivars

**Description**

- **Type of plant**: Perennial or deciduous shrub
- **Leaves**: Simple, opposite, toothed or entire
- **Flowers**: Single, in clusters, white, pink, red, or yellow
- **Fruits**:uyo, flattened, orchen\n
**Cultivation**

- **Preferred soil**: Well-draining, rich in organic matter
- **Light requirements**: Full sun or partial shade
- **Watering**: Moderate to low, depend on variety

**Uses**

- **Garden**: Ornamental, edging, hedges, topiary
- **Cut flowers**: Popular for floral arrangements
- **Edible**: Ripe rose hips can be used in tea and herbal medicine

**Common Varieties**

- **R. chinensis**: Chinese rose
- **R. canina**: Dog rose
- **R. gallica**: French rose
- **R. rugosa**: Hardy rose

**Historical and Cultural Significance**

- **Roses** have been cultivated for thousands of years, symbolizing love, beauty, and romantic love throughout history.

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**Additional Information**

- **Flower Arrangement**
- **Planting Guidelines**
- **Care Tips

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**Image Reference**

- **Image of Rose**
- **Additional Photographs**

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**Further Reading**

- **Books**
- **Online Resources**
- **Gardening Magazines**

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**Note**

- The information provided is a general overview and may not cover all aspects of rose cultivation and care.

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Following are the equivalents of some of the common names of roses:

- **Ayshire** – *R. arvensis var. capreaeata*
- **Banks Rose** – *R. Banksi*
- **Bengal** – *R. chinensis*
- **Bourbon** – *R. borbonica*
- **Champney** – *R. Noisettiana*
- **Creek** – *R. chinensis*
- **Cinnamon** – *R. cinnamomea*
- **Dumask** – *R. damascena*
- **Dog** – *R. canina*
- **Eglantine** – *R. rubiginosa*
- **Macartney** – *R. bracteata*
- **Memorial** – *R. Wichurana*
- **Moss** – *R. gallica var. moschata*
- **Noisette** – *R. Noisettiana*
- **Prairie** – *R. setigera*
- **Provence** – *R. gallica*
- **Scotch** – *R. moschata*
- **Sweetbrier** – *R. rubiginosa*
- **Tean** – *R. odorata*

When one speaks of roses, the hearer is likely to think only of the large improved kinds of the gardens; and yet there are more than one hundred well-recognized species-forms of Rosa, while only a dozen or so have entered largely into the horticultural forms. The systematic account beginning on page 2981 describes sixty species, and many more are entered in the supplementary list at its conclusion. The results of domestication are marvelous, and yet the real breeding of roses is little more than begun, and it confounds the imagination if one contemplates what may appear when endless new combinations are made with the many species that are yet little modified by man. The beginnings in this endeavor by persons in this country and elsewhere, indicate a rich field for useful experiment.

These other species of Rosa, aside from the domesticated forms, are of interest and merit largely for landscape planting. Usually we do not think of roses as “shrubbery” but rather as “flowers;” yet *Rosa rugosa* is a good landscape subject, and the same is true of *R. setigera, R. multiflora, R. levisigera,* and many other species. The lists and suggestions by Rehder, on page 2982, are valuable in this connection. Some of the native wild roses are most attractive in their natural setting, not alone in flowers but in foliage, color of stems, fruit, and general habit; and if the grounds include a suitable area, these plants may well be transferred in quantity. In half-wild and informal borders, on banks, along streams and the margins of woods, many of the roses are admirable. The usual horticultural roses are of little merit in landscape work, because they do not supply sufficient foliage and they lack strong shrubby characteristics; and this fact has no doubt obscured the merits of the wild single roses as material for planting.

The highly improved roses are essentially flower-garden subjects, and they produce better bloom when grown by themselves in regular areas, plantations or beds, where they may receive tillage and such other treatment and care as are specially adapted to them. The preferable location is on the private property, not at the place, at the side or rear, and well removed from tall buildings and overhanging trees. They should be given ample space, good soil, and liberal fertilizing, as one would provide these requisites for strawberries, bush-fruits or tomatoes.

The value of the rose product is particularly difficult to estimate. A census-accounting could assemble figures for the nursery stock, the glass devoted to rose-culture, and the value of roses sold by commercial establishments; but the greatest value of the rose is the unmeasurable satisfaction that it returns in thousands of homes and the ministry that it renders to millions of persons.

The literature of the rose is voluminous. The American book writings on the subject are listed on page 1552, Vol. III. For a list of rose books in all languages, see “Bibliografia de la Rosa,” by Vergara, Madrid, 1892.

**Rose organizations.**

The American Rose Society was organized in New York, March 13, 1899, “to increase the general interest in the cultivation and improve the standard of excellence of the rose for all the people.” To organize a system of exhibitions, and otherwise “to foster, stimulate, and increase the production in every possible way of improved varieties of the rose, suitable to our American climate and requirements.” The Society is a clearing-house for those interested in roses.

Including at first primarily so-called commercial rose-growers—those who grow roses the year round for cut-flowers—the Society has gradually broadened until a considerable number of interested and capable amateur rose-growers are included. Intensive consideration for the rose is fostered by the exhibitions that the Society either gives or takes part of which it exercises authoritative supervision. For example, four so-called national flower shows, held in Chicago, New York, Boston, and Philadelphia, have had as a prominent attraction notable displays of roses forced into bloom in the early spring, usually offered in competition for the prizes gathered under the leadership of the Society. Inasmuch as these displays have included many of the better climbers and garden roses, large numbers of persons are thereby brought into contact with these advances in rose-culture.

*Rose test-gardens have been established under the supervision of The American Rose Society in several places, including, for example, Hartford (Conn.), Washington, Minneapolis, and at Cornell University, Ithaca, N. Y. In these gardens no less than five plants of certain varieties are grown*
XCIX. Rose.—White, Bride; pink, Bridesmaid.
under comparable conditions, and committees of the Society make an annual inspection at the time of bloom. The rose test-garden in Hartford, in connection with the well-known and beautiful municipal garden planted in 1904 by Theodore Wirth, has proved a wholesome attraction to the more than 115,000 persons who have annually visited it. The superintendent of the Hartford park system estimates that the area included in the rose-garden attracts visitors at the rate of 5,000 persons a year, thus increasing the use of a park system.

The Society maintains a bureau of registration for new roses, provides a scale of points for judging both blooms and plants, and awards medals and certificates for new roses. Its membership includes three classes—life, active, and associate—the latter relation being open only to amateur rose-growers. In 1916, The American Rose Society began the publication of The American Rose Annual, under the editorship of J. Horace McFarland.

Under the leadership of E. M. Mills, of Syracuse, New York, an organization was formed in that city under the title of the Syracuse Rose Society, for the purpose of stimulating local interest in rose-growing. The ideal proposed by Dr. Mills is noted in the following extract from his article in the 1916 American Rose Annual: “It is far more important that 500 people in a city have rose-gardens with from twenty-five to a few hundred bushes in each of them than that there should be only a few large show gardens.” Other societies have been formed in the Pacific Northwest directly to promote rose-growing, and various garden clubs and local societies have affiliated with The American Rose Society under its rules. There are a number of affiliated interests. Any horticultural society in the United States or Canada holding an annual exhibition of roses may affiliate with The American Rose Society, and receive medals for the exhibitors.

The present assembly on the rose, aside from the systematic account of Rose, pages 2981 to 2999, comprises the following articles:

Horticultural classification of roses.

The garden classification of roses presents considerable difficulty, as the several groups have been so much mixed that the original characteristics of each overlap at nearly all points. This is particularly true of the Perpetuals, of which any close classification is impossible. The difficulties increase as one advances. Certain clear-cut characters may be taken to mark given distinct groups in the summer roses, with which the horticulturist has not hurried himself so much. Nearly all of these characters are reproduced in the Perpetuals, and, being blended, give rise to endless confusion; thus the following scheme is merely suggestive and should be studied in comparison with the botanical classification (see page 2983).

American rose-culture, so far as garden varieties are concerned, can hardly be said to have established itself as yet. Our growers are today striving to overcome the short-lived character of the blooms, so as to secure in our gardens something of the rose beauty of Europe. The Wichuraiana, Rugosa, and Multiflora roses, combined with our native species and blended again with the best representatives of the garden-varieties already grown, with the admixture of some of the newer species from western China, seem to offer the solution. The beginning has already been made. The hot sun and trying climatic conditions of our summers are fatal to the full beauties of the roses of France and England. The flower is developed so quickly that it has no opportunity to “build” itself, and once developed it fades as rapidly. What has been accomplished for the other florists’ flowers remains yet to be accomplished for the rose, and the American rose of the future must be developed to suit the circumstances in the same way that the American carnation has been produced.

**CLASS I. SUMMER-FLOWERING ROSES, BLOOMING MOSTLY ONCE ONLY.**

A. Large-flowered (double).

b. Growth branching or pendulous; leaf wrinkled... 1. Provence
Moss
Pompon
 Sulphurea.

b. Growth firm and robust; leaf downy........ 2. Damask and French
Hybrid French
Hybrid Provence
Hybrid Bourbon
Hybrid China.

bb. Growth free: leaf whitish above, spineless...
3. Alba

aa. Small-flowered (single and double).
bb. Growth climbing: flowers produced singly... 4. Ayrshire
bb. Growth short-jointed, generally, except in Alpine and Prairie... 5. Briers

Austrian
Scotch
Sweet
Pentance
Prairie
Alpine.

bb. Growth climbing or rambling: flowers in clusters...
6. Multiflora
Baby Ramblers.

bb. Growth free; foliage persistent (more or less), shiny........ 7. Evergreen
Sempervirens
Wichuraiana
Cherokee
Banksian.

bb. Growth free; foliage wrinkled........ 8. Pompon

**CLASS II. SUMMER- AND AUTUMN-FLOWERING ROSES, BLOOMING MORE OR LESS CONTINUOUSLY.**

A. Large-flowered.

b. Foliage very rough...... 9. Hybrid Perpetual
Hybrid Tea
10. Moss

bb. Foliage rough...... 12. Bourbon
13. Bourbon Perpetual

bb. Foliage smooth...... 14. China
Txa

bb. Foliage smooth, very shiny and vigorous 15. Perpetua

aa. Smaller-flowered.

b. Foliage deciduous.

c. Habit climbing...... 16. Musk
17. Ayrshire
18. Perpetual Multifloras
Wichuraiana Hybrids

co Habit dwarfi, bushy... 19. Perpetual Briars
Rugosas
Ludida
Microphylla
Bergerii
Scotch.

bb. Foliage more or less persistent...... 20. Evergreen
Macartney
Wichuraiana
Garden-group 1. _Provençal_. Fragrant; branching or pendulous; fls. generally globular; foliage bold, broad, wrinkled, deeply serrate; prickles uncertain; sometimes fine and straight, sometimes coarse and hooked. Rich soil. Prune closely unless very vigorous. Types are: _Moss rose_, a created form of the _Provençal_ (Fig. 3442).

3462. American Beauty, one of the most popular roses in America. One of the Hybrid Perpetual class.
The picture shows a specimen grown in the open. (X 1/4)

Garden-group 2. The _Damask_ and French. Damask roses are fragrant; growth robust; spinous; lvs. light green, downy, coriaceous. Hardy; free-flowering; scent destroyed on drying.

French roses: Fragrant (moderately); more upright and compact in growth than the _Provençal_; prickles smaller and fewer; fls. generally flat. Very hardy, growing in any soil; petals bleach in strong sunlight; makes abundance of wood, which should be thinned out; perfume develops in the dried petals.

Hybrid French or Hybrid _Provençal_, a less robust group with smoother, short-jointed wood and generally light-colored flowers. Type, _Princess Clemence_.

Hybrid China (China _×_ French and _Provençal_, par-taking more of those parents). Growth more diffuse than the French rose: foliage smooth, shining, and remains on the bush late in the year; thorns numerous and strong. Vigorous of growth; very hardy, and not generally well adapted to poor soil; requires but little pruning.

Garden-group 3. _Alba_, or white roses. A very distinct group; all light-colored flowers of moderate size; leaf whitish above, deep green below; spineless (some hybrids with other groups are very thorny), of free growth; prune closely. Type, _Feleite Parmentier_ and _Maiden’s Blush_.

Garden-group 4. _Ayrshire_. Climbing roses; very hardy; slender shoots suitable for trellises and trunks of trees: fls. produced singly. Useful for pot cultivation when trained over a frame; fls. vary from white to deep crimson. Type, _Queen of the Belgians_, _Dundee Rambler_. _Ruga_ is a hybrid between this group and one of the _Teas_; fragrant.

Garden-group 5. _Briers_. Under this heading may be grouped most of the well-defined types of garden roses, mostly small-flowered and which do not readily respond to high cultivation. They are more useful as flowering shrubs in the garden than for cut-flowers. The blooms are generally short-lived.

_Austrian_ or _Yellow Briers_. Small leaflets: solitary flowers: bark chocolate-brown. Very hardy, but require free air and dry soil; will stand very little pruning, as it produces flowers from the upper ends of the old wood. Types, _Harison’s Yellow_, _Austrian Copper_, and _Persian Yellow_.

Scotch or Spiny. This group is well recognized by its excessive spininess; compact low bushes, flowering abundantly and early: flowers small, double. Multiply by underground suckers; fragrant. One hybrid of this group, _Stanwell_, is a Perpetual.

Sweetbrier. Distinguished by the fragrance of its leaves: the fruits are also decorative: foliage small: flowers light-colored and not of much merit.

_Lord Penzance Briers_. This is a group of hybrids of _R. rubiginosa_ (the _Sweetbrier_), and the older large-flowered varieties, especially _Bourbon_ and _Damask_.

The results are hardly distributed in America as yet; a few are to be found in select collections. Generally speaking they may be described as very greatly improved Sweetbriers. _Brenda_ is particularly desirable for its fruit.

_Prairie rose_ ( _R. setigera_). A native species; promises under cultivation to develop some valuable acquisitions, especially in hybridization with other groups: Type, _Baltimore Belle_ (Fig. 3439).

_Alpine_ or _Boursault_. Native of the Swiss Alps; semi-pendulous, long, flexible, smooth shoots: flowers in large clusters; mostly purple or crimson flowers. Good for pillars; very hardy; especially suitable for shady places; should be well thinned in pruning, but the flowering wood left alone: type _Amadis_. Produced by crossing _Teas_ and _R. alpina_.

Garden-group 6. _Multiflora_. The _Multiflora_ group divides itself naturally into the _Multiflora_ true and _Baby Perpetual_ Rambler. _R. multiflora_, the parent type, is characteristic of the varieties here, the flowers being produced in large corymbs and continuing over a comparatively long time. These varieties are useful as pillar and trellis roses and respond to high cultivation. In pruning, remove only the (old canes, leaving the young new growth to carry flowers next year.

The _American Pillar rose_ belongs here (Fig. 3451). This group is particularly well adapted to the wild-garden. The name _Polyantha_, sometimes applied to these roses, should be dropped to avoid confusion. The _Rosa polyantha_ of botanists is a synonym of _R. multiflora_ (p. 2985), but the _Polyantha_ of horticulturists are hybrids of _R. multiflora_ with _R. chinensis_ or _Hybrid Perpetuals_; they are low bushy plants, first described as _Polyantha_ varieties by Carrière in _Revue Horticole_, 1884.

Garden-group 7. _Evergreen_. The so-called _Evergreen_ roses hold their foliage until very late in the year and in hybridization appear likely to yield varieties which are practically evergreen.
Sempervirens, useful as pillar roses, producing flowers in corymbs: very hardy; vigorous growth: free bloomer: requires considerable thinning in pruning. Types, Felicite perpetuella.

Wichuriana (Fig. 3440), most popular of all the rampant roses: very hardy, growing in any soil: this promises to be the basis of a very valuable race of American roses: flowers in the type white. Hybrids have been raised from Hybrid Perpetual and Tea varieties giving large flowers, scented; such are Gardenia and Jersey Beauty. Many hybridists have worked on this species, and the past few years have thoroughly made good the early promise of remarkable developments.

Clementine (Rosa lavandula) of the southern states can be grown satisfactorily away from its native regions only in a greenhouse. (Figs. 3463, 3459.)

The Banksian (Rosa Banksiae). Two varieties of this are known, the yellow and the white. Requires greenhouse treatment: evergreen; needs very little pruning, merely shortening the shoots that have bloomed. Yellow variety scentless, white variety possessing the odor of violets: flowers are produced in graceful drooping clusters. See Summer Roses and Fig. 3464.)


Garden-group 9. Hybrid Perpetual, or Hybrid Remontant. A large and comprehensive group of mixed origin. The mixture with other groups has become so involved as to render separation practically impossible. The characteristics may be described as stiff, upright growth, sometimes inclined to pendulous: flowers of all types: foliage dull green, wrinkled, not shiny; embracing generally the characteristics of the Provence, Damask, French, and the Chinese groups: flowers large, inclined to flat, generally of dark colors. By far the largest and most comprehensive division. (Figs. 3462, 3463.)

Garden-group 10. Hybrid Tea. The La France group belongs here. (Fig. 3568.)

Garden-group 11. Moss. A perpetual-flowering group of the Provence. See Summer Roses and Fig. 3462.

Garden-group 12. Bourbon. Dwarf and compact growth, with rounded, more or less shining leaves, very floriferous: brilliant colors: good outline; in perfection late in the season: requires close pruning. Type, Hermosa (or Armosa).


Garden-group 14. China (Rosa chinensis). The China or Monthly rose is characterized by its positively perpetual manner of flower. Its blooms become much darkened in color from the action of the sun's rays: flowers small and irregular in shape. Somewhat tender.

The Tea-scented China or Tea Rose (Fig. 3465), Rosa odorata, is an allied species. It has large thick petals, with the characteristic tea scent: flowers generally light-colored, pink and creamy yellow: growth free: the best for forcing. The group has been hybridized with all other sections and the Tea influence is seen throughout the rose family. Some of the varieties are climbing. Type, Bon Silene and Homer.

Lawrenceana. Dwarf forms, requiring the same treatment as the Teas. Commonly known as the Fairy Rose.

Garden-group 15. Perpetua. Crosses of Hybrid Teas and "Austrian" brier. Habit generally like Hybrid Teas but more vigorous, with stout spines and coarse shiny foliage. The chief distinction, however, is in the remarkable coloring of the flowers, which is indescribable, but often spoken of as "shrimp," with blendings and shadings of burnished copper. Tendency to shed foliage unless grown on almost pure clay. Some forms, as Juliet, show affinity to Austrian in resenting pruning, but later kinds are closer to Tea. Type Madame Edouard Herriot.

Garden-group 16. The Musk. Very fragrant: rather tender: derived from Rosa moschata: flowers of pale color. This group has been much hybridized with others, and its identity is lost as a garden plant in that of its derivatives, especially the Noisette. The flower buds are elongated and the flowers produced in clusters.

Noisette (Fig. 3469). Larger flowered than the true Musk roses, flowering very late: free growth: more hardy. The group bears a certain superficial resemblance to the Teas and requires moderate pruning; will grow in any soil. The subgroup has been largely blended with the Teas and with a loss of hardness. In consequence it has fallen into disuse.

Garden-group 17. Ayrshire. Perpetual forms of the Ayrshire. For characters, see Summer Roses.

Garden-group 18. Perpetual-flowering varieties of the Multiflora group. The term in gardens is taken to include a large number of small cluster-flowered, climbing roses, and is particularly important in American rose-culture, as the basis of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichuriana and Teas. M. H. Walsh in Mas
sachusetts, M. Horvath in Ohio, and Jackson Dawson in Massachusetts have accomplished important work in this field. Some of Walsh's recent introductions, as Debutante and Sweetheart, not as yet fairly tried, and the Dawson rose, may be classed here. They are valuable as trellis and pillar roses for garden decoration.

Seeds.—Roses are grown from seeds not only to obtain new varieties but also because many true species are economically procured in this way, e. g., *R. canina*, *R. multiflora*, *R. ferruginea*, *R. rugosa*, *R. rubiginosa*, and the like. The seeds should be gathered in autumn and at once stratified with moist sand or allowed to ferment in tubs with a little water, and kept in a fairly warm place. When well rotted they can be easily rubbed and washed clean and should be planted at once, either in carefully prepared and well-manured beds out-of-doors or in pans or flats in a cool greenhouse. It is sometimes advised that the hips should first be dried and then rubbed clean, but this method often causes delay in germination, a matter sufficiently troublesome without additional complications; they should always be kept moist. Whether they are planted under glass or in the garden it is difficult to forecast their coming up. It may be within a few weeks, e. g., *R. multiflora* under glass; or at the beginning of the second growing season after planting, e. g., Sweetbrier seed planted out-of-doors in November, 1914, may be expected to germinate in the spring of 1916, while *R. rugosa* sown at the same time may come up the following spring; i. e., in 1915, or, a season intervening, it will appear with the Sweetbrier in 1916. Stratifying or fermenting the seeds tends to secure uniform germination within a reasonable time. It has also been suggested, and many things confirm the idea, that early gathering helps to hasten germination; in other words, do not wait for excessive ripeness, but pick the hips as soon as the seeds harden, some time before the fruit is deep red. Until these matters are better understood, all rose seeds sown out-of-doors, either in autumn or spring, should be mulched 2 to 3 inches deep with pine needles or other litter. Frequent examinations should be made in spring and the covering at once removed when the seedlings appear; if they do not appear, let the mulch remain to keep down weeds and retain moisture in the seed-bed. Pans or flats in which seed has been planted should be kept at least eighteen months before discarding, with the soil always moist. Notwithstanding the difficulties of germination, the young seedlings make most satisfactory growth and may generally be transplanted into nursery rows when

**Garden-group 10. Perpetual Briers.** Of this group there are about five important types. Rugosa or Japan rose, a low-growing bush: hardy: useful as a hedge plant, and specially adapted for exposed situations near the seashore (Figs. 3446–3448). Hybrids have been made with other Perpetual groups, especially Teas and H. P.'s. Mme. Georges Brunat is a type. The Rugosa blood is strongly seen in all cases.

Microphylla has minute leaflets; now called *Rosa Roxburghii*.

Guarderidifolia has leaves somewhat resembling barberry; now known as *Rosa persica*.

Perpetual Scotch, a perpetual-flowering form of *Rosa spinosissima*, probably a hybrid from the Danusk.

**Garden-group 20. Evergreen.** Two types, as follows:

Macartney, slender: sweetly scented and very floriferous throughout the season. Is derived from *R. bracteata*.

Wichuraiana. The Wichuraiana hybrids already referred to under Group 7 may dubiously be included here. They have not yet been sufficiently tested. The perpetual-flowering Ramblers have foliage partaking of Wichuraiana and Tea characteristics.

**Leonard Barron.**

**Propagation of roses.**

The rose is propagated by seeds, cuttings, grafting or budding, by layers and by divisions. The genus is so large and diversified and the requirements are so many that the whole art of the propagator is needed to satisfy the claims of the Queen of Flowers.

**Seeds.**—Roses are grown from seeds not only to obtain new varieties but also because many true species are economically procured in this way, e. g., *R. canina*, *R. multiflora*, *R. ferruginea*, *R. rugosa*, *R. rubiginosa*, and the like. The seeds should be gathered in autumn and at once stratified with moist sand or allowed to ferment in tubs with a little water, and kept in a fairly warm place. When well rotted they can be easily rubbed and washed clean and should be planted at once, either in carefully prepared and well-manured beds out-of-doors or in pans or flats in a cool greenhouse. It is sometimes advised that the hips should first be dried and then rubbed clean, but this method often causes delay in germination, a matter sufficiently troublesome without additional complications; they should always be kept moist. Whether they are planted under glass or in the garden it is difficult to forecast their coming up. It may be within a few weeks, e. g., *R. multiflora* under glass; or at the beginning of the second growing season after planting, e. g., Sweetbrier seed planted out-of-doors in November, 1914, may be expected to germinate in the spring of 1916, while *R. rugosa* sown at the same time may come up the following spring; i. e., in 1915, or, a season intervening, it will appear with the Sweetbrier in 1916. Stratifying or fermenting the seeds tends to secure uniform germination within a reasonable time. It has also been suggested, and many things confirm the idea, that early gathering helps to hasten germination; in other words, do not wait for excessive ripeness, but pick the hips as soon as the seeds harden, some time before the fruit is deep red. Until these matters are better understood, all rose seeds sown out-of-doors, either in autumn or spring, should be mulched 2 to 3 inches deep with pine needles or other litter. Frequent examinations should be made in spring and the covering at once removed when the seedlings appear; if they do not appear, let the mulch remain to keep down weeds and retain moisture in the seed-bed. Pans or flats in which seed has been planted should be kept at least eighteen months before discarding, with the soil always moist. Notwithstanding the difficulties of germination, the young seedlings make most satisfactory growth and may generally be transplanted into nursery rows when
one year old. When two years old they are fit for permanent planting. A winter protection of pine boughs is helpful to the young plants. Some seedling roses are extremely precocious, blooming before they are one year old, e.g., some Hybrid Perpetuals and so-called Polyantha roses. The first flowers of seedling roses do not always indicate their real character; in hybridizing it is well to wait for the second or third season before discarding.

Cuttings.—A common means of propagation, under glass and out-of-doors, is by cuttings. Under glass short cuttings 2 to 3 inches long can be made in November and December from wood of the current year's growth. They should be firmly planted in sand, in flats or pans (Fig. 3467) and kept in a cool greenhouse. They root in February or March, and can either be potted in thumb-pots or kept on in flats until May or June, when they should be planted out in rich beds; salable plants are obtained in October. This is the shortest way to strike R. setigera and its varieties, Crimson Rambler and its allies, R. multiflora, and their various offspring, R. Wichurana and its hybrids, Madame Plantier and doubtless many others. Rosa indica, in all its forms, all tender species, and many Hybrid Perpetual roses, are propagated by cuttings of hardened wood grown under glass. Peter Henderson says the wood is in the best condition when the bud is "just open enough to show color." Blind eyes can also be used, and the smaller wood is better than the strong rampant growth. Plant in sand and in a warm house; bottom heat and a close frame are often used but are not necessary. The cuttings are from 1½ to 2 inches long; single eyes strike readily.—In the open air, cuttings of ripened wood may be planted in spring in V-shaped trenches in carefully prepared and well-manured ground. They make strong plants in autumn. Wood of the season's growth is gathered before severe frost, cut into 6-inch lengths, tied in bundles, and stored through the winter by burying in sand, moss, or earth. They root in February or March, and can be planted in pots until they can be hardened off and planted out in May or June, the point of union being well below the surface. A specimen of Dawson's work is shown in Fig. 3468, the stock being a bit of R. multiflora root; its age is about three months.

Rosa multiflora is an excellent stock for garden roses, since it does not sucker; this great advantage, is also obtained by using the root-graft as above described. (See article on roses in Country Life in America, March, 1916, by Geo. C. Thomas, Jr.) The commercial florists use Manetti stock planted in thumb-pots. Cut back to the crown, this is splice-grafted and kept in a warm close frame until united; plants are afterward grown on in pots until large enough to put out in the beds, in which they will flower the following winter. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants: just now many of the foremost growers prefer the latter for forcing. It is a perplexing question and could be settled by only a series of exact experiments costing much time and trouble.

Rosa canina is used for standard, R. Manetti for dwarf stocks. Under glass roses are budded also, with a shield-bud, at any season when the bark slips, using for stock a vigorous variety. About Boston the yellow and white Banksian roses once had high local repute for stock for Tea and other tender kinds.

Grafting roses in the open air in this country is not often employed, but in the South, Hybrid Perpetual and other hardy roses are said to be root-grafted in winter (very much as apple stocks are grafted), tied in bundles, stored in sand, and planted out in early spring, the worked portion being set well below the surface. Root-grafting is not sucker; this great method of propagation under glass. Jackson Dawson's practice is to use the whip- or splice-graft, but the veneer-graft is also employed, with bits of R. multiflora root 2 to 3 inches long for the stock, the cion being somewhat longer but of equal diameter. They are firmly tied with raffia and waxed made into bunches, they are covered with moist moss in an open frame in a coolhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface. A specimen of Dawson's work is shown in Fig. 3468, the stock being a bit of R. multiflora root; its age is about three months.
money. It is also quite possible that matters of tempera­
ture, soil, moisture, and food are equally important fac­
tors.

Layering.—This method is employed only when few plants are required; it is cumbersome and wasteful. Layer in early spring, using wood of the last year’s growth; where possible, the bark of the buried portion should be abraded.

Division is an easy means of increasing. Rosa virgin­
iana, R. nitida, R. palustris, R. spinosissima, Crimson Moss and many other varieties which sucker. Plant them in rich soil, and if they are not to grow from three to four years, then lift and tear apart. It will be found that the increase is large and that plants so obtained are salable after one year’s growth in the nursery. The year in the nursery may be omitted with the quicker-growing kinds which are to form new plantations on the same estate.

B. M. Watson.

Roses for the amateur.

Roses may be successfully grown in any soil that will produce fair crops of grain, vegetables, or grass. Certainly the best results will be secured in the more favorable soils and situations, but everyone who loves a rose and possesses a few feet of ground with plenty of sunshine can have his own rose-garden and find pleasure and health in cultivating the plants.

The soil and the beds.

The ideal soil is a rich deep loam, but a soil that will produce fair crops of grain, vegetables, or grass. Certainly the best results will be secured in the more favorable soils and situations, but everyone who loves a rose and possesses a few feet of ground with plenty of sunshine can have his own rose-garden and find pleasure and health in cultivating the plants.

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than on their own roots, and some are utterly worthless unless budded, notably, Reine Marie Henriette and Viscountess Folkstone, both charming roses when well grown. The budded plants are mostly grown in Europe, taken up as soon as the wood is ripened in the autumn, and shipped to us in the dormant state in time for planting in the latitude of Philadelphia before the ground is frozen. They are usually received in such excellent condition that rarely one in a hundred of the hardy sorts fail to make a good growth, and a fair bloom the following season.

With the tender sorts, dormant planting out-of-doors in late autumn is attended with much risk, because of the inability of these plants to endure the rigors of our winters before becoming established. Consequently, they need much more protection than the plants in pots. In the spring, if the plants can be safely housed through the winter. After they have become successfully established their safety is assured, and they will repay in vigor and excellence the extra work expended on them. Few amateurs, however, have the conveniences for caring for a number of plants under cover in the winter. Therefore they must take the risk of planting in the autumn or cultivate plants grown on their own roots. (For further discussions of budded and grafted roses, see page 3005.)

For budded roses, holes at least 1 foot deep and 15 inches wide should be made for each plant, the collar or point where the bud was inserted and from which the new growth starts placed 2 inches beneath the surface of the soil, the roots spread out and downward (care being taken that no roots cross each other), and all roots covered with fine soil free from clumps of manure. (Fig. 3470.) Manure should never be placed in actual contact with the roots, but near at hand, where the new feeding roots can easily fill the space. The remaining soil should then be packed in firmly, the surface leveled and covered with about 3 inches of coarse litter and manure, and the long wood cut back to about 15 inches to prevent the plant being whipped and loosened by high winds. This extra wood is left to encourage root-action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to a strong outside bud, without injuring it, to develop an open and free head, this admitting light and air. If the uppermost bud is on the inside surface of the shoot, the new growth will be directed inward, dwarving and hampering the plant and preventing proper development. The deep planting above described is necessary to prevent suckers from being thrown out by the roots, as these will speedily choke and kill the less vigorous wood which we are endeavoring to develop. From the writer's experience, the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded roses who cannot distinguish the brier should it appear, or who is too careless to dig down at once and cut the wild shoot clean off at the root, rubbing it smooth to prevent its starting again. A very little experience will enable anyone to develop an open and healthy condition. Teas are much more likely to be attacked by insect enemies than when planted in the open. Roses grown on porches are usually attacked by aphides and slugs, the leaves becoming riddled and skeletonized, which only infrequently occurs anywhere when they are planted in the open sunny garden. If roses are wanted around porches, the Microphyllre, white and pink, and the Crimson Rambler can be safely planted, as they are not attacked by the slug; but the blooms do not come in favorably with many other roses of their habit. The other varieties usually appear a few inches outside of the regular growth, rarely inside; consequently there is little difficulty in detecting and removing them.

Roses from pots should be planted as soon as the spring weather has fairly settled and all danger of frost is over, that the plants may be firmly established before the heat of summer. Roses planted late in the season never do well. The holes need be made only a little larger than the pot in which the plant in growing. Choose a cloudy day to make a good planting, and if it starts below the minute thorns and bear seven leaflets, instead of the astrantia, at the root-action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to a strong outside bud, without injuring it, to develop an open and healthy head, this admitting light and air. If the uppermost bud is on the inside surface of the shoot, the new growth will be directed inward, dwarving and hampering the plant and preventing proper development. The deep planting above described is necessary to prevent suckers from being thrown out by the roots, as these will speedily choke and kill the less vigorous wood which we are endeavoring to develop. From the writer's experience, the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded roses who cannot distinguish the brier should it appear, or who is too careless to dig down at once and cut the wild shoot clean off at the root, rubbing it smooth to prevent its starting again. A very little experience will enable anyone to develop an open and healthy condition. Teas are much more likely to be attacked by insect enemies than when planted in the open. Roses grown on porches are usually attacked by aphides and slugs, the leaves becoming riddled and skeletonized, which only infrequently occurs anywhere when they are planted in the open sunny garden. If roses are wanted around porches, the Microphyllre, white and pink, and the Crimson Rambler can be safely planted, as they are not attacked by the slug; but the blooms do not come in favorably with many other roses of their habit. The other varieties
may also be grown around porches, provided that they can be planted where the drippings from the roof will not fall on them and they are kept free from slugs.

Climbing Teas can be grown successfully in the latitude of Philadelphia only in the case of a few varieties.

3472. Reine Marie Henriette, the finest climbing Tea rose for the latitude of Philadelphia. This shows the vigorous growth, the trellis being 10 feet wide and 9 feet high.

Many of the finer kinds are worthless, in spite of all the protection that can be given them, unless they are covered with glass. Lamarque, Bouquet d’Or, Clion of Gold, Triomphe de Rennes, Marechial Niel, and Reve d’Or have, in the writer’s experience, all perished in the first winter, but Reine Marie Henriette, Claire de Dijon, William Allen Richardson, and Celine Forester will do well and yield satisfactory results. Reine Marie Henriette blooms finely and makes a magnificent growth, as may be seen in Fig. 3472. The trellis is 10 feet wide and 9 feet high.

Hybrid Sweetbriers, of the Marquis of Penczance kind, are a valuable addition to rose collections. The foliage is abundant, healthy, vigorous, and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. It would be difficult to choose among them, for all are worthy of a place, when there is sufficient space for them to root. They should have a high trellis and be planted fully 8 feet apart.

Pruning roses.

Of the common garden roses, the flowers are produced on new wood of the season that arises from the canes or the crown, or else, in the case of shrubby species, from old trunks or arms. It should be the aim of the grower to secure strong clean canes for this flower-bearing, and not to have so many of them on each plant as to produce much small weak bloom.

Standard or “tree” roses are sometimes grown, but they require so much care in keeping down suckers and in staking and tying, that they are little known in this country. They are grown abroad when a few excellent blooms are desired or where space is limited. These tree roses are top-budded, on strong stocks, to the desired variety. Sometimes an effect approaching the true tree rose is produced by tying up a very few strong canes to a stake, as shown in Fig. 3474. The usual type of rose-bush in America, however, of the Hybrid Perpetual class, is shown in Fig. 3475.

Pruning the dwarf-growing Hybrid Perpetuals may be begun late in March and regulated by the quantity or quality of the blooms desired. If the effect of large masses be wanted, four or five canes may be left 3 feet in height and all very old or weak growth entirely removed. This will give a large number of flowers, effective in the mass but small and with short weak stalks scarcely able to support the weight of the heads and not effective as cut-flowers, as this sort of pruning is entirely for outside show. After the bloom is entirely past, the long shoots should be shortened back, that the plant may make good and vigorous wood for the next season of bloom. But if quality be desired, all weak growth should be removed, every remaining healthy cane retained and cut back to 6 or 8 inches. Always cut just above an outside bud, to make an open head that will admit light and air freely. After the first season’s growth, there may be about three canes to be retained, but with good care and cultivation the number will increase yearly, until after fifteen or twenty years there will be at least as many canes to be utilized as the plants are years old.

The writer had a bed over twenty years from planting, in which each plant, after close pruning, measured 15 to 18 inches in diameter, each cane throwing up four to six shoots 1 to 2 feet in length and sufficiently vigorous in most varieties to hold up the largest flowers and to give magnificent specimen flowers for cutting. Roses grown in this way do not need stakes. They are sufficiently strong and vigorous to hold erect any weight they may be called upon to bear; but late in the autumn, before the high gales of November arrive, they should be cut back to about 2 feet to prevent their being whipped by the winds, for this would loosen the plant and break the newly formed feeding-roots. The plant should not be cut back too far. This point suggested for spring pruning, as in the hot Indian summer the upper leaves will surely be forced out and the promised blooms for the ensuing season destroyed; so in pruning for protection from November blasts, enough wood should be left to avoid all danger of the lower buds being forced out. The upper buds always develop earliest. Some varieties will not produce large flower-stalks under any method of treatment, notably Prince Camille de Rohan, La Rosarie, and Rosie-riste Jacobs; but almost all the other kinds do better under this method. They may be trimmed back sparingly.

Pruning dwarf-growing Tea roses is conditioned on the fact that they will not endure such vigorous cutting back as the Hybrid Perpetuals. All good strong shoots should be retained unless they form a very close head, when it is better to remove a few from the center. The canes should be shortened about one-third of their length, the branches cut back to one or two eyes, and after each period of bloom the longest shoots should be trimmed back sparingly.

Bourbons need even less trimming. Souvenir de Malmaison, Mrs. Paul, and others of this class should have only the weak ends of each shoot removed, and no more wood cut away than is necessary to remove weak and unhealthy parts.

Climbing roses should be pruned sparingly by simply shortening-in the too vigorous shoots and cutting the laterals back to two eyes. Tie all to the trellis in a fan shape, dividing the space as evenly as possible. Fig. 3473 shows the same Reine Marie Henriette pruned and trained on trellis. These continue in flower until November, the early bloom in June being the finest.
Hybrid Teas should be pruned for quality, and the proper time is when the buds are swelling. The amount of wood to leave on the plant varies with the variety. Shortening the shoots to 4 to 8 inches gives fair results. Cut back the weak growers more severely than the vigorous kinds. To provide for good blooms later, leave three good buds in the axil of the leaves at the base of the shoot when removing flowers or withered blossoms (Beal).

Hybrid Sweetbriers require only such pruning as to shorten back the over-vigorous growth and occasionally to remove some of the oldest shoots to prevent crowding.

Tillage.

Just before growth begins in spring, the surplus rough manure should be spread over the beds and all the remaining fine particles forked in. Deep cultivation is not desirable, as the roots are likely to be injured or broken. Three inches in depth is quite sufficient for a bed that has not been trampled on, and this should be performed with a four-toothed digging-fork, which is less likely to cause injury to roots than a spade. The beds should then be neatly edged and the surface smoothed off and even. Frequent stirring of the surface with a sharp rake is all that is necessary afterward, until frequent stirring of the surface with a sharp rake is all that is necessary afterward, until

Much of the charm of growing roses is derived from the accurate knowledge of each variety by name. Yet few amateurs ever accomplish this, chiefly because the labels have been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been placed on the wrong plant. To obviate this, a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been lost or misplaced, and not 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The following roses are sufficiently hardy for planting, with more or less protection, even in central New York, where all have been tested (Beal):
with a chart for each bed. Fig. 3476. This should be made at once after the plants are set out and before the labels have become detached. ROBERT HUBB.
A. C. BfAL.

Outdoor roses for the mid-continental region.

An intercontinental region, of which central Missouri may be considered a typical representative, often presents gardening problems which markedly differ from those in territory adjacent to large bodies of water. The longer season of intense heat combined with extreme low humidity, together with the frequency of sudden and extreme fluctuations in temperature, both during winter and summer, so influence vegetation that if the same degree of perfection is to be attained, and competition successfully met, horticultural operations must be strictly orthodox, and confined to fewer varieties than may be grown elsewhere. This appears to be preeminently true in outdoor rose-growing. This crop can be as successfully produced under the varying conditions to which the region is subject, providing well-established rules, practised by expert rose-growers everywhere in planting and cultivation, are strictly followed, and if the right varieties are chosen. The most hopeless situation is the congested city conditions with air contaminated with poisonous gases. Energy and enthusiasm in gardening in such a place are better spent with other plants.

In planning a location and the arrangement for roses, the purposes for which they are to be grown must be considered. A rose-garden separated from other features of the ground is becoming more and more an important part of parks and private estates. Into this area are grouped a general collection, or specimens of all kinds. It should have a sunny position, though the ground-surface may gradually slope in any direction. Other conditions being identical, a gentle northerly slope is preferred. The kinds may be grouped by types, the rugosas, briers, and wild roses bunched in masses, -the climbing sorts on a pergola or trellis. The kinds may be grouped by types, having their long flowering period, the character of some partaking strikingly of the delicate Teas, while others resemble the more vigorous Hybrid Perpetuals. There are exceptions with some of the varieties of both types, having their long flowering period and beautiful blooms of good substance, preeminent among which are: Gruss an Teplitz, scarlet; Jonkheer J. L. Hook, pink; General MacArthur, scarlet; LaFrance, pink; Kaiserin Augusta Victoria, white; Antoine Rivoire, pale yellow; Mrs. Aaron Ward, yellow; Lady Ashtown, soft rose; My Maryland, salmon-pink; William H. Taft, pink; Helen Gould, carmine-red; William Shean, pink.

The Hybrid Perpetual is a still harder type in which are to be found varieties producing blossoms that command the highest prices because of their large size, good substance, and long stems. The most noted representative is American Beauty, still largely grown under glass and in many localities out-of-doors, but for the latter purpose not now generally counted on for the degree of success usually attained by other kinds in plant in double rows, about 9 inches apart, the plants 18 inches to 2 feet apart, alternating in each row. Suitable hedges may be made from many varieties of roses: notably rugosa and its hybrids for a broad or thick hedge, Orleans for a dwarf, and Gruss an Teplitz for medium to tall. Hybrid Perpetual sorts may also be used. With the exception of rugosa, it is better to

3476. Russian form of Rosa rugosa. (×½)

3477. Rosa rugosa. (×½)

3478. Russian form of Rosa rugosa. (×½)
this region. The limited season of flower-production, and the unattractive plant-display the remainder of the year, places this group second to the Hybrid Teas in usefulness for outdoor culture, even though little or no winter covering is required with the one, while it is important that some protection be provided for the other in the more northerly section of this region: General Jacqueminot, brilliant scarlet-crimson; Coquette des Alpes, white; Ulrich Brunner, cherry-red; Frau Karl Druschki, snow-white; Victor Verdier, crimson; Paul Neyron, dark rose; Madame Charles Wood, scarlet; Magna Charta, bright pink; Mrs. John Laing, soft pink.

Roses of the dwarf rambler class are as hardy as Hybrid Perpetuals and as ornamental as Hybrid Teas. The dwarf compact habit, together with the clustered masses of bloom, gives it a distinction all its own. The class is very showy in the garden, but with rather short stems, and therefore less valuable for cut-flowers. Occasionally the blossoms bleach a little in conditions following alternate rain and warm sunshine, but this fault is more than outdone by the wealth of color produced over most of the period from beginning of blooming to frost: Clotilde Soupert, rose white; Baby Rambler, crimson; Baby Rambler, pink; Orleans, red; Katherine Seinet, white.

The varieties and hybrids of Rosa rugosa are useful, especially in landscape masses and usually make excellent hedge-rows. (Figs. 3477-3480.) The single-flowered forms produce bright red hips or seed-vessels that remain on the bushes late in the winter. The bright green leaves give these and similar varieties an interesting and pleasing appearance a large part of the season. Good varieties are: R. rugosa alba, white; R. rugosa rosea, pink; R. rugosa rubra, red; Madame Georges Bruant, double white; and others.

Hybrids of the Sweetbriars type are most charming when in bloom, though the flowers are only medium to small in size, and endure for less than a fortnight. It produces conspicuous fruits and fragrant foliage. The plants are a little slow in making their growth, but meet all weather conditions without injury and live to a great age. The plants form a good shrubbery mass or border group. Three good varieties are: Lord Penzance, Lady Penzance, Brenda.

Many of the native species of roses are well used for mass planting, similar to the Sweetbriers. There are several American species known to thrive and bear abundant bloom at St. Louis: R. palustris, R. virginiana, R. setigera.

The most valuable climbing roses for this region fall under two types, R. multiflora and R. Wichuraiana. Isolated examples have been reported of other forms doing equally well, but the above are by far the most common, and the varieties give so wide a range of color as practically to make other forms unnecessary. They grow rapidly in good soil, and when trained to tree-stumps, trellises, walls or the sides of buildings, quickly make a thorough covering. For covering solid walls and sides of buildings it is better to provide lattice-work a few inches from the building to give opportunity for free circulation of air between the wall and the vines. The Wichuraanas are especially adapted for trailing over banks, mounds, and the like. Good varieties are: Crimson Rambler, crimson; Dorothy Perkins, both pink and white.

After several years' experience with Moss roses, the writer has never seen a plantation that was as satisfactory as other types. At St. Louis they were no more hardly than Hybrid Teas and appear to be more subject to mildew than any other roses. The blooms were not superior to other roses and are rarely grown except by persons maintaining collections of old-fashioned flowers, from whom some good results have been made. They are more valuable here for their associations than for real horticultural merit.

Roses take most kindly to a heavy clay loam enriched with well-rotted cow-manure. Such a soil is characteristically abundant in this region. Sand and ground limestone are added to the average clay loam unless it is known that the soil already contains enough of one or more of these ingredients. Except for Tea roses, lighter soils are avoided as much as possible, and even the Tea do better in ground moderately compact.

Great care must be exercised in the preparation of the soil and providing perfect drainage. Ground for a rose-bed should be excavated 2 to 2 1/2 feet deep and the lower 6 inches filled with pieces of rock or broken brick. The bottom should be connected with a drain-tile to carry the surplus water quickly to a lower level. About a foot of cow-manure, preferably rotted, should be spread over the broken rock and brick, and the excavation filled with heavy clay loam of sufficient depth to keep the surface when settled slightly lower than the surrounding level. To most soils in this region some form of lime should be added to neutralize any acidity that may occur. If there is a greater proportion of clay than loam in the soil a little pulverized sheep-manure, dried blood, or other quick-acting chemical fertilizer will provide available plant-food immediately and give the plants a better start.

Planting.

In starting a rose-plantation, the stock may be dormant wood or growing plants in 3- or 4-inch pots. The plants may have been grown from cuttings on their own roots or budded or grafted on other stock. Plants on their own roots are equally good, cheaper to buy, and there is no danger of the stock plants making growth from the roots in place of the desired kind. Most roses in this region are grown on their own roots. Dormant roses may be set out either in fall or spring, using preferably one- or two-year-old plants. Spring is the most common season, but autumn-planting is practised by some and considered equally good, or even better by many successful growers. The plants are set in the ground 2 or 3 inches deeper than they originally grew, and if planted in autumn, earth is drawn up around the stem and the ground mulched with the most convenient material suitable for the pur-
Roses are pruned in the dormant season, mainly in stronger the growth the smaller the proportion of wood removed. As a general rule, uninjured plants of Teas need to be removed. Climbers, rugosa, sweetbrier, and wild roses need only enough to keep the plants in shape and practically all of the top. All dead wood should be protected, and the severity of the preceding winter often governs the amount of pruning, especially with Teas. In setting the plants are removed from the pots with the soil intact, placed a little deeper than the ground-level, and watered. A frequent and serious error is made in setting the plants too close. They must have plenty of room for light and air. The Baby Ramblers should have about 18 inches apart; other dwarf roses about 2 feet; climbers 4 feet. The surface is cultivated a few times, and at the beginning of hot summer weather the ground is given a thorough mulch, preferably of rotted manure. This feature is probably the most important operation in making a success of monthly roses in this region. Cultivation and mulching should be continued each year, and about every fifth season Tea and Perpetuals, the potted plants usually give more bloom the following years. There is less labor in planting and the potted stock is no more expensive than dormant material. In setting, the plants are removed from the pots with the soil intact, placed a little deeper than the ground-level, and watered. A frequent and serious error is made in setting to the desired size. In pruning rose-hedges, a special effort should be made to keep the base as full of new growth as possible.

H. C. Irish.

Roses in California. (Fig. 3481.)

In many localities in California the rose attains a striking and perhaps unique perfection. That this perfection is not general throughout the state is partially owing to adverse conditions, such as great range of temperature during each twenty-four hours, heavy fogs at critical periods, and the like, but as a rule, failure in whole or in part is due to the lack of intelligent treatment. In the present article, the conditions in southern California are specially in mind, but the discussion will apply, in the main, to other parts of the state.

The chief obstacle to successful rose-culture in California is the attempt to produce blooms every day of the year. Although this practice is quite an impossibility with any rose, the evil is still persisted in by ninety-nine in every hundred possessors of a garden. While roses are grown in great profusion in Los Angeles, few, if any, do as well here as in Pasadena, which, although only 9 miles distant, has the advantage of being several hundred feet higher than Los Angeles, and therefore less subject to fog or great range in daily temperature. In some places a certain few roses will produce an astonishingly fine crop of bloom, when but a mile or two distant, with no change of soil and very slight difference in altitude, they will be utterly worthless; while a like number of other varieties will give as good returns as those first mentioned.

Many roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a continuous crop of blossoms than any other. For this reason it stands in a class by itself and is not considered in the appended list of the best dozen roses for southern California, though every one should grow at least one bush of this variety. Along with the Duchesse might well be placed the Polyantha, Mademoiselle Cecile Brunner, and the climbers Cherokee, Banksia, Ophir (or Gold of Ophir), Beauty of Glazenwood or Fortune's Double Yellow. All these produce most wonderful crops, but none more so than the last mentioned, which in favored regions produces a wealth of flowers simply dazzling to behold. Many well-known Californian writers assert that Gold of Ophir and Beauty of Glazenwood are one and the same rose, but this is not the case. Gold of Ophir was here for many years before the other made its appearance, and some of the original plants are still growing on many of the homesteads of Los Angeles and vicinity.

All the roses named thus far are worthy of a place in any garden. One of the chief causes of failure by the average amateur is the lack of an intelligent knowledge of the plant's first requirement—recurring periods of absolute rest. These necessary resting-periods are best secured by the withholding of the water-supply. Most amateurs, and a larger part of self-styled "gardeners," persist, against all rules of common sense, in planting roses either in the lawn or in mixed borders with other plants. In either case, all but the roses require a constant watering. Having planted in this fashion, the grower has cast away all chances of first-class results. Rose-beds should never be made a feature in landscape gardening, as the plants when dormant and judiciously pruned are unsightly objects at best. The most obscure spot obtainable with the proper exposure is the place to grow flowers. To obtain the best results the rose requires the same amount of rest here that it secures where the winter season leaves the grower no alternative. But the same amount of rest may here be given semi-annually, with equally good and perhaps better results than is possible with one long annual period of inactivity.
Climate is the all-important feature of rose-culture in California, and if that is satisfactory the character of the soil makes little difference. The dry summer air is a serious drawback to the growth of many roses, there being few places where Moss roses thrive, and these must be grown in whole or partial shade. Niphetos and Marechal Niel are good examples of roses requiring partial shade if good results are desired. Many localities cannot grow the two last mentioned, or such as Perle des Jardins, Meteor, Catherine Mermel, Madame Francesca Kruger, Reine Marie Henriette, and many others, on account of mildew. Even among varieties whose buds are immune, it is often impossible to get foliage unaffected. Injudicious watering is more largely to blame for these unfavorable conditions than any other agency. Laurette is a rose which often produces the only perfect flowers to be found among a hundred varieties, and this is particularly the ease in places visited by heavy frosts, Laurette remaining unscathed while all others are more or less blasted. The great rose of the eastern United States, American Beauty, is almost a complete failure here and is not worth growing except in a very few well-favored gardens, and even then it is far from being perfect.

Persons in the southern end of the state and inland sections have yet to learn that fine roses may be grown in either full or light or heavy shade. Many roses, also, are of little value in California unless budded or grafted. Of this class Marechal Niel is the most striking example. Examples may be found where this rose has thrived unusually on its own roots, but such cases are marked exceptions. Some persons maintain that all roses are best on their own roots, but such opinions are easily refuted by consulting any of our veteran rosarians. The best roses are root-grafted, but of course this procedure is too expensive for the general nurseryman, and the bulk of the local stock is budded on Manetti or Maiden's Blush, though the Dog rose (Rosa canina) and even the Banksia are often used. Those roses grown on their own roots are usually propagated from hardwood cuttings, grown out-of-doors, and December is usually the best month, although they have been successfully rooted from October to March, according to the variety.

Rust bothers but little; likewise scale, although in many neglected gardens the bush and climbers alike may be found covered with both the rose-scale and the red scale of the orange. Fuller's rose-beetle is a nuisance only in small areas, but green-aphis is a pest in winter and spring. La France for many years was the leading rose in California and grew well, budded or on its own roots, in almost any locality, but is now rapidly becoming a thing of the past, though it can never be wholly discarded, for it is still, in a few gardens, the queen of the family; its involuntary retirement from our rose-gardens is due entirely to a "die back" (anthracnose), which affects many other plants than the rose, but seems to have a special liking for La France. Thus far no cure has been found.

1 A list of the best dozen bush roses and the best half-dozen climbing sorts, as agreed upon by many experts within a range of 20 miles of Los Angeles, is as follows:


Climbing sorts.—Climbing Kaiserin Augusta Victoria, Madame Abel Chatenay, Heinrich Munch, Paul Neyron, Mlle. Cecile Brunner, Duchess de Auerstadt, Reve d'Or. Outside this list are members of widely divergent classes which should find a place in every large garden, such as the Banksias, the three Cherokees, and both the bush and the climbing Cecile Brunner.

(2) Following are lists of a dozen varieties each of the different recognized standards of color of roses which have proved best adapted to southern California conditions:


3681. California rose-bush.


(3) Following are roses suitable to California as a whole (John Gill): General MacArthur, Madame Caroline Testout, Lady Hillingdon, Juliet, George Dickson, Mrs. Aaron Ward, Radiance, Mad. Abel Chatenay, Miss Kate Moulton, Ulrich Brunner, Ophelia, Mlle. Cecile Brunner, Frau Karl Druschi,
The absence of outside walls, and the ease of construction, the lower cost of heating owing to the materials used by the large commercial rose-growers. The single house has the approval of many, while the connected, or ridge-and-furrow sections, are obtainable where more time can be given their development, which, if forced into flower by excessive heat, do not, in warm climates, produce the quality of bloom that is considered the home of the greenhouse rose industry.

The industry is widespread and embraces every section of the country. Southern California grows good roses for the markets in the open field and better quality types of rose-houses (Figs. 3482, 3483).

There are two distinct types of greenhouse construction used by the large commercial rose-growers. The single house has the approval of many, while the connected houses, or ridge-and-furrow sections, are favored by others, because of the smaller expense of construction, the lower cost of heating owing to the absence of outside walls, and the ease of superintendence. Advantages of the single house are its better control, more light, and less trouble with snow and ice, the latter being a serious consideration in the maintenance of the connected houses.

The single house is constructed with iron frame and concrete sides and built even span or two-thirds span to the south. Houses strong and permanent, with good ample ventilation and ample light, are the essentials of construction. With connected houses, the essential factor in addition to these is to have the gutter at least 12 feet from the ground, which almost entirely overcomes the effect of shade which the gutter casts by diffusing this over a larger area. A heating-pipe beneath the iron gutter to assist in melting snow and ice is a necessity.

The size of houses to be preferred is largely a question of opinion, but there are certain factors which must not be overlooked. The wide house must necessarily be high, and a house that is high is likely to be lacking in humidity, and the plants consequently will suffer. This seems to be the only objection of consequence to the wide single house. From 40 to 60 feet is the normal width and should be satisfactory, and the length is controlled by the capital of the owner or the natural lay of the land. Houses are workable with economy up to 1,000 feet provided, naturally, with crosswalks at least every 300 feet for employees. The width of connecting houses should be from 36 to 44 feet, and the length as given also applies to these connecting houses.

Beds and benches.

There is but small connection between the bed or bench and the house containing them, except that in planning new construction the approved plan is to have a walk next to the outside walls and, if the proper width house is selected, this can be accomplished without varying the width of walks and beds or benches. As the modern house is relatively high at the plate or eave, either bed or bench may be used at the discretion of the builder. The construction of the bench is simple, the essential point being durability; this is secured by using cypress lumber and double crosspieces, which enables the builder to put nails back a short distance into the bottom board and prevents the breaking of the bench at the joint, as the bottom usually decay first at the ends of the boards. Benches not over 24 inches to the bottom from the ground surface are to be preferred, being easier to work, as the larger part is on the platform itself, at least 12 inches above the bench surface and, if the bench is higher, the labor is correspondingly harder. Ample drainage must be provided by leaving cracks between bottom boards from 1/4 to 1/2 inch and using 6-inch width boards. The concrete bench for rose-growing is in the experimental stage and has not as yet shown superiority.

The solid bed, so-called, is not in reality solid, except as to side walls. Ample drainage of the ground itself is needed, if solid beds are to be built. If the soil is naturally gravelly, the making of solid beds is simple. If the soil is of heavy clay texture, the building of the solid bed necessitates not only under-draining the surface, but the supplying of coarse gravel or ashes through which the water from the soil may escape to the permanent drain-tiles. These drain-tiles should be laid crossways of the house every 100 feet, and the smaller tile running lengthwise under each bed should empty into these larger cross-tiles. Sides of solid beds are best built with concrete which can be made as thin as 2 3/4 inches thick.
at the top, and the outsides can be made perpendicular. The inside should be on an angle, and a base width of 6 inches with the flare on the inside will give the wall a purchase on the soil under the bed and hold it in place. Solid beds are cheaper of construction, provided the land is naturally well-drained. They are more expensive when much ashes or gravel must be used. There is another type of solid bed made by using plank nailed to posts for siding which is just as good, but not durable. The bed built by laying broken stone, to serve as drainage, and which elevates the bed to a better working level, is a permanent and satisfactory one, but natural conditions to stone make this impracticable under usual conditions. Results as to roses grown on raised tables or benches and on solid beds vary very little. The raised bench having the heating-pipe beneath it seems to produce better in the winter months. The solid bed having a cooler soil and a greater rooting depth will give a better quality in the summer months. On the yearly average there is small difference in quantity and quality of product, and the question of bed or bench must be settled by the opinion of the owner and the questions of cost and permanence.

Heating.

In close connection with houses and beds is the question of heating. It is a universally recognized fact that steam heat is essential to the growing of good roses. No attempt will be made to explain boilers and the piping of the houses, except to say that sufficient steam-pipes must be supplied to carry normal temperature in the coldest possible weather, that such pipes should be evenly distributed over the area inclosed, and that the heat should not be overhead, but on the level with or below the level at which the plants are set. The use of steam is due to the fact that quick heat in rose-houses is necessary. The change that comes with the dropping of the sun in the fall and winter must be counteracted by a quick steam-service to prevent a chilling of the plants. A pipe or two in all big houses in summer nights prevents the condensation of moisture on the plants and means the difference between success and failure. Hot-water heat is more uniform than steam, but loses because steam can be obtained on much shorter notice. The use of a hot-water system in conjunction with steam is admirable, and in large establishments is to be recommended. The gentle warmth radiating from the hot-water pipes during the day is not detrimental and enables the grower to use more ventilation, which is a distinct benefit.

Soils for roses.

Soils for rose-culture should be of clay body, but have enough of more friable ingredients to pulverize readily. The grower usually chooses land for the building of commercial rose-houses which has on it the character of soil required. Good heavy clay turf is the material from which to form the compost for rose soil. The fiber of the turf as it decays gives the humus required and leaves the soil open, porous, and in good condition for root-action. Winter-preparation is to be preferred, and the freshly prepared compost which is not over six months old is in ideal condition. Piling alternate layers of soil and cow-manure, using two parts of good heavy clay turf to one part of cow-manure, makes an ideal rose soil. Horse-manure may be used with good results, or a mixture of the two, but cow-manure has the preference.

Lowland soil usually has the body and fiber that is needed, and soil which is part of the year under water has been found to be free from eel-worm or nematode, which attacks the rose roots; this troublesome pest often infests the soil of the uplands. The meadow soil should be plowed into ridges in the fall and hauled on frozen ground to the place where it is to be composted. The thorough freezing of the soil is considered beneficial as it tends to make it more friable. The compost should be worked over when the frost has gotten out, and after settling will be ready to use when needed. A point should be made to lay the soil-compost near the sec-
The propagating-bed should have ample drainage, which can be secured by using coarse ashes for the bottom half of the bed. Five-inch side boards with ashes for drainage and above it 2½ inches of good clean sand constitute a workable propagating medium. Rose-cuttings can be rooted with good success in screened soft cool ashes, if sand is not available, but extra care must be taken to prevent breaking off the roots in taking the cutting from the stock. A pot for potting. Distance in the propagating-bed depends on the variety. The leaves should not be allowed to overlap and thus invite fungus. With the heating-pipes beneath the bench, and a uniform temperature of 55° to 60° in the sand and 54° to 60° overhead, the cuttings should be rooted and ready to pot in about four weeks. Do not allow the cutting to begin growth in sand, which it will if not potted when the roots have started. Be sure that clean pots are provided, and the 2¼-inch size is ample for the newly rooted cuttings. Pot carefully so that the tender roots are not broken or bruised and be sure that some soil is between the cutting and the pot. Water carefully and provide shade for the first few days until the cutting has recovered from the shock of moving. Make sure that all the soil is thoroughly moistened, but do not over-water it. Light sprinklings are all that will be required until the roots show activity, which can be assessed by knocking the plant and ball of soil carefully from the pot, taking care not to break the ball of soil. As the plant begins to grow, remove all shade and keep the plant growing. It will require more water with the increase in foliage. When the plant fills the 3-inch size will be ample for its requirements for the next six weeks. Keep the young plants clean and growing, using the same treatment as for plants on the bench for the various insects and fungi. Shift into larger pots, if necessary, but keep them growing.

Grafted roses are very distinct in handling from the own-root plants. It is best to start with strong-rooted Manetti stock, which rose species has been chosen for its strength of growth and the freedom with which the cions unite with it. Manetti is grown from hardwood cuttings taken during the winter months, and which are planted in early spring in the open field. These are kept growing rapidly throughout the summer, are dug in the fall and are ready when potted for grafting. Manetti should be disbudded or suckered, which means the removal, so far as is possible, of all eyes which are below the point at which the graft is to be made. In growing Manetti, deep planting is advisable as the stem which has been under ground all summer, cuts better and makes a better union than the harder stem which has been exposed. Manetti varies very little with the section, but varies with the method of growing and grading. The deep-planted, well-graded Manetti, whether English-, French-, Dutch- or American-grown, is equally valuable and serviceable, but the greater variation in the growing and handling has caused the erroneous opinion that Manetti from certain sections is superior. Labor values alone prevent the American grower from producing his own Manetti, but irrigation is necessary in our climate. Having pencil-size Manetti,—being for best work about the thickness of a lead-pencil,—the process of grafting is simple. A cut is made as close to the pot-level as possible diagonally across the Manetti. The cion is cut on the same plane and is tied to the stock with raffia fiber (Fig. 3484). Raffia is used because it decays and does not need to be cut away as will be necessary with string, and it covers the union more completely. The union of the cambium layer is the essential point, and if the cion is not equal in size to the stock, one should be sure of a perfect union on one side. The rapid flow of sap which occurs when the new grafted plant is put into the case covers the union and growth begins. In a temperature from 76° to 78° the first week and from 70° to 72° the two succeeding weeks, with careful ventilation and shade from hot sun, the union should be perfect and the young plant ready to be taken into the air and light when hardened sufficiently by increasing these gradually. The grafting-case is usually constructed by having sufficient steam-pipes beneath it to maintain the temperature—a miniature greenhouse.

The advantages of grafted roses over those grown on their own roots are: a stronger root-action, a more rapid-growing plant, and a root-system that will be immune to eel-worm or nematode. Experiments conducted by the Illinois Experiment Station have proved that the production from grafted roses is sufficiently larger to warrant the use of grafted plants. There may be a connection between the use of flowering wood for grafting and increased production, as all cions for grafting purposes should be from selected flowering wood. There is also a difference in varieties and a few are superior on their own roots. It has been generally stated that all yellow or yellow-tinted roses are better on their own roots, but results contradict this statement.

The after-care of the grafted plant varies little from the care of own-root plants. One should be sure to remove any Manetti suckers that appear, cutting close to the stock, and much once in small pots before shifting into larger, using for this mulch a compost of good rose-soil with a heavy sprinkling of bone-meal added. Repotting will furnish all the feed necessary, but the top mulch will often grow up the extra, which should be removed. The pots and repotting should be done under a miniature greenhouse. The blooms should be kept cut off.

General cultivation, diseases and insect pests.

Having good, clean, thrifty, young plants in 3- or 4-inch pots and a compost soil in the benches or beds, one is ready for planting. The correct spacing is about 12 by 18 inches or 14 by 16 inches; there is some difference in varieties, but the average is about as stated. Planting should be deep enough to cover the union by an inch or more with grafted plants and yet away from the bottom of the bench. Plant firmly and water thoroughly. Growth will soon begin. Keep the plants clean from red-spider by thorough and consistent spraying of the undersides of the leaves with water under pressure. Red-spider is an insect which multiplies rapidly when favored by a dry warm atmosphere, and as its sustenance is the foliage of the plant, it must be eradicated. The general care of a rose-house consists in keeping the house properly ventilated, heated and watered, in addition to keeping the plants clean from insects and fungi; and the cutting of the flowers. Ventilation should be given more attention, for it concerns the success of the whole business. How properly to ventilate a rose-house is...
The rose is subject to the attack of a nematode, or eel-worm, which infects the roots. The use of Manetti for grafting purposes has, to a large extent, relieved the trouble; the use of lowland soil is a safeguard. Sterilization by means of steam will render soil safe and its usefulness is not impaired, but this is, as a rule, unnecessary.

Rose-galls are a bacterial disease which causes growths on the plants, varying in size, and usually brown in color. These appear at the joints or where cuts have been made. Remove these at once and do not cut them open with a knife used for cutting flowers, because the infection can be carried to the other plants in this manner. Cut off the affected branch and burn it.

Thrip is an insect which attacks the leaves and petals. It is small and its work usually can be recognized by the white lines on dark-colored flowers, showing where the surface has been eaten. Green-fly is a sucking insect which attacks the new growths. Both can be readily killed by the evaporation of nicotine preparations upon the steam-pipes, this having almost entirely replaced the burning of tobacco-stems.

Feeding the plants is accomplished by top-mulching, or by liquid fertilizer, or by using both. Aside from bone-tankage, few commercial fertilizers are in use, cow-manure, well-rotted, clear or mixed with well-rotted horse-manure, being more generally used. These manures in liquid form may be used to advantage. Feed light and often is the rule when plants are well established.

Watering depends on crop-condition. Water copiously when the plants are coming into bearing. Water less when the crop is being cut, and sparingly after the crop is cut and before the new growth starts.
The question of humidity in the house is a serious one with the wide, large houses, and where the atmosphere lacks moisture the growths will be hard-wooded and the plant will fail to be prolific. It is safe to say that a house with all cement walks fails to grow good roses for lack of humility, and the gravel or ash walk will do much toward furnishing the atmosphere the needed moisture.

Varieties.

Varieties to grow depend largely on the market to which the grower caters. There are two types of greenhouse roses: those which are at their best in the warm summer months, and those which are at their best in cooler weather.

The varieties best suited for summer cutting are My Maryland and its sports, Kaiserin Augusta Victoria, Francis Scott Key, and Mrs. Aaron Ward.

For general use, the best varieties are Killarney and its sports, which are numerous, and of which Double White Killarney, Killarney Brilliant, White Killarney, and Killarney Queen are such notable examples that they must be mentioned; Ophelia, Mrs. Aaron Ward, Mrs. George Shawyer, Hoosier Beauty, Hadley, Milady, Richmond, Radiance, Lady Alice Stanley, Jonkheer J. L. Mock, Sunburst, Mrs. Charles Russell, American Beauty, and the Polyantha roses—Cecile Brunner, Perle d’Or, and George Elgar, which are widely used for corsage bouquets and decorative work. Mrs. Aaron Ward, Double White Killarney, Mrs. George Shawyer, Killarney Brilliant, and Ophelia are the best varieties for cutting continuously for the entire year. Of these varieties mentioned, American Beauty, Mrs. George Shawyer, Radiance, Lady Alice Stanley, and Sunburst are better grown upon their own roots, while the balance of the varieties are superior when grafted on manetti. Mrs. W. C. Whitney was formerly grown as a forcing rose.

Cutting the flowers.

Proper care and cutting of the flowers has as much to do with financial success in the rose industry as the proper growing of the plants. Just when flowers are mature enough to cut is a matter of variety to a considerable extent. Those varieties which do not have many petals should be cut in the bud, while many of the varieties with large petals, such as Francis Scott Key and Mrs. Charles Russell, should be allowed to expand before being taken from the plant. How much wood to leave when cutting the flowers is also a question of variety to a certain degree, but as a rule two good eyes are sufficient. Certain varieties which naturally throw strong flowering growth from the main stems or hard wood can be cut to one eye from good-sized plants. There is a tendency of plants to increase in size and become awkward to handle if much growth is left in cutting, and production from large overgrown plants is as a rule no greater than from plants more closely headed in by carefully cutting the flowers.

It is customary with some growers to “pinch” all flowering shoots when the bud has reached the size of a pen, and this removal of the bud and first leaf causes a new flowering growth and gives a longer stem, as the flower is cut back to the proper place in the older growth. This method of pinching allows the grower to control the time of maturity of the crop very accurately, eight weeks in the early winter months and seven weeks in February and March being the necessary time for the maturity of the new flowering shoot. This varies a few days with the character of the growth when the pinching is done; those shoots nearer maturity will require less time than the softer or more immature growths.

There is also a slight difference in varieties as to the time of the year to commence the pinching. Thus pinching allows the grower to bring in a crop at the holiday season and produce flowers for exhibition use.

The stronger and more vigorous the growth pinched, the better the quality of the resultant flower and by selection of strong heavy flowering growths and by pinching and careful timing, the roses for exhibition purposes are produced.

When flowers are cut they should at once be placed in water and kept at a temperature from 35° to 42° for several hours to harden them. The stems and flowers fill with water and are then in a condition to be graded. The American Rose Society has established a grading standard to which the leading growers adhere in preparing the product for market. Length of stem is the basis, but quality and substance of bud should be in proportion to length of stem, and a poor quality flower on a large stem on the open market will by no means command the price of a good flower on a stem of the same length. In grading, keep the flowers uniform in length of stem and quality.

Marketing cut roses.

There are three methods of marketing cut roses, viz.: retailing direct to the consumer; supplying flower shops direct; and the shipment of the product to the commission stores which supply the large city florists. It is of first importance to have the product reach the consumer fresh, well hardened, and not too open, for the demand for open flowers is limited. Careful packing for the wholesale market necessitates wooden boxes with crockets to hold the flowers snugly in the box, which bruises the flowers. Wooden boxes allow the use of ice to keep the flowers in condition for sale. Heavy waxed paper between the layers of flowers in the boxes aids in handling them conveniently. Any precaution taken to insure the product reaching the consumer in perfect condition is a paying investment, for a good product has little value when bruised and inferior in condition for consumption.

The sale of flowers direct to the consumer by the grower is becoming greater every year, many of the leading florists operating their own ranges of glass and using the product in their own store. The demand from the large cities where this is not possible to any great extent is increasing yearly. Returns from money invested is in fair proportion to the money earned by investments in any well-conducted line of production, but is dependent upon the skill of the grower and the business-like conduct of the enterprise. The risk of handling a perishable product and the property risk also is heavy, owing to wind, hail, snow, and ice. Deterioration is also heavy because of the excessive humidity necessary to good culture. Rose-growing is an industry catering to the demand for a luxury, and the profit is often a thorny one.

W. R. Pedersen.

Rose insects.

ROSE APHIS (Macrosiphum rosae).—Greenish or pinkish plant-louse about one-twelfth inch in length, that cluster on the rose and injure the bloom; injurious both in the open and on roses grown under glass. The insect hibernates in the egg stage in the North, but in the South breeding continues throughout the winter. The eggs hatch as the buds are bursting. The aphid of the first generation are each female being capable of producing thirty to forty-five young one-twelfth inch in length. that cluster in great number about one-tenth inch long. They multiply with great rapidity, and injurious both in the open and on roses grown under glass.

The aphids are protected from the air by a waxy secretion, and when crowded together the tip of the abdomen bursts, and the waxy secretion exudes from the wound. This secretion is of a sticky nature, and the aphids of the second and succeeding generations are protected from the air by this secretion.

There are three methods of marketing cut roses, viz.: retailing direct to the consumer; supplying flower shops direct; and the shipment of the product to the commission stores which supply the large city florists. It is of first importance to have the product reach the consumer fresh, well hardened, and not too open, for the demand for open flowers is limited. Careful packing for the wholesale market necessitates wooden boxes with crockets to hold the flowers snugly in the box, which bruises the flowers. Wooden boxes allow the use of ice to keep the flowers in condition for sale. Heavy waxed paper between the layers of flowers in the boxes aids in handling them conveniently. Any precaution taken to insure the product reaching the consumer in perfect condition is a paying investment, for a good product has little value when bruised and inferior in condition for consumption.

The sale of flowers direct to the consumer by the grower is becoming greater every year, many of the leading florists operating their own ranges of glass and using the product in their own store. The demand from the large cities where this is not possible to any great extent is increasing yearly. Returns from money invested is in fair proportion to the money earned by investments in any well-conducted line of production, but is dependent upon the skill of the grower and the business-like conduct of the enterprise. The risk of handling a perishable product and the property risk also is heavy, owing to wind, hail, snow, and ice. Deterioration is also heavy because of the excessive humidity necessary to good culture. Rose-growing is an industry catering to the demand for a luxury, and the profit is often a thorny one.

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W. R. Pedersen.
C. Rose, American Beauty.
are laid in the tissue of the leaves by a shining black four-winged fly.

**BRIEFLY ROSE SLUG (Cadius pettinctoria).—**Yellowish, or greenish, more or less brassy, larvae about \( \frac{1}{4} \) inch in length that show up when young but burrow out holes in the leaves, often leaving only the larger veins. In the North there are three generations of the summer brood which place the leaves on twigs, those of the winter brood on the ground. The eggs of this species are inserted in the pedicel of the leaf in the South. The adult rosette is a rose shaped, somewhat pinnate red or brownish with a metallic lustre. The larval stage is goth in a cabinet and is highly destructive to the foliage of roses grown in the greenhouse. The grubs are somewhat curved, 2 to 3 times as long as the leaf, and feed upon the leaves of the roses.

**CHRISIIL ROSE SLUG (Emplasia cinctus).—**Larvae about \( \frac{1}{4} \) inch in length that feed on the edge of the leaf with the body coiled beneath it. The larva is metallic green spotted with white; above, green or orange; first segment of the thorax blue and the last two gray. Pupation takes place in the pith of a dead twig.

**Treatment for rose slugs.—**An arsenate of lead, two pounds in fifty gallons of water, or in the dry form diluted with double its weight of powdered plaster or lime, is effective. Rose slugs may also be killed with nicotine solution as recommended for the rose aphid.

**RUSTY ROSE SLUG (Lepidostyla annularis).—**Small nearly white last-hopper, feeding on the under side of the leaves, extracting the juices and causing the leaves to turn yellowish. The insect spends the winter as eggs which are inserted in the bark.

**Treatment.—**This last-hopper may be controlled by thorough spraying of the under side of the leaves with nicotine solution as recommended for the rose aphid.

**BRIEFLY ROSE BLISTER (Archips subpustulatus).—**Long-legged un­
galaered beetles that swarm into the rose-garden, and devour the leaves, petals, and opening buds. The grubs from which these insects develop feed on the blossom or buds of roses in sandy soil only. In New York the beetles emerge from the ground about the middle of June and disappear in about a month or six weeks. In the summer the beetles are numerous, for much damage will be done before the poison has had time to take effect. In the ease of a few choice plants it is safer to protect them with careful netting during the period when the beetles are most abundant.

**ROSE CURCULIO (Macroductylus subspinosus).—**Long-legged un­
galaered beetles that swarm into the rose-garden, and devour the leaves, petals, and opening buds. The grubs from which these insects develop feed on the blossom or buds of roses in sandy soil only. In New York the beetles emerge from the ground about the middle of June and disappear in about a month or six weeks. As a rule the maggots are most troublesome during June and July. This insect is more injurious to roses grown under glass than out of doors.

**Treatment.—**This is a difficult insect to control because the beetles will avoid feeding on foliage poisoned with an arsenical. The grubs are dried with live with an arsenate of lead made up of molasses. This method, however, cannot be relied upon to protect the plants when the beetles are numerous, for much damage will be done before the poison has had time to take effect. In the ease of a few choice plants it is safer to protect them with careful netting during the period when the beetles are most abundant.

**ROSE MIDGE (Neonotus thysanoides).—**Small whitish or pinkish maggot about one-fourteenth inch in length that infest opening buds, either killing them or causing the leaves and blossoms to be more or less stunted. Mature maggots become full grown in two or seven days, leave the buds and complete their transformation in the ground in the summer. They complete their total life cycle as completed in about two weeks. As a rule the maggots are most troublesome during June and July. This insect is more injurious to roses grown under glass than out of doors.

**Treatment.—**This is a difficult pest to eradicate once it has become established in a greenhouse. Rotation with some other crop, such as violets, may be practised to advantage. Fumigation with hydrocyanic acid gas in March, when the growth of the adult stage has ceased, will be effective. The only alternative is the thorough disinfection of the benches, and so on, is the only remedy that has been recommended for the rose midge.

**BRISTLY ROSE SLUG (Lasiocampa rosae).—**Small greyish brown maggot about \( \frac{1}{4} \) inch in length which often injure the opening blossom-buds of roses grown under glass. They may be controlled by spraying with tobacco extract or by the use of a sweetened poison made according to the following formula: Water, twelve quarts; parts green, one tablespoonful; sugar, three. ROSE 3017

**C. R. CROSBY AND M. D. LEONARD.**

**ROSE DISEASES.**

**POWDERY MILDEW, caused by the fungus Sphaerotheca pannosa,** is one of the commonest and most injurious diseases known to roses, greater or less, they are grown. It is usually first noticed as greyish or whitish spots on the young leaves or shoots. Later as the spots enlarge, they have a white, powdery appearance, a felt-like coating being formed, especially on the thorns. The young leaves, shoots, and flowers are dwarved, curled, or twisted, and soon drop, and growth and flower-production is seriously interfered with. Frequently the thorns and branches are attacked by the fungus, rendering the flowers worthless.

**Treatment.—**(1) Under glass. Thoroughly dusting with sulfur, or spraying with potassium sulfide, is practicable, and with two applications at intervals of a week or ten days being sometimes necessary. Ammoniacal copper carbonate is also effective. Vapors of hydrocyanic acid gas, either by blowing sulfur in a pot over an alcoholic lamp, or by painting the heating apparatus with equal parts of sulfur, lime, and water, can be successfully used. No time should be lost in applying one of these treatments as soon as the mildew appears. Burned sulfur is likely to injure the plants. As one of the conditions favorable to the spread of mildew is dry, cool air, such as would come into the greenhouse from ventilation, broken down in any way, it is therefore desirable to eliminate all drafts. (2) Out-of-doors. Outside, rose mildew can be controlled by dusting with finely ground sulfur. Frequent applications should be made, starting with the first appearance.

**BLACK SPOT, caused by the fungus Dispoanrops rose (more commonly known as Actinomma rose),** is the most common and injurious disease known to roses. Roses grown both out-of-doors and under glass are affected. The disease is most destructive during the summer. The more or less circular spots may attain a diameter of a centimeter or more, are of a black color, and are characterized by an irregularly fringed border. The spots occur on the upper surface of the leaf, and by confluence may involve the entire surface. Frequently the leaves become yellow, both in the invaded and adjacent areas, and soon drop. Bushy sorts are more susceptible than the climbing varieties.

**Treatment.—**The fungus lives over winter on fallen leaves. Therefore, the source of spring infection will be eliminated by gathering and burning all the leaves about the plants, preferably in the spring before the buds expand. However, this is not sufficient entirely to control the disease. Rotation of the greenhouse is essential, as the spores must be sprayed as soon as the disease becomes manifest, several applications at intervals of a week or ten days being sometimes necessary. Bordeaux mixture is said to be effective, but it is not recommended by some authorities, in that it coats the foliage. As a spray of ammoniacal copper carbonate is just as effective and lacks this objectionable feature of Bordeaux mixture, it is to be given the preference.

**ROSE BLOTCH, caused by the fungus Phragmidium (several species),** has been reported occurring on indoor and out-of-doors roses. It is abundant on wild roses. The disease manifests itself in early spring as orange powdery patches on leaves, shoots, and buds. Frequently the greater portion of the surface of the leaf may be covered. The patches on the wood are often large, and distortion or curving of the part affected may occur. Black spots are to be found on the under side of the leaves and on the stems, the latter often infested with scale. The disease is contagious, all fallen infected leaves and all diseased plants or plant parts should be collected and burned. Spraying with potassium sulfur has been recommended, but further experimentation with this fungicide is desirable.

**SYN CANKER, caused by the fungus Cynomyces veronicae (probably the same as C. fulciu),** cankers are formed on the stem and branches, being characterized by a brown center with a black border, outside of which is an orange zone. Pustules are to be found on the under side of the leaves and on the stems, the latter often infested with scale. The disease is contagious, all fallen infected leaves and all diseased plants or plant parts should be collected and burned. Spraying with potassium sulfur has been recommended, but further experimentation with this fungicide is desirable.

**TREATMENT.—**Diced canes should be cut and burned.

**CROWN GALL, a bacterial disease caused by Bacterium tumefaciens,** the disease occurs on stems and roots of all plants that come in contact with soil containing the bacterium. It is characterized by galls or tubercles being formed on the stems or roots, or both. The treatment consists in the removal of the affected portion of the plant and burning the diseased area, thorough disinfection of the benches, and so on, is the only remedy that has been suggested. Injection of all stock showing any indication of gall is advisable.

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ROSE

Downy mildew is caused by the fungus Peronospora sparsa. It is a persistent disease of greenhouse roses, and is of somewhat rare occurrence. The disease is characterized by wilting and rapid blighting of young leaves.

Treatment. - Dusting with sulfur is bold to be effective against this disease.

L. M. Massey.


R. rock: A good plant for the rockery. F. Tracy Hubbard.

ROSELE. An annual herbaceous (H. Sobardar, page 1485, Vol. III), cultivated in tropical and subtropical regions for the acid of the immature calices and involucels or bracteoles; known also as red sorrel and Jamaica sorrel; it also yields a fiber.

The rose is used in the making of an acid drink and also for jellies, jams, sauces, and marmalades, being a good substitute for cranberry and currant in regions where these fruits do not grow. It is grown somewhat in the southernmost parts of the United States. The culture is essentially that of the eggplant. Seeds are sown in a seed-bed, and the young plants transferred to rows in the field far enough apart to allow of horse-tilling 1.5 to 2 feet apart in the row. The plant usually grows 4 to 5 feet high if not too highly fertilized, and produces a bush of many stalks. No special tillage or care is required. Before the bolls are woody or stringy, they are broken off by hand. They may be utilized fresh, or dried for future use. The common forms of rosele are rich red and make very attractive products: the yellowish forms appear not to be grown in this country. The yield of one plant may be three to sixteen pounds.

ROSMARINUS (Latin, sea-dew; the plant is common on the chalk hills of the south of France and near the seacoast). Labiatae. Rosemary: Hardy evergreen shrub; a well-known garden plant, with aromatic leaves used for seasoning.

Leaves narrow, entire, with revolute margins; fls. in short axillary racemes, few, approximate, opposite, subsericeous, bluish or white; calyx ovoid-campanulate, perfect stamens 2: nutlets smooth, ovoid-subglobose.

Species: floridus, C. floridus, the golden hairs covering the upper parts of the st. and petals. Brazil. - Rare and imperfectly known.

R. floridus, Hort., is a plant offered by Siebrecht which does not appear in botanical works.

F. W. Barclay.

ROUPELIA: Strophanthus.

ROYENA (named for Prof. J. T. Rotherock). Asclepiadaceae. Perennial twining herb hardy in the southeastern United States. Stems somewhat woody at base; lvs. opposite, cor- date-acuminate, long-petioled; fls. loose axillary cymes; fls. white; calyx 5-parted; corolla rotate, deeply 5-delt, the lobes oblong; crown simple, inserted at the junction of the corolla and stamen-tube, 5-parted; follicles thickened, acuminate, smooth. - Three species, N. W. Mex. and Ariz.

cordifolia, Gray. Lvs. opposite, slender-petioled, corhaitic, acuminate; fls. white or whitish, in racemes; corolla-lobes 3-4 lines long. N. W. Mex. - Grows on gravelly slopes near the borders of Ariz. Also in Ariz. - Cult. in S. Calif.

F. Tracy Hubbard.

ROTTBOELLIA (Christen Friis Rottbøell, a Danish botanist, 1727-1797). Gomphrena. Annual or perennial, usually robust, grasses of the tribe Andropogoneae, found mostly in warmer regions of the world. The species furnish some forage but they are scarcely horticulturally. Spikelets in pairs as in Andropogon, awnless, arranged in cylindrical spikes, more or less embedded in the axis, the first glume narrow and covering the excavation of the rachis-joint. The genus is more properly referred to Manisuris by recent authors, this name being taken up on technical grounds.

A. S. Hitchcock.

ROUPALA (probably a native name in Guatemala). Also spelled Ropala, Rupala, Rhopala. Proteaceae. Trees, smooth or ferrugineous-tomentose, suitable only for the warmhouse.

Leaves alternate, leathery, stiff, entire or dentate, undivided, or those of the st. branches (and younger trees?) pinnate: fls. in axillary or terminal racemes pedicelled in pairs, perfect; perianth cylindrical, slightly dilated at base, the limb scarcely broader, subglobose, oblong or elongated, finally reflexed; ovary sessile; caps. hard, calyptra-valved, short-stipitate. - About 40 species, Trop. Amer.

A. Hairs rust-colored.

Pohili, Mein. (R. corcovadensis, Hort.). A tree, with branches clothed with rusty colored woolly tomentum: lvs. 1 ft. or more long, pinnate, with 5-8 pairs of lfts. which are 3-5 in. long, on stout petioles 1 in. or less long, ovate or obliquely ovate, acuminate, narrowly serrate; fls. many, long; ovaries sessile in nearly sessile axillary racemes 3-5 in. long. B.M. 6985.

A. Hairs golden.

R. aurea, Lind. According to Belg. Hart. 1866:202, this species was named for the golden hairs covering the upper parts of the st. and petals. Brazil. - Rare and imperfectly known.

R. fragilis, Hort., is a plant offered by Siebrecht which does not appear in botanical works.

F. W. Barclay.

ROUPÈLIA: Strophanthus.

ROYAL PERN: Osmanthus regalis. R. Palm: Osmunda regalis.

ROYENA (named for Adrian van Royen, of Leyden; died 1770). Ebenaceae. Evergreen trees or shrubs suitable for the warmhouse.

Leaves alternate: infl. axillary; fls. small, hemaphro- dite; calyx deeply 5- (rarely 4-) lobed, often accrescent in fr., lobes more or less pubescent or silky; corolla campanulate or urceolate, 3-delt, lobes obtuse, reflexed; stamens 10 in one rank; ovary conical, pubescent: fr. globose, ovate or oblong, leathery, indeliscient or splitting. - About 20 species, natives of Trop. and S. Afr. The genus is distinguished from the other genera of the ebony family by the fls. being hemaphrodite instead of dicoceous and the stamens in a single series.

Royena lucida is one of the old-time Cape shrubs formerly cultivated under glass for ornament in England and lately offered in southern California. It has small white flowers about ½ inch across, with five more or less reflexed lobes.
lédica, Linn. Tender evergreen shrub, 4–12 ft. high, or a small tree; bark nearly smooth, dusky gray or whitish; lvs. oval or somewhat ovate, leathery, shining above, more or less hisutate beneath; fls. solitary, axillary, white or yellowish; calyx 5-toothed; corolla-tube, ovoidate, limb reflexed, 5-parted, puberulous; segms. rounded; fr. oval or subglobose, red or purple and fleshy when ripe. S. Afr. B.R. 32:40.

ROYSTÓNÉA: Oreoédos.

RUBBER PLANTS. Various plants furnish rubber. The best gutta-percha is said to be produced by Isomandrá Guita (which see), a native of India. For the rubber tree of South America, see Hevea brasilíentis. The rubber tree of tropical Africa is Landolphiá florídeá; see B.R. 6963. The rubber plant of horticulturists is Ficus elástica. For an agricultural account of rubber, see “Cyclopedia of American Agriculture,” Vol. II.

RÚBIA (Latin, red; referring to the color of the dye extracted from the root). Rubiácées. Mostly hardy herbs, sometimes shrubby at base, of little horticultural worth, but one, R. tinctórum, is of economic value.

Plants frequently rather stiff, hispid, or aculeate; lvs. in whorls of 4–8 or very rarely opposite and stipul., sessile or petiolate, lanceolate or ovate, round, cordate; fls. small or minute, in axillary or terminal cymes, 5-merous; involucr. none; calyx-tube ovate or globose, limb lacking; corolla rotate or subcampanulátus, ovate, reflexed, 5-toothed; fr. didymous, fleshy, 2 rare-1 celled.—About 40 species. Medit. region, Trop. and S. Afr., Temp. Asia, Trop. and S. Temp. Amer. R. tinctórum is the dye-plant called madder, the long, fleshy roots of which are ground to powder. Madder is said to furnish a good green fodder if cut the second year when in flower.

RúBUS (Latin, name, ultimately connected with ruber, red). Including Boskéria, Rubícer, Oreóborá, Batíida, and others, but excluding Dalíbarda. Rosácées. Brambile, Blackberries, Dewberries, Raspberries, and Thimbleberries. Low and diffuse mostly woody plants, usually producing canes, grown for the edible fruits, some of the species for ground-cover, and others for the more or less ornamental character of habit, foliage, and bloom.

Trailing, decumbent, ascending, or erect plants, the tips of long growths usually recurring even if otherwise erect, glabrous, hairy or variously glanular, mostly thorny or prickly; st. usually short-lived and pithy (sometimes semi-herbaceous); lvs. simple or compound, alternate, the compounding on the pinnate order and the leaflets largely 3 (several in many of the tropical and oriental species); fls. mostly white or rose-colored, usually in corymb umbels or racemes but sometimes solitary; calyx 5-parted (rarely 3–5-parted), the lobes persistent; petals 5, usually ovate; stamens many, inserted on the torus-rim; pistils many (or sometimes few), closely packed on the torus, usually becoming druplets but sometimes dry when ripe, the style nearly terminal.—A most variable and perplexing genus, containing perhaps 400 fairly well-marked species and numberless intermediate forms. More than 3,000 species-names have been applied. The genus is particularly strong in Europe, where great numbers of species names have been made (see Weide & Née, Rubí Germaniá, 1822–7; Focke, Synopsis Rubíner Germaniá, 1877; Babbington, Britísh Rubí, 1889; Focke, in Ascherson & Grabner, Synopsis der Mittel-
europálschen Flora, 1902; Rogers, Handbook of British Rubí, 1900, and many other publications). Focke in 1877 described 72 species inhabiting Germany. In 1902 he admitted 87 full species to the mid-European flora. There is also a large extension of the genus in the Himalayan region, about 50 species being recognized (J. D. Hooker admits 41 species in the Flora of British India). The species extend eastward into China and Japan. Hemsley, in his Flora of China, admits 41 species. In Japan, Franchet and Savatier admit 22 species. In the North American Flora, Rydberg admits 112 species, in 1913, counting those in Mexico and southward and excluding certain species that are referred to other genera. Students of the American forms should consult the recent writings of Blanchard, Brainerd, Bicknell, and Rydberg. There is no agreement as to the number of species in N. Amer. or elsewhere, and recently other genera have been segregated. Rubus is widely distributed in the northern hemisphere, particularly in temperate and warm-temperate parts. Some of the species are alpine and arctic. In tropical climates the genus is relatively poorly represented. Oliver admits only 4 in the Flora of Tropical Africa. Only 2 species are described in Grisebach’s Flora of the British West Indies. Baker admits 3 species in the Flora of Mauritius and the Seychelles. Hillebrand describes 3 species in Flora of the Hawaiian Islands. The southern hemisphere has few species. Bentham’s Flora Australiánsís has but 5 species. Cheeseman’s Manual of the New Zealand Flora mentions only 4 indigenous species. There are also 5 species described in Harvey and Sonder’s work (Flora Capensis) on the flora of the Cape of Good Hope region. In his Species Rubíera (Bibil. Bot. parts 72 and 83. 1810–14) Focke describes 429 or more species from all around the world.

The genus Rubus tempts the species-maker. The lines of demarcation are obscure or indefinite, the variables are numberless, the botanical characters differ widely on old and young canes and even on spring and autumn foliage of the same cane, and the plants respond readily to conditions. There are marked shade-forms and sun-forms, moisture-forms and dry-land forms, apparently only environmental modifications of prevailing types. The tendency, therefore, on the one hand is to recognize a very few stem-types as species (Bentham reduced all the British rubi of the blackberry...
type to one species, *R. fruticosus*), and on the other hand to make species of the marked departures (Rogers makes more than 100 species and many varieties of the "Rubi fruticosi" of Britain). The herbarium usually provides few checks; the student needs constantly to supplement his specimens with careful observations in the field under many varying conditions, if he is to arrive at an independent judgment on the group. We do not yet know how far the older herbarium definition corresponds with phylogenetic facts. There is indication that rubi hybridize freely, particularly in the blackberry group, and artificial hybrids are produced easily; but to assume hybridity from the herbarium specimen alone is inconclusive, particularly when we have now learned that intermediateness is not a proof of hybridity and that hybrids may even show little departure from one or the other parent. If to the variability of plants in the wild is to be added the variation under cultivation, the difficulties are intensified if one endeavors to name and separate very closely; and if very many species are to be made, then it may be practically impossible to identify the horticultural forms with any of the minutely defined wild species. This difficulty is likely to be little taken into account in the usual study of wild material, and yet it is an obligation of the systematist to give the horticulturist; it would be a pity to serve the horticulturist without the knowledge of the close forms with a Latin name. This procedure, however, may be properly imperfect and because the American species had not then been studied critically; the problem must therefore be worked out mostly as a current systematic study.

Rubus is closely allied to Rosa, from which it differs chiefly in the structure of the flower. In Rosa, the torus or hypanthium is hollow and contains the dry fruits or achenes. In Rubus the torus is convex, conical or elongated, and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stems (canes) that die after one or two years, but some of them have herbaceous tops. In raspberries and blackberries, the canes bear the second year and then die or become very weak. The fruit is an aggregate of carpels. The drupelets are usually more or less coherent at maturity, the collective body forming the "fruit" or "berry" of horticulturists. In the raspberries, the coherent fruits are referred to the torus at maturity, thus causing the berry to be hollow or concave on the under side. In the blackberries, the coherent drupelets adhere to the torus, which separates at maturity and forms the "core" of the berry. Usually the tops are not long-lived, and commercial plantations require frequent renewal.

The horticultural and controlled hybrids in Rubus are now many. Raspberry-blackberry crosses have been frequently effected, but they appear to have little popular interest. The illustration (Fig. 3486) shows a hybrid between *Fontouze* raspberry (*R. idaeus*) and "the common blackberry" of England as shown by Veitch at London in 1897 (G.C. Oct. 2, 1897, from which the illustration is reduced). The fruits were described as of a purplish black color with gray bloom, produced abundantly.

Relatively few of the rubi have horticultural merit, although some of them are of great importance. As pomological subjects they are more important in North America than elsewhere. Here are grown only raspberries, which are popular elsewhere, but also great quantities of improved blackberries, a fruit that is less known as a regular cultivated product in other countries. Although the European raspberry, *R. idaeus*, is grown in North America, it is mostly of a purplish black color with gray bloom, produced abundantly. The beauty of most shrubby rubi depends largely on the removal of the canes after they have bloomed once. After flowering, the cane becomes weak or may die outright. It should be removed to the ground. In the meantime other canes have arisen from the root, and these will bloom the following year. That is, the stumps of rubi are usually more or less perfectly biennial: the first year they make their growth in stature; the second year they throw out side branches on which the flowers are borne; after fruiting, the entire cane becomes weak or dies. Removing
these canes not only contributes to conserve the vigor of the plant, but it also adds to its appearance of tidiness. These remarks apply particularly to the cultivation of raspberries, blackberries, and dewberries.

For other accounts, see Blackberry, Dewberry, Himalaya Berry, Loganberry, Lowberry, and Raspberry, at their respective entries.

In recent years, many of the Chinese species of Rubus, mostly in the subgenus Malachobatus and Ideobatus, have been introduced to cultivation for ornament, some of them with promise of providing desirable edible fruits. Many of them make long vine-like canes and are excellent for training to posts, pillars, on pergolas and arbors. The foliage is often very ornamental and several of them have white or bluish white canes that render them useful for winter effect. Some of the species are evergreen. These oriental rubusces are known in cultivation mostly in England, but are being tested in this country, particularly at the Arnold Arboretum, Boston; at the latter place, none of the species has proved to be perfectly hardy. The following species have survived, although mostly much killed back each winter: R. floccosus, R. Lambertianus, R. lasiostylus, R. Giraldianus, R. mesogonus, R. inominaatus, R. adenophorus; R. conduplicatus and R. teledapos stood the winter of 1915–16.

The species of Rubus require no special place or care in cultivation except to provide in a general way the conditions as to moisture and exposure under which the plants grow in the wild. They are plants of wide adaptability. Propagation is by dividing the clumps in some cases, but better by the use of the natural stolons, or if artificial propagation must be employed, root-cuttings 2 or 3 inches long may be used for many species. They are grown readily from seeds.

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BB. Raspberries, with the coherent drupelets separating from the torus; upright or ascending shrubs, with simple or ternate lvs., small lfts., and drooping fls. in mostly short clusters; stipules linear to lanceolate. Nos. 25–55.

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Section III. DALIBARTIUS.

The species described are prostrate and spineless, woody, brown-hairy: lvs. simple, evergreen, cordate; fls.-stls. erect, the fls. large and white. No. 7.

Section IV. ANOPLOBATUS (batas is Greek for bramble). Upright rather soft-stemmed shrubs, usually 3–5 ft. high, shaggy with barb-like leaf-like bristles, large, lobed lvs., large erect fls., and broad torus. Nos. 8–11.

AA. Species shrubby; flowering shoots arising from woody canes of 2 or more years' growth, the plants small or large but usually large.

B. Plant spineless.

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Section V. MALACHOBATUS. Climbing or prostrate shrubs with entire or palmately lobed seldom compound lvs. and mostly not showy fls.; stipules broad, fugacious. Nos. 12–24.

1. Chamæemorus, Linn. Cloudberry. Bakeapple-Berry. Yellow Berry. Molka. Salmonberry improperly (see No. 32). Fig. 3487. Creeping: branches herbaceous, covering the ground, pubescent or almost glabrous: lvs. round-tipped or reniform, shallowly 3–5-lobed, finely dentate: fls. large and white, in solitary terminal peduncles: fr. large, globose, red or yellowish, composed of few soft drupelets, edible. Entirely across the continent in high northern and arctic regions, and reaching as far south, in the E., as the high land of Maine and N. H. and eastern end of L. I.; also in Eu. and Asia.—The cloudberry is an inhabitant of peat-bogs and cool places. It is much prized for its fr., which is gathered from the wild in large quantities. It is sometimes planted farther south as a rock-garden plant. R. arcticus, Linn., a pink-flowered species with trifoliolate lvs., occurs in nearly the same range, and produces small edible berries; this species belongs to Section II.

Section II. CYLACTIS.

2. pubescens, Raf. (R. americanus, Brit. R. trifolius, Rich.). Sts. slender and trailing, 1–2 ft. long, herbaceous, without prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhomboid-ovate, coarsely serrate lfts.: fls. 1–3 on each peduncle, small and white, the calyx reflexed: fr. small, reddish. Cold swamps, N. J. west and north.—Offered as a rock-garden plant for moist places.

3. pedatus, Smith. Low creeping unarmed herbaceous coptis-like perennial, rarely cult., probably apple-berry of arctic or subarctic regions, and much prized for its frs., belongs here. No. 1.

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Plant spine-bearing (exceptions in some blackberries).

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Section VI. IDEOBATUS. Raspberries, with the coherent drupelets separating from the torus; upright or ascending shrubs, with simple or ternate lvs., small lfts., and drooping fls. in mostly short clusters; stipules linear to lanceolate. Nos. 25–55.

Section VII. EUBATUS. Blackberries and dewberries, with the drupelets adhering to the torus when ripe; stipules linear. Nos. 56–66.

1. Chamæemorus, Linn. Cloudberry. Bakeapple-Berry. Yellow Berry. Molka. Salmonberry improperly (see No. 32). Fig. 3487. Creeping: branches herbaceous, covering the ground, pubescent or almost glabrous: lvs. round-tipped or reniform, shallowly 3–5-lobed, finely dentate: fls. large and white, in solitary terminal peduncles: fr. large, globose, red or yellowish, composed of few soft drupelets, edible. Entirely across the continent in high northern and arctic regions, and reaching as far south, in the E., as the high land of Maine and N. H. and eastern end of L. I.; also in Eu. and Asia.—The cloudberry is an inhabitant of peat-bogs and cool places. It is much prized for its fr., which is gathered from the wild in large quantities. It is sometimes planted farther south as a rock-garden plant. R. arcticus, Linn., a pink-flowered species with trifoliolate lvs., occurs in nearly the same range, and produces small edible berries; this species belongs to Section II.

Section II. CYLACTIS.

2. pubescens, Raf. (R. americanus, Brit. R. trifolius, Rich.). Sts. slender and trailing, 1–2 ft. long, herbaceous, without prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhomboid-ovate, coarsely serrate lfts.: fls. 1–3 on each peduncle, small and white, the calyx reflexed: fr. small, reddish. Cold swamps, N. J. west and north.—Offered as a rock-garden plant for moist places.

3. pedatus, Smith. Low creeping unarmed herbaceous coptis-like perennial, rarely cult., probably adapted to cool woods or rock-gardens: lvs. pedately 3–5-foliolate, with thin obovate or rhombic-obovate irregularly cut lfts. which are glabrous or only sparsely
hairy on veins beneath; fls. solitary and terminal on short shoots, white, about 1 in. across. N. Calif. and Idaho to Alaska; reported in Japan.—By Focke referred to the subgenus Dalibarda; if kept in a distinct genus, the plant becomes Dalibarda pedata, Stepp. Interesting as a rock-garden plant.

4. stellatus, Smith. produces an edible fr. prized in Alaska, where it is native, as well as in Yukon and Kamchatka: st. simple and herbaceous, only a few inches long, 1-fld.: lvs. cordate, 3-lobed or 3-parted, reinform in outline, pubescent on both sides or glabrate in age, simply or doubly serrate; fls. solitary and terminal, rose-colored: fr. red, globose, with 20 or more druplets, said to be known locally as a dewberry.

5. xanthocarpus, Bur. & Franch. (R. Potaninii, Regel). Trailing, the sts. dying back every year, the sts. ploose and weak-spiny: lvs. pinnately 3-foliolate, the fls. ovate, acute or obtuse, strongly and unequally dentate, the terminal one twice larger than the others: fls. solitary or twin in the axils of the upper lvs., the peduncle and calyx weak-prickly, the petals white: fr. large, ovate, bright yellow, fragrant, and palatable, the calyx persistent. China; discovered in 1885 in the Province of Kansu, 40° north latitude, and later found in provinces Szechuan and Yunnan.—Intro. into the U.S. in 1898 by the Dept. of Agric. through N. E. Hansen, to be tried for its edible raspberry-like fr. It is said to provide a good cover; fairly hardy in Minn; it appears not to have found favor in this country and its value is doubtful.


Section III. Dalibardastefum.
7. triflorus, Focke. (R. polycirrus, Franch., not Prog.). A distinct dwarf species with prostrate spineless brown-yellowish-hairy sts., growing several feet in a season under moist shady conditions: lvs. simple, about 3 in. long: cordate, evergreen, sharply toothed, dark green above but with rows of hairs between the chief veins, white-tomentose beneath and with brown bristle-hairs on the rib and chief veins of the lvs.: fr. white, 1 in. across, erect fl. sts.: fr. rather large, bright red. W. China, up to 10,000 ft.—Probably worthy as a wild-garden and rock-garden subject.

Section IV. Anploratus.

8. triflatus, Thunb. First Raspberry. Strong-growing and erect, 7-10 ft. tall: lvs. large, palmately ribbed, 3-5- or even 7-lobed, serrate; fls. solitary, the peduncles villous: berry of medium size, scarlet, with pointed druplets. Japan.—Sparingly intro. and prized for its bright autumn foliage (whence the name "fire raspberry").

3489. Clump of Rubus odoratus (flower X½). No. 10.

10. odoratus, Linn. (R. grandifolius, Salisb. Bossekia odorata, Greene. Rubécer odoratum, Rydb.). Flowering Raspberry. Mulberry (erroneously). Fig. 3489. Strong-growing plant, with the shreedy canes reaching 3-6 ft.: lvs. very large, pubescent beneath, 3-5-lobed, the lobes triangular-acuminate with broad triangular teeth and sharp-serrate; fls. 1-2 in. across, rose-purple, several to many in the cluster, the sepals with a long point, the peduncles and pedicels glandular-pubescent: berry flattish and broad (½ in. across), rather dry, light red, edible but not valued. Nova Scotia to Mich. and Ala. Gn. 34, p. 230. B.M. 323. J.H. III. 31:133. F.E. 22:557. Var. columnaruis, Millsp. (Rubber columnarum, Rydb.), native in W. Va., has lanceolate incised-dentate or doubly dentate lobes. Var. albicus, growing with the type, has whitish fls. and lighter-colored bark.—R. odoratus prefers rich shady woods and banks. It makes a bold subject in a foliage mass, and its fls. are nearly as large as many single roses, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.

11. parviflorus, Nutt. (R. nuttânus, Moq. R. lacer, Kunze Bossekia variiflora, Greene. Rubécer parvi-
florum, Rydb.)). Differs from the last in having white florets in few-flowered clusters and less glandular peduncles. N. Mich. to the Pacific Coast and southw. in the Rockies; the western representative of R. odoratus. B.M. 3453. B.R. 1306. Gn. 45, p. 75; 59, p. 61; 62, p. 249; 67, p. 255.

Section V. Malachobatus.

a. Lvs. compound (in R. Henryi 3-lobed lvs. sometimes occurring).

12. Hénryi, Hemsl. & Kuntze (R. bambusiforme, Focke). Evergreen, with trailing shoots 10-15 ft. long, with few spines and gray-tomentose when young: lvs. 3-lobed and of 3 lfts. often on same branch, rarely of 5, the lfts. long-lanceolate, 3 in. or more long, minutely and more or less distinctly toothed, tomentose beneath: fls. small, pink, in terminal racemes 2-3 in. long: fr. ½ in. or less diam., shining black, not unpleasant in flavor. W. China, 4,000-7,000 ft. altitude. G.C. III. 42:251; 51:148. G. 28:630.—A handsome plant for pillars and pergolas, because of its graceful growth and interesting foliage. It has been considerably advertised abroad.

13. Pláyfairi, Hemsl. (R. Playfairi, H. Hort.). A rambling or diffuse shrub, evergreen, with thin wiry-sts. which bear small curved spines and are cobwebby when young: lvs. of 3-5 linear-lanceolate or lanceolate serrate lfts., the terminal one 5-7 in. long, all bright green above and gray-felty beneath, the stipules ½ in. long and cut: fls. ½ in. across, in irregular clusters, the petals shorter than calyx-lobes: fr. black of fair or moderate flavor. China. G.C. III. 51:106.—Makes a handsome plant when trained up on stakes.

b. Lvs. not compound, although sometimes lobed.


16. Lvs. usually paniculate or thyroid, the peduncles mostly fascicled (except perhaps in No. 20).

17. ichangénis, Hemsl. & Kuntze (R. eugénis, Focke). Sts. long and slender, with few small prickles, evergreen: lvs. simple (the older ones sometimes more or less 3-lobed), broad-lanceolate, cordate at base, 3-4 in. long, light green on both surfaces, remotely toothed, long-pedioled: fls. very small, in small panicles: fr. small, red, of good flavor. Cent. and W. China, to 7,000 ft. altitude. G.C. III. 48:275.—The lvs. have a metallic luster.


3490. Rubus cratagifolius (X J.) No. 27.

cc. Lobes of lvs. usually prominent, and the lvs. mallow-like.

d. Sts. herbaceous or only half-shrubby.

20. irenénus, Focke. Unarmed or with very small prickles, with slender creeping sts., evergreen: lvs. simple, nearly orbicular, 5 or 6 in. either way, cordate at base, slightly 3-5-lobed, white-tomentose and rusty along the nerves beneath, glabrous and metallic green above: fls. ½ in. or more across, the petals roundish, white, exceeding the sepals; fr. yellow. Cent. China, 4,000-8,000 ft. altitude.—Probably useful in mild climates and moist places for covering slopes.

DD. Sts. shrubby.


22. flagellifórus, Focke (R. flagelliformis, Hort., not Smith). Evergreen or nearly so, of attractive habit. 8 ft. or more, the sts. and under surface of lvs. dull tomentose, the spines few: lvs. simple, cordate, acum-
23. *R. moluccanus*, Linn. A large raspberry-like plant in many forms, common in India and Malaya, and to be expected as an intro. plant in many warm countries. Very robust, the tomentose canes and branches reddish and with short curved scattered prickles: lvs. simple, very variable, large, usually hairy, gray- or yellow-woolly beneath, mostly broad-ovate or orbicular and deep-cordate, shallowly 3–5-lobed, irregularly serrate: fls. white, in contracted terminal clusters: fr. in shades of red or succulent. Gn. 63, p. 408. G.M. 46, p. 323.

—Probably not in the American trade.


Section VI. IDAEBATUS. Raspberries.

A. Lvs. simple, often 3-lobed on strong shoots.

25. *R. corchorifolius*, Linn. f. Nearly or quite erect, 4–6 ft., the terete sts. downy and bearing small straight spines: lvs. simple, cordate-ovate, mostly 3-lobed on the verdurous shoots, 4–7 in. long, dull green above and pubescent beneath, the margins coarsely toothed, midrib and petiole with hooked prickles: fls. white, solitary, on short lateral twigs: fr. bright red, large, said to be excellent in quality. Cent. and W. China, to 7,000 ft. altitude. Japan. G.C. III. 51:149.—There are several forms or very closely related species.

26. *R. palmatus*, Thumb. Spreading, often slender-stemmed plant growing 4–5 ft. tall, with many short, but stout nearly straight spines: lvs. rather small, 2–3 in. long as a rule, narrow-ovate-acuminate, or somewhat nearly triangular-ovate-acuminate, rather deeply 3–5-lobed and the middle lobe long and acuminate, the margins very sharply serrate: fls. white, nearly or quite small, ½ in. across, with broadly ovate petals: fr. small (red?), of little value. China, Japan. B.M. 7801.—Sparingly intro. as an ornamental plant, but little known here. The Mayberry, intro. by Luther Burbank, is said to be a hybrid between this species and the Cuthbert raspberry (*R. strictus*). The Mayberry is described as producing a large yellow edible berry, ripening in advance of the strawberry. *R. palmatus* is doubtfully referable to *R. microphyllus*, Linn. f.

27. *R. cratregifolius*, Bunge. Fig. 3490. Strong, erect or diffuse much-spreading plant (3–5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-ovate, acuminate, 3–5-lobed, and the margin coarsely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about ½ in. across: fr. small, orange-red, of no value. China, Japan.—An excellent plant for holding banks and for covering waste places, and giving fine deep reds in the fall. Perfectly hardy in Cent. N. Y.


30. *R. conduplicatus*, Duthie, perhaps the same as *R. trianthus*, but described as differing in the pale green (not white) under surfaces of lvs., smaller fls., prickles on st. stronger and more curved. China.—A scendent glandless shrub, with simple petiolate lvs. which are ovate-lanceolate and acuminate and sometimes obscurely 3-lobed, the margins unequally incised-serrate: fls. 3–4, terminal, white.

31. *R. koehneanus*, Focke (*R. incisus*, Hort., not Thumb. *R. morifolius*, Hort., not Sieb.). Nearly erect shrub, 3–4 ft. high, the branches with purplish bloom and unarmed or sparingly prickly: lvs. simple, varying from almost entire to 3–5-lobed, 5 in. or less long, and nearly as broad, mostly deep-cordate at base, green above and white-pubescent beneath, the lobes more or less acute, petioles somewhat prickly: fls. few, in loose terminal corymbs, white, the petals about ½ in. long: fr. small and globose, orange. Japan. B.M. 8246. Gt. 53, p. 555 (as *R. incisus*).

AA. Lvs. ternately compound, running to 5-foliate forms, often on the pedate order.

B. Fls. large, solitary or few together.

32. *R. spectabilis*, Pursh (*Parmenia spectabilis*, Greene). *Salmonberry*. Fig. 3491. Strong-growing, reaching 5–15 ft., glabrous: spines few or often none, weak: lvs. of 3 ovate-acuminate lfts., which are doubly serrate-toothed and sometimes indistinctly lobed, long-stalked, thin, glabrous or becoming so beneath: fls. solitary or in 2's, large, red or purple: fr. large, somewhat conical, salmon-color or wine-red, edible, the drupelets bearing the persistent styles. Calif. and Idaho to Alaska. B.R. 1424. L.B.C. 17:1602. F.S. 21:2260. Mn. 4, p. 57.

Rubus phenicolasius, Maxim. 

WINEBERRY. Fig. 3492.


Interesting as an ornamental plant, and also recommended for its fr. In the N. it often kills to the ground, but the strong young recurving canes and white-bottomed foliage make it a handsome plant. Sparingly run wild in the E. U. S.

Rubus ellipticus, Smith (R. flavus, Hamilt. R. Gounerk- bid, Roxbg.). Fig. 3493. A yellow-fruited species from the Himalayas (X4½). No. 35.

34. adenoporus, Rolfe (R. sagitus, Focke). Resem bles R. phenicolasius: stts. stout, with short red prick­les, the exposed parts dark red, densely covered, as are the sepals and petals, with purple stalked glands: lvs. un­ternate or the upper ones simple, the lfts. unequal (rarely 5), the terminal largest and cordate-ovate, the lateral subsessile, all dull green above, hairy on both sides: fls. 6-10, in short terminal clusters, rose-colored, the broadly clawed petals about ½ in. long: fr. about ½ in. across, edible, the druplets red with black tips. China.—The erect red stts. are ornamental in winter and also recommended for its fro. In the N. it often kills to the ground, but the strong young recurving canes and white-bottomed foliage make it a handsome plant. Sparingly run wild in the E. U. S.

35. ellipticus, Smith (R. flavus, Hamilt. R. Gounerk­ bed, Roxbg.). Fig. 3493. Tall and erect or nearly so (6-10 ft.), the canes stout and densely beset with straight red-brown or crimson hairs and bearing a few stout, short, nearly straight prickles: lfts. 3, the terminal one much the largest, ovate to orbicular-ovate, not lobed, evenly doubly serrate, thickish, soft pubescent and strongly veined and prickly on the midrib beneath: fls. white, ½ in or less across, in small, many-fl. clusters: berry the size of a common raspberry, yellow, of good quality. Himalayas.—Grown in S. Fla., where it is said to be the only raspberry that perfects its fr. Advertised in Calif. as Golden Evergreen raspberry, and recommended for pergolas and covering sheds. Naturalized in Jamaica.

36. macilentus, Camb. Shrub, to 5 ft., the branches bearing strong straight or hooked prickles, the plant glandless and nearly glabrous: lvs. glabrous, with many hooked prickles, the lfts. 3, of which the terminal one is 2 in or less long and ovate-oblong, the lateral ones small, all doubly toothed: fls. white, usually 3 together on end of short lateral growths: fr. orange, yellow, or red, glabrous, inclosed in the calyx. Himalayan region.

37. lasiostylus, Focke. A species apparently of variable forms, having bluish white bristly strong arch­ing sts.: lvs. pinnate, small, silvery white beneath, the lfts. 3-5 and coarsely unequally double-serrate and sometimes 3-lobed: fls. magenta-red, of good size, the petals erect and clawed: fr. rose-color but woolly, sweet but said to be useless for eating. China. G.C. III. 51:167. G. 28:631.

38. bihorus, Hamilt. Strong shrub prized in cult. for its glaucous-white canes: reaches 8-10 ft., with arching canes that bear stout, recurved prickles: lfts. 3-5, ovate or oval, incise-serrate, whitish beneath: fls. large and white, 1-3 on drooping pedicels: berry golden yellow or amber-colored, size of the common raspberry, the calyx at first erect, but finally spreading. Temp. Himalaya. B.M. 4678. R.H. 1555:5. Gt. 54, p. 456. Var. quinquefiorus, Focke. A striking plant with sts. reaching 12 ft. high and 4-5 in. circum. at base, covered with a waxy white bloom and therefore very showy, the spines stiff and ¼ in. long: pinnate lvs. about 1 ft. long, the lfts. about 5 and white beneath: panicles terminal and axillary and about 5-fl., the fls. white and ½ in. across: fr. golden yellow, good. W. China. Gt. 75, p. 624.—A promising fr.-bearing as well as ornamental plant.

39. Wilsonii, Duthie. Scandent shrub with tense very spiny brown-purple glaucous sts., the branches quadrangular and red-purple and more or less winged between the nodes: lvs. pinnate, of 3-5 ovate more or less cordate strongly double serrate lfts. which are gla­brous and deep green above and paler beneath and sparsely prickly on the ribs underneath: fls. purple, in axillary and terminal few-fl. fascicles (terminal clusters 4-5-fl., axillary 2-3-fl.), the petals about ½ in. broad and long. Cent. China.

E. Infl. usu­ally 1- to 6-fl.

40. innominatus, S. Moore. Raspberry-like in appearance, with strong upright very soft-pubescent and sparingly prickly sts. 6-8 ft. high: lvs. pinnate,
large (often 9 in. long), dark green, grayish white beneath and thickly covered with glandulodes, with 3 or 5 (usually 3) ovate lfts., the terminal one much larger than the others and often 3-lobed; lfts. small, pink, in panicles 15 in. long in Sept.: fr. orange-red, edible. Cent. and W. China. G.C. III. 58:291. R. B. 33, p. 390. — R. Kuntzeanus, Hensli., is distinguished by its glandless lvs.; perhaps not specifically separate; the plants in cult. as R. immonimus apparently belong to this species.

41. telêdapos, Focke. Arching or procumbent, with few strong incurved prickles; lvs. ternate or somewhat quinate, opaque above but densely pubescent when young, white or somewhat yellow beneath; lateral lfts. oblong or oval, dark red; yellow or whitish produced more or less continuously throughout the flowerIng shoots, petioles, and calyx, the latter less pubescent or hirsute:

fl.-clusters more open or scattered: fr. bright light red, or rarely yellow or whitish, not produced continuously. Widely spread in the northern states as far west as Missouri, also in the mountains to Ariz. and northward to Alaska, extending farther north than the Blackcap; also in Asia.—Under cult. the glandular hairs usually disappear. The light red garden berries, like Cuthbert, belong here. Var. altus, Fuller, has amber-white frs.

This plant belongs to a variable group, and other species have been separated from it, as: R. carolinus, Rydb., from N. C., with young sts. puberulent and densely retrorsely glandular-hirsute; R. Egglestonii, Blanch. (R. idaeus var. anomlia, Forn.) from Vt., perhaps an aberrant form, with lvs. of floral branches mostly simple and reniform and somewhat rounded-3-lobed; and others.

45. neglctus, Peck. PURPLE-CANE RASPBERRIES. Fig. 3494. A large and variable race of hybrids between R. strigosus and R. occidentalis occurs both naturally (Rubus neglectus, Peck, 22d Rep. Reg. N. Y. State Univ. 53, 1890) and in the garden (Bailey, Amer. Gard. Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. Univ. 53, 1869). These plants prop. either by "tips" or suckers, usually by the latter. The fl.-clusters are open and sprawling, and the fr. ranges in color from yellow to purple. As a rule, the fr. is aggregated at the end of the cluster, but is scattering below. The Purple-Cane type of raspberry belongs here. Prominent varieties are Shaffer, Philadelphia (now nearly out of cult.), Gladstone, and probably Caroline.

DD. Fr. black at maturity (yellow-fruited forms are known).

46. occidentalis, Linn. COMMON BLACKCAP. Figs. 3485, 3486. Strong, erect bush, the canes finally recurving and rooting at the tips, furnished with straight spines, glaucous, not bristly; lfts. broadly ovate, dull green above and white beneath, finely and sharply serrate and notched, the petioles usually bearing short prick­less fls. in small, dense, prickly clusters with sometimes a few scattering pedicels, the petals shorter than the long-pointed whitish woolly sepals; fr. rather small, hemispherical, firm or even hard, black or occasionally amber-white, dry and sweet. Plentiful in fields and clearings in the northeastern states and Canada to Ore. and Brit. Col. and southward to Ga. in the mountains, and to Mo.—In cult. known in many forms, as Ohio, Gregg, etc. Var. pilillis, Bailey, has amber­yellow fr.; sometimes found in the wild.

47. leucoderms, Douglas (R. occidentalis var. leucoderms, Card.) Branches oft. yellow-tinged: lfts. more coarsely dentate-serrate, sometimes nearly incise­serrate, more gradually acuminate, yellowish green above, the prickles strong and more hooked and those of the infl. flattened laterally: fr. reddish black or black. Rocky Mts. and west to the Coast Range.

AAA. Lvs. long-pinnate, usually with 3 or more pairs of narrow lfts.

48. roseolius, Smith (R. floribundus and R. sinenis, Hort. R. rosæformis, Roxb.) Erect and tall-growing,
evergreen in warm countries, glabrous or somewhat pubescent-hirsute: lvs. odd-pinnate, the lateral lfts. 2-7 pairs, all the lfts. ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-ser-rate, more or less silky-hairy beneath: fls. solitary or in few-fld. clusters, white, 1½-2 in. across, showy: fr. erect, bright red, long thimble-shaped, usually about 1-1½ in. high, very showy, edible but insipid. Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan; naturalized in W. Indies. B.M. 6970. F.S. 17:1714. A.G. 20:82, 87. Var. coronarius, Sims (R. grandiflorus, Hort.), is a double form, sometimes cult. as the "Brier Rose" and "Bridal Rose" (B.M. 1783. G.C. II. 11:77. G.Z. 26, p. 266). The double-flowered form is often grown under glass and in pots.

49. illecebrosus, Focke. A vigorous species, with mostly perennial canes, and fls. usually borne on the ends of the main shoots.

50. coreanus, Miq. Of upright or erect growth, with straight prickles on the sts. and hooked prickles on the petioles, self-supporting, 6-7 ft. or more high, the sts. hoary, bluish white and the young growths dark brown: lvs. pinnate, 7-9 in. long, usually of 7 or 9 ovate serrate pointed light green lfts.; fls. rose-purple, in large terminal panicles: fr. said to be of no value. China, Korea. G.C. III. 51:149.

51. amabilis, Focke. Shrub, 6 ft., slightly prickly or unarmed above: lvs. pinnate, with about 9 ovate or ovate-lanceolate, deeply double-serrate lfts. 2 in. or less long, the petiole and rachis weak-prickly, the stipules small and linear: fls. solitary, terminal, large (about 2 in. across), white: fr. large and red, of good flavor. W. China.

52. fuscatus, Focke. Erect, about 7 ft., the dark brown sts. bearing stiff prickles: lvs. pinnate, silvery white beneath, with 5-7 lfts. which are distant, lanceolate or narrowly rhomb-lanceolate, serrate, white-tomentose beneath: fls. about 12, small, pale purple, in a panicle, appearing in Sept.: fr. small (size of a pea), dark red becoming black. Cent. and W. China, 4,000-6,000 ft.

53. thibetanus, Franch. (R. Velthii, Rolfe). A curious deciduous rubus, said by Focke to represent perhaps the type of a well-marked section in the genus: shrub with terete prickly branches and graceful fern-like foliage: sts. at first erect, but arching with age, blue-white: lvs. 6-9 in. long, pinnate, with 5-11 elliptic or ovate coarsely toothed lfts., puberulous or silky-hairy above and white beneath, the terminal lft. ovate-lanceolate or rhomboid and 2-3 in. long and sometimes almost pinnatifid: fls. rose-purple, in terminal few-flowered prickly and pubescent panicles, the orbicular-obovate petals small: fr. globose, red or blue-black, of moderate size. W. China. G.C. III. 51:149.

54. niveus, Thunb. Very strong-growing, the sts. reaching 12 ft. and 6 in. in circumference, with many stiff brown hairs and small spines, arching at the ends: lvs. pinnate, with 3-11 lfts. variable in shape but mostly rhomb-oblong or ovate-oblong, coarsely serrate, whitish-tomentose beneath, the lateral ones scarcely stalked: fls. small, white, many in terminal and axillary panicles: fr. dull black, of medium size. Cent. and W. China, 3,000-8,000 ft. altitude.

55. Giralddianus, Focke. Said to be an elegant bush reaching 8-9 ft. in height, the sts. white, branching and gracefully curving above, terete, glabrous, prickly: lfts. usually 7, the terminal ovate-lanceolate, the lateral oblong-lanceolate, unequally coarsely serrate, glabrous above, tomentose beneath: fls. in terminal panicles, 4-5 in. long, small, white: fr. black. N. and Cent. China. Gn. 76, p. 824. G.C. III. 51:147 (as an unnamed species).

Section VII. EUBATUS. Blackberries and Dewberries.

a. Blackberries: plant usually erect or essentially so (strong canes often recurring and very long ones often repent).

b. Species exotic, with mostly perennial canes, and fls. usually borne on the ends of the main shoots.

56. thrysanthus, Focke. A vigorous species, with suberect or decumbent canes which are prostrate when very long, the strong prolonged sts. angled and
grooved, thorny with flattened declined or curved prickles, mostly thinly hairy or pubescent; petioles and midribs recurved prickly; lfts. 3 or 5, thick, green above and white-tomentose beneath, round-elliptic or round-ovate, the terminal one broad-elliptic or ovate, abruptly pointed, sharply and mostly doubly serrate-dentate: infl. thyrsoid-paniculate, narrow, short or elongated, sometimes compound, densely pubescent or tomentose, leafy; fls. about medium size, white, the small reflexed sepals white-tomentose: fr. black.—Germany, and probably scattered by cult., regarded by Focke as one form of the collective species R. thyrsanthus, Wimm. Inserted here because the plant grown in this country as the Himalaya berry (p. 1492) is perhaps referable to it.

57. Linkianus, Ser. St. angled with many very strong and sharp hooked prickles and mostly finely pubescent: petioles and midribs strongly prickly; lfts. 3–5, oval or elliptic and acute, strongly and mostly doubly toothed, green and nearly or quite glabrous above but white-tomentose beneath: infl. short-paniculate, beset with strong prickles and often more or less leafy, pubescent or tomentose: fls. mostly double, white, the petals oblong and about 1/2–1/3 in. long; fr. black.—Species founded on garden specimens, the native country being unknown. It is said to be sometimes escaped from cult. and occurs now and then on ballast. A similar plant (not double-fid.) occurs under R. bellidiformis, but differs in its very different foliage. This group is much in need of careful study; Focke regards it as one of the forms of R. thyrsanthus. The plant sometimes grown as R. fruticosus flore alboplena and R. spectabilis, Hort. (not Pursh), probably belongs here or with the following.

58. ulmifolius, Schott (R. fruticosus flore rubroplena, Hort. R. bellidiflorus, C. Koch). Sts. or canes reflexed unarmd tomentose sepals and red broad-ovate or suborbicular petals, sometimes double: fr. black. Eu.; sometimes grown for its evergreen foliage and in the form with double red or pink fls.

59. laciniatus, Wild. (R. fruticosus var. laciniatus, Hort.). CUT-LEAVED or EVEIWREEN BLACKBERRY. Fig. 3499. A tall, straggling bush with permanent or perennial canes in mild climates, and lvs. more or less evergreen, the sts. provided with recurved prickles: lfts. 3, broadly ovate in general outline, cut into several or many oblong or almost linear sharply toothed divisions, the ribs prickly below and the petioles strongly so: fls. in terminal panicles, white or blush, the calyx and pedicels pubescent or even tomentose: fr. usually thimble-shaped, late, black, often excellent. Gn. 21, p. 57; 45, p. 78. G.M. 49: 765.—This blackberry is probably native to Eu., where it has been long known in gardens. It is apparently only a cut-lvd. form of the European R. vulgaris, Welw. & Nees. It is now widely scattered, and seems to thrive particularly well in Hawaii and other Pacific islands and on the Pacific slope. By some it is supposed to be native to the South Sea Isls. (see Bull. 64, Utah Exp. Sta.). It is probable that the plant has been intro. into the W. from those sources, but such fact does not prove its original nativity. It has aroused considerable attention in Ore. and other parts of the W., and has been known as the Oregon Everbearing blackberry. In mild climates the lower parts of the canes often live from year to year until they become as thick as one’s wrist; and in such climates the lvs. persist for the greater part of the winter. The plant has long been grown for ornament in the eastern states, but it has not attracted attention as a fr.-plant in this region. The fruits are of fair size and quality, and ripen from midsummer or late summer to Oct. The plant is a good ornamental subject, although it is likely to cause trouble by sprouting at the root.

BB. Species-group of native American origin, with essentially biennial canes: fl.-clusters from lateral shoots as well as terminal.

60. Cultivated American blackberry. A large group of confused or at least undetermined origin, developed within 50 to 75 years from native American species: mostly erect and thorny plants, the canes commonly tall and more or less recurving at the ends: lfts. 3–5, from ovate-acuminate to rarely nearly
broad-lanceolate, usually pubescent and hairy on the ribs beneath; infl. on elongated raceme-like cluster of which the center or terminal fl. is commonly the oldest (the long-cluster blackberries), or nearly as broad as long, due both to shorter axis and longer lower pedicels (short-cluster blackberries), sometimes with small lvs. intermixed (leafy-cluster blackberries), the rachis and pedicels usually glabular-pubescent but in some forms nearly or quite glabrous: fr. various, from long and thimble-shaped to ovoid or nearly globose.—The more or less well-recognized wild native species-types, variously defined and re-defined, from which some or all of the prevailing pomological blackberries are probably derived, are as follows: R. argittus, Link, an erect or prostrate plant, usually not over 3-4 ft. tall, the prickles many, mostly hooked, and very strong, the young growths white-tomentose; lfts. on bearing canes mostly small and thick, wedge-oblong to wedge-obovate, obtuse or nearly so, densely white-tomentose beneath, the margins sharp-toothed: fl. clusters 4-10-fl., short, more or less leafy and thorny, the fl.-buds globular and pubescent: fr. medium in size, firm, often sweet and good. See discussion under R. Lankians, No. 57.

a. Dewberries: plant trailing or strongly decumbent (often trained to stakes or on trellises under cult.):—The pomological dewberries of the American origin.

61. Cultivated American dewberry. A variable group of American origin, from the native species: trailing or prostrate plants, the weak slender canes lying on the ground or sometimes making low mounds, mostly prickly or thorny: lfts. usually 3: infl. short and mostly interrupted or leafy, or the fls. axillary, pubescent or glabrous: fr. blackberry-like.—The wild thornless blackberry, R. cuneifolius, Pursh, growing in dry fields from Conn. to Fla. and La., appears not to be in cult. or to have contributed to the admixture of the garden blackberries. (Fig. 581, Vol. I.) It is a stiff and thorny plant, usually not over 3-4 ft. tall, the prickles many, mostly hooked, and very strong, the young growths white-tomentose: lfts. on bearing canes mostly small and thick, wedge-oblong to wedge-obovate, obtuse or nearly so, densely white-tomentose beneath, the margins sharp-toothed: fl. clusters 4-10-fl., short, more or less leafy and thorny, the fl.-buds globular and pubescent: fr. medium in size, firm, often sweet and good. See discussion under R. Lankians, No. 57.

RUBUS 3031

3500. Rubus allegheniensis (X3). No. 60.

3501. Rubus procumbens, a common northern wild dewberry (X3). No. 61.
increased by the fact that the same plant may bear 3
medium size, mostly on simple, more or less pricky
toothed, the petiole and midribs usually prickly: fis. of
pointed, rather shallowly and sometimes bluntly
seldom that the lvs. of sterile and flowering shoots of
armed with prickers and sometimes bearing reddish
bristles: lfts. usually 3, narrow-ovate to oblong, short-
over winter and remain at flowering-time; the small ivs.
the canes that are to bear fr. and which often persist
the young verdurous sterile shoots; the smaller lvs. on
the canes that are to bear fr. and which often persist
the vigorous shoots usually 3-foho late: fis. white, the
petals of staminate fis. about 1⁄4 in. long and of
the pistillate fis. or less: fr. black, mostly oblong,
sweet, the drupelate pubescent. Calif., along streams
and moist places.—A perplexing species, by some sepa-
rated into two: R. vitifolius, with lvs. sparingly pubes-
cent on both surfaces and glabrate with age, the
st. only slightly hairy, fr. distinctly longer than
broad, lvs. on vigorous shoots often unifoliate;
and R. ursinus, Cham. & Schlecht., with st.
and lvs. densely pubescent beneath and fr. only
slightly elongate. Certain horticultural dew-
berries appear to be of this species, but they
are of minor importance. The loganberry (which
see, p. 1900) is said to be a hybrid between this
species and probably R. ursinus, but the botanical
origin of it is by no means clear. The Phenomenal is said
also to have sprung from R. vitifolius through hybridization
(p. 1900). The Mammoth black-
berry of California is said to be a cross between R. vitifolius
and the wild blackberry of
Texas (R. arguta). See Pacific
Rural Press, Sept. 4, 1897, for
description and portrait. The
account says that the Mammoth
"produces berries of immense
size, supposed to be the largest
peduncles: fr. usually oblong, sometimes ex-
cellent but often dry and seedy. From Va.
to Fla. and Tex., and in cult. in two or
three forms for its fr.—This is the common
wild dewberry or running blackberry of the
southern states, often a serious pest in old
fields, ranging as far north as Va. and west
to Okla. What are apparently forms of this
species have been intro. for cult. for the fr.
in the southern states.

BBB. The swamp dewberry, with mostly
pubescent lvs. and fis. often imperf rt:
species variable.

BBB. The southern dewberry or running
blackberry.

62. hispidus, Linn. (R. obovatus, Michx. R. sempervirens, Bigel.). Fig.
3505. Sts. very slender, scarcely woody but usually persisting over winter,
creeping, bearing many weak reflexed small bristles: lfts. usually 3, thick,
shining above, wedge-obovate or oval-obovate, usually obtuse, doubly ser-
rate: fis. small, white, on few-fld., herbaceous nearly or
quite leafless peduncles arising from
the creeping canes: fr. small and of few
drupelates, red to red-
black, sour. Swamps or low sandy soils,
Nova Scotia to Ga.
and Kans.—Of no
value for fr., but
sometimes offered by
dealers for covering
the ground in moist
places. The lvs. usu-
ally persist through
the winter, and in
sunny places they
assume a fine bronzy
hue.

BBB. The swamp dewberry or running
blackberry.

63. trivialis, Michx. SOUTHERN DEWBERRY. A variable
and perplexing species, the difficulties being
increased by the fact that the same plant may bear 3
kinds of lvs.: the large, broad blackberry-like lvs. on
the young verdurous sterile shoots; the smaller lvs. on
the canes that are to bear fr. and which often persist
over winter and remain at flowering-time; the small lvs.
that appear with or somewhat before the fis. It is
seldom that the lvs. of sterile and flowering shoots of
the same plant are preserved in herbaria. Canes very long,
usually wholly prostrate (sometimes 10–15 ft.), thickly
armed with prickles and sometimes bearing reddish
bristles: lfts. usually 3, narrow-ovate to oblong, short-
pointed, rather shallowly and sometimes bluntly
toothed, the petiole and midribs usually prickly: fis. of
medium size, mostly on simple, more or less prickly

BBB. The southern dewberry or running
blackberry.
blackberry ever grown, berries 2½ in. in length being frequently found. . . . The canes of the Mammoth are very peculiar, being very large and thickly covered with small, short spines. The canes start early in March, grow thick and stout until about 5 ft. high; they then take on a running habit and grow from 25–30 ft. in a season. Late in the fall the tips of the canes seek the ground and take root. ’The Mammoth is partially evergreen in Calif. The fr. is said to be more acid than the old Lawton blackberry, but “when perfectly ripe is sweet and of superior flavor.”

65. *macropétal us*, Douglas (R. *myricacínthus*, Douglas). By many writers combined with *R. vitífolus*, but differs in its glabrous fr., always terean lvs. which are green and sparingly hirsute on both sides, and larger lfts.: it grows in low woods and on stream-banks from N. Calif. to Idaho and Brit. Col.: sts. trailing or scandent, slightly hairy or glabrate, with weak prickles, and prickles on the petioles and midveins: terminal lft. broad-ovate, subcordate, doubly serrate, often somewhat lobed, acute or acuminate; lfts. ovate: infl. slightly glandular, weak-prickly; lfts. white; petals of staminate lfts. about ½ in. long and those of the pistillate somewhat shorter: fr. half-globular or slightly elongate, black, sweet, about ½ in. long.

**The exotic dewberry, with long prickly glaucescent canes and large very sharp-toothed lfts.**

66. * dumetum *, Weihe. Fig. 3506. Canes long and slender, terete, often 10–25 ft. long, trailing or half-prostrate, glaucescent, thickly beset with rather small somewhat curved spines: lfts. usually 3, mostly broad-ovate pointed to acuminate, irregularly sharp-toothed, becoming bronzy and brown in autumn: lfts. small, white, the calyx white-tomentose, on short pedicels in a cluster terminating leafy growths of the season: fr. of a few large black drupellets. Eu.—Intro. for the covering of banks and stony places, for which it is highly recommended. Its autumn color is attractive. Hardy in New England.

**RUBUS** (after the two Professors Rudbeck, father and son). *Compáctus*. Cone-Flower. Very attractive summer-blooming perennials or biennials, usually with yellow flowers.

Leaves usually alternate, the blades undivided or in some species much cut, as in the common Golden Glow: lfts. both tubular and ray-like, the former usually purplish, the latter always yellow; involucre hemispheric, its bracts imbricated in 2–4 series; receptacle conic or very rarely convex, with chaffy concave scales subtending the disk-fls.; disk-fls. perfect, fertile, their corollas 5-lobed; achenes 4-angled, obtuse or truncate at the apex; pappus none or of 2–4 short teeth.—There are about 31 species, not counting Echinacea, all of N. Amer. Of these scarcely a dozen are of horticultural importance. Under Rudbeckia are often included in nursery catalogues certain plants here referred to Echinacea and Lepachys. These three genera form an interesting horticultural group. Rudbeckia and Lepachys are typically yellow-flowered genera, while Echinacea is predominately rose-purple-flowered. The chaft of the receptacle is usually persistent in Rudbeckia and deciduous in Lepachys. Among the hardy herbaceous species, there are several with striking habit and distinct foliage. There is a wide range of color in the rays of wild plants and many new races are yet to be perpetuated. Some of these with variations in the shape, color, length, color of disk-fls., and so on may serve as the basis of many fine forms. The season of bloom could doubtless be extended. The only full double form, apparently, is the Golden Glow, one of the best perennials of recent intro. Its origin is uncertain, but it appears to be a form of *R. laciniata*. About 1840 John Lewis Childs found it among some plants sent by correspondents. See Gg. 6:370. For structure of the Rudbeckia inflorescence or head, see Vol. III, Fig. 1535.

The cone-flowers are of easy cultivation in almost any soil and situation, from a semi-shady position to one in full sun. Most of the species are found inhabiting moist locations, but thrive well in the garden under the ordinary methods of cultivation, although *R. laciniata* and its double form, Golden Glow, do much better if abundantly supplied with moisture. *R. hirta*, the black-eyed Susan,—sometimes called by the children out West “nigger-heads,”—will thrive in the driest hottest situation, where many others would fail. The best known as a garden plant, and probably the sweetest, is Golden Glow. If cut back severely when through blooming and well watered, it often produces a second crop of flowers. Autumn Glory will be well liked when better known. It is fine for masses and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It resembles *R. nitida*, an improved form of which, known as Autumn Sun, with bright primrose-yellow flowers, is a splendid acquisition. It grows 2 to 6 feet high, blooming from August to October. *R. triloba* is one of the very best, and, while a biennial, perpetuates itself through self-sown plants. It forms a dense twiggy bush somewhat over 3 feet high and nearly as broad if kept moderately well watered, and much smaller if in a dry situation. These plants may be used with effect as a border to a large bed of hybrid delphiniums, as the latter will tower above them and bloom in their young state. By the time the delphiniums are cut down for their second flowering, the rudbeckias hide their untidiness and are in their prime. The flowers are somewhat like those of the ordinary field black-eyed Susan, but smaller, and much more numerous. While doing best in full sun, they also do remark-
RUDBECKIA

ably well in semi-shade, as under overhanging shrubs or in shady corners such as the north side of a house would afford. They like a good open soil. When grown in the open with one stake to the center or main stem, and a string run loosely around the whole plant—being, in fact, a string hoop—catching the larger outer branches to prevent breakage by the wind at the connection with the main stem, they make a very handsome compact plant. If well soaked at the roots, they may be taken up when in full bloom, and potted in a 10-inch pot, placed in a dark sheltered place over night, and then used for decorative purposes. They remain in good form for a month in a room or on the porch if not in a draft. They may also be taken up carefully and all the soil washed from the roots, and the roots placed in a large vase filled with water, where they present a bouquet arranged as Nature intended. An effective fall-flowering group may be formed by using the lighter colored flower forms of *Hibiscus syriacus*—such as *Totus albus*, Lady Stanley, and *elegantissima*—for a center or background, and interspersing groups of the taller rudbeckias (except *Golden Glow*, which is too tall and spreading) and boltomias next to them. In front of these place *R. speciosa* and *R. triloba*, with the blue form of *Aconitum Napellus*, and for a border use *R. bicolor* var. *superba*, placed well to the front to be pulled up when its bloom is past. This group will give color from July until frost. The allied *Echinacea purpurea* and *E. angustifolia* are well adapted for grouping in open bays in shrubby borders, as their flowers are extremely durable and seem in harmony with such surroundings. Rudbeckias are easily increased by seeds, cuttings, or division. (C.W. C. Egan.)

INDEX.

| a. Base of upper lvs. cordate-clasping. |
| b. Color of disk brown or dark purple: shape of disk never cylindrical. |
| c. Lower lvs. deeply 3-cut. |
| d. Duration biennial: disk black-purple. |


cc. Lower lvs. not deeply 3-cut.

d. Plants bristly hairy.


e. Rays 1–2 in. long.


dd. Plants nearly glabrous.

e. Lvs. mostly entire.


dd. Duration perennial: disk dull brownish.

3507. Rudbeckia triloba. (× 34)

3508. Rudbeckia laciniata. (X nearly 3/4)
**Rudbeckia**

Hort., is a dwarf compact-growing form. Var. variabilis, Hort., is a form growing about 3 ft. high, with numerous rigid sts.; fls.-heads with yellow and brown ray-florets and dark purple disk-florets.

**EE.** Les. irregularly serrate.


8. nitida, Nutt. This and the next are southern perennials, with lvs. entire or barely dentate; rays drooping, pure yellow, several or numerous; disk finally columnar, 1-2 in. long. Wet ground, Ga. to Fla. and Texas. Gn. 47:201.


10. laciniosa, Linn. (R. maxima, A. Nels.). Fig. 3508. Perennial, 2-7 ft. high; lower st.-lvs. 3-5-parted, upper ones 5-cleft, rays yellow, few or several, soon drooping; disk cylindric in fr. Most ground, Canada to Fla., west to Mont. and New Mex. G.F. 2:281 (adapted in Fig. 3508). Golden Glow is a full double form, 2 1/2-3 1/2 ft. high. Gg. 3509. Gns. 5:5, 117; 6:370. A.F. 12:274, 275. Ga. 50, p. 411; 62, p. 305. G.C. III. 20:339.
**RUÉLLIA**

cc. Fls. rose, 2-6 in. long.

macràntha, Mart. It forms a compact, many-stemmed shrub, 1-6 ft. high, with ovate-lanceolate lvs. 4-6 in. long; fls. large, bell-shaped, with tubular ñææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææææ æ
when in fr., glabrous: root-lvs. (Fig. 1336, Vol. II) elliptic-ovate, tapering both ways, the margins undulate, the blade 8-12 in. long; st.-lvs. ovate-lanceolate, long-acuminate, more or less rounded at the base: infl. long and compound (often 2 ft. long), dense in fr.; wings of theтвержда across, veiny, entire, one of them bearing a small tubercle near the base. Eu., but naturalized in π many places.—An excellent plant for greens, the strong root-lvs. being used in early spring.

crispus, Linn. CURLY DOCK. YELLOW DOCK. Tall, often 3-3½ ft.: lvs. long-lanceolate, wavy-margined, rounded at the base; valves entire, the tubercles usually 3, the infl. not leafy. Naturalized from Eu., and now one of the common docks about yards and in old fields.

—Not cult., but the lvs. sometimes used for greens.

obtusifolius, Linn. BITTER DOCK. A common weed: lvs. much broader, very obtuse or even coriaceous at base, obtuse at apex, not wavy-margined: valves long-tubercled, the tubercle usually 1, the infl. somewhat leafy below. Eu.

RB. Wings of calyx not tubercle-bearing.

venosus, Pursh. Perennial, 1½ ft. or less tall, glabrous, branched: lvs. oblong-ovate or ovate-lanceolate, usually tapering at both ends, entire, the stipular sheath (ochraceous) funnelform and prominent: valves of fr. large and thin, entire, 1 in. or more across, red-veined and showy, the pedicels hanging in fr. Mo., north and west.—Once offered as an ornamental plant because of the very showy wide-winged fruiting calices. Eu., Madeira, and Caucasus. The foliage of this species, New S. Wales. The genus is closely allied to Epacris.

Hydropapathum, Huds. GREAT WATER-DOCK of Great Britain and elsewhere in Eu., a stout perennial 4-6 ft. high, with very large lvs., sometimes planted for bold effects along water-courses: lvs. broadly oblong-lanceolate to lanceolate, sometimes 2 ft. long, tapering below but the base often somewhat rounded, acute at apex, the margin entire: pedicile very large, with rather crowded mostly leafless whorls, the fruiting pedicels jointed near the base and equaling or exceeding the sepal: valves broad, nearly entire, all tubercle-bearing.

Hydrophilum, Britton. GREAT WATER-DOCK of Eu., a stout perennial, 2-3 ft. high, with large lvs. (Fig. 3511) composed of lvs.-like branches or cladodia which are alternate, leathery, persistent, and spreading; the tubercle, usually 1, the infl. large and ample, the larger part of the fr. sterile (plant sometimes dioecious): valves entire or very pearly so, not over ¼ in. across, cordate-ovate, each with a callosity near the base, the outer small scales reflexed. Eu. and Asia, naturalized in some places in this country.

—Useful for early spring greens, but later in foliage than R. Patientia.

Rupicola (named for F. F. Runge). Acaenthacea. Creeping, diffuse or erect herbs, glabrous or villous; warmhouse plants: lvs. entire: spikes cone-like; bracts in 4 ranks (whereof 2 alternate are sterile), much larger than the calyx, broad with prominently scarious margins; calyx 5-parted, segments acuminate; corolla-tube short, straight, limb 2-lipped, posterior lip entire or 2-toothed, anterior often longer, spreading and 3-cleft; staminodia none; disk annular or short-cup-shaped; caps. ovoid or oblong.—About 30 species in the warmer parts of the Old World. R. eriostachya, Hua. St. pubescent: lvs. ovate-lanceolate, 2-3 in. long: fr. white and yellow in crowded racemes, the barbs and calices covered with long white hairs. Trop. Afr.

Rupicola (Greek rock and grower, presumably referring to its place of growth). Eparidaceae. Shrub: lvs. small, short-petioled, solitary in the axil of the bracteate pedicels which are shorter than the fr.; calyx-lobes 5; corolla 5-cleft, with a very short tube and with spreading divisions which cover themselves in the bud in the form of a quincunx; ovary 5-celled, with numerous seeds.—One species, New S. Wales. The genus is closely allied to Eparica. R. sphenoglandulosa, Maiden. Shrub 2½ ft. high with twiggy branches: lvs. linear-lanceolate ½-1 in. long, rigid: fls. solitary, axillary, forming a raceme-like leafy inf. with a barren apex; corolla subulate, almost ½ in. across, milky white; segments, ovate. B.M. 8435.

Ruscus (an old Latin name). Lithocereus. BURCHET'S BROOM. Erect shrubs with branched partially woody stems, hardy in southern Europe and the southernmost United States.

Leaves minute, bract-like, on lf.-like branches (cladodia) which are alternate, leathery, persistent, and sessile: fls. small, fasicled in the middle of the upper, rarely lower surface of the cladodia, diclinous; berry globose, pulpy, and indehiscent.—Three to 5 species, Eu., Madeira, and Caucasus. The foliage of this plant (Fig. 3511) is composed of lf.-like branches or cladophylls, as in the florists' smilax. D.V., blanched, and 3037
colored sprays (mostly dyed red) are now much used in florists' decorations.

aculeatus, Linn. Shrub, 1 ½-3 ½ ft. high; phyllodia ovate-lanceolate, ½-1 ½ in. long, tapering into a spiny point: fls. 1-2, short-pedicelled: berry red, ½ in. thick. Spring. Gn. 34, p. 291. R.H. 1984, p. 343.—Cult. in Fla. and S. Calif.

R. androgynus, Linn.—Semele androgyna, Kunth.—R. Hypoglossum, Linn., has been highly commended in Germany as a decorative subject. This is the same as R. Hypophyllum, Linn., are both natives of S. Eu., where they have been studied by several botanists, some of whom distinguish them by various characters, while others unite them into a single species. J.G. Baker considers R. Hypoglossum a variety of R. Hypophyllum, differing in having the young shoots elongated in the cluster of fls. in the form of a large leafy bract lacking entirely the texture of the phyllodium. In B.M. 1919, R. Hypophyllum is shown with minute white fls. and handsome red berries nearly ½ in. thick.—R. racemosa, Lam.—Danae racemosa, Moench.

F. TRACY HUBBARD.

RUSSELLIA (in honor of Alexander Russell). Scrophulariaceae. Shrubs with angled, usually slender, and often pendulous branches, grown in the warmhouse for their showy flowers. Leaves opposite or verticillate, usually small, reduced to scales on the branches: fls. in bracteate dichotomous cymes, either laxly or densely many-flowered, sometimes solitary, or becoming minute bracts on the branches: raceme very loose, remotely fl-d.: peduncles elongated. B.R. 1773. P.M. 4:79. G.W. 5, p. 379. Var. semperflorens, Hort., has been mentioned. Gt. 1:5.

Lemoinei, Hort. (R. junccea var. Lemoinei, Hort.), is a garden hybrid between R. junccea and R. sarmentosa, said to be more floriferous, especially during the winter, than the parents.

elegantissima, Hort. (R. junccea var. elegantissima, Hort.), is another product of the same cross as the above and said to have similar characters.

AA. Peduncles many-fl.d.


F. TRACY HUBBARD.

RUSTS. The plant rusts are fungi constituting the large and well-defined order Uredinales, which contains approximately 3,000 species distributed in about forty genera. They are all obligate parasites, mostly on angiosperms, few on gymnosperms, and a small number on ferns.

Relations between host and parasite.

The mycelium of the rust fungi (see Puccini) lives symbiotically within the tissues of the host. It is generally confined to the intercellular spaces, but short branches or haustoria penetrate the cells and absorb nutrient from them. Usually not more than one or two haustoria are found within a single cell and only a small proportion of the host cells are thus invaded, although the mycelium itself is abundant in the intercellular spaces.

The extent to which the mycelium spreads within the tissues of the host and its duration of life vary greatly with different species of rusts. In most of the species which inhabit annual parts of plants, as leaves and stems, the mycelium resulting from individual infections is localized within a more or less restricted area, as in case of hollyhock rust, carnation rust, and wheat rust, and generally persists as long as the infected parts remain alive. That plants thus infected nevertheless become completely covered with rust spots is attributable to the large number of separate infections which occur and not to the spreading of the mycelium through the whole plant. When biennial or perennial parts are locally infected, the mycelium often persists for two years, as in the rust of the red cedar, Gymnosporangium globosum and G. juniperi-virginianae, and becomes perennial, as in the rust of juniper, Gymnosporangium clavaria-forme, and the blister rust on sycamore, Pseudopeziza vulgaris. Many rusts have mycelia which extend throughout the tissues of the host. This type of mycelial distribution is characteristic of the orange rust of the species of brambles, Gymnocoronis interstitialis, and of a number of rusts infecting herbaceous perennial plants, as the rust of Canada thistle, Puccinia suaveolens and the pea rust (Uromyces pisii) on the cucumber spurge (Euphorbia Cyparissias). In such cases the mycelium of the fungus remains dormant in the rhizomes or in the roots and in spring grows out into the developing shoots which are usually characterized by splitting growth with long internodes and small and somewhat deformed leaves. Shoots which are normally trailing or prostrate and branches which are naturally horizontal tend to become erect. This effect is sometimes observed in annual plants also, as in the case of Euphorbia maculata infected by Uromyces euphorbiae. Blackberry canes growing out from roots infected by Gymnomaenia resembles the characteristic growth described above, are free from thorns.

In spite of the intimate association of rust fungi with their hosts, very little apparent injury results to the...
RUSTS

Plants during the vegetative growth of the parasites. Deformations of various kinds are common in plants attacked by these fungi. Aside from those described above there is in many cases a marked stimulation to abnormal growth which results in the formation of galls, as the well-known cedar apple rust, or in enlarged and distorted flowers, fruits, and branches, or in the production of witches' brooms. The greater number of rusts, however, do not cause any abnormal deformation of their hosts, and the presence of the fungus is usually not evident until the time of spore-production, although it may be assumed, and is sometimes apparent, that the plants have been weakened or retarded in growth, particularly when the mycelium is widely dispersed in the tissue. At the time of spore-production, the injury to the host becomes unmistakable. The spores are produced in pustules beneath the epidermis. This is finally ruptured and the spores break forth forming the characteristic orange, brown, or black spots and patches to which these fungi owe their name. The injury is brought about both by the withdrawal of nutrient from the host cells and by the extensive destruction of the epidermis of the host and the resulting loss of water from beneath. The magnitude of the injury differs with the extent to which the plant is infected. Plants which are severely infected often lose their leaves, which wither and die prematurely. In annual or biennial plants this injury hastens the death of the plant, as in the hollyhock and the cereals, or, as in greenhouse carnations, impairs their vigor to such a degree that the plants are of little commercial value. In perennial plants like asparagus, the yearly injury of the assimilating parts results in the slow weakening of the plant and finally in the death of the plants. Apple trees are frequently defoliated as a result of infection by the cedar rust (Gymnosporangium). In plants grown for crops, whether flowers, fruits, or other parts are sought, these injuries diminish the yield, but in ornamentals the mere presence of the fungus can be considered sufficient damage. Rust fungi do not attack various plants indiscriminately. In general, each morphologically distinguishable species is confined to one or to a relatively small group of closely related host plants. Nevertheless, the degree of adaptation to particular hosts varies much with different species of fungi. Some species are truly plurivorous. A striking example of this habit is furnished by the hollyhock rust (Puccinia malvacearum) which inhabits about forty species belonging to many different genera of the subfamily Malvae, and passes readily from one host to another. Many rusts which are apparently plurivorous have been found on closer investigation to be divisible into a number of so-called biological or physiological races, each of which is restricted to a comparatively small group of host plants. This type is illustrated by the common cereal rust (Puccinia graminis): This occurs on all the common cultivated cereals and on about 180 species of wild grasses. The forms on the different hosts are not morphologically distinguishable but culture experiments with this rust on the cereals and the common grasses have shown that it falls into a number of biological races each of which is more or less restricted to a small group of host plants, and cannot readily be transferred to plants outside of that group. Thus the form on barley infects also orchard grass and a few other grasses, but not wheat, rye, or oats; the form on rye infects also barley and some other grasses, but not wheat; and the form on wheat infects less readily barley, oat, rye, and some other grasses. This type of specialization is very common and occurs in many species which have a wide range of host plants. The separation into physiological races is not always sharp and clear-cut and often a transfer of a race from one host to another can be accomplished by so-called bridging species of host plants, i.e., species which act as a common host to two races of rust. It appears also that the degree of specialization of different forms is not the same in different geographical regions. It is readily seen that the matter of specialization of rusts is one of considerable economic significance. In the case of truly plurivorous species of rusts, many wild plants may be the source of infection for cultivated plants. Thus the hollyhock is easily infected from Malex rotundifolia and other Malva; but, in the case of species which, like the cereal rust, have become differentiated into a number of physiological races, there is comparatively little danger of infection from wild plants unless the host on which each host has become more or less strictly adapted to its particular host. Thus, for example, different members of the pink family are inhabited by the carnation rust (Uromyces carophylli) but each genus has its own physiological race which does not infect the members of other genera of the family. The specialization of rusts to particular hosts has also another economic bearing. When a given rust is restricted to one or more species of a genus but does not infect the others, these are said to be immune and there are numerous instances in which there may be immune varieties within a species, as the phrases "disease-resistant cowpeas," or "rust-resistant carnations," indicate. This fact, that the cultivated varieties of a given plant may show various degrees of resistance, furnishes the basis for the breeding of immune varieties, which is one of the most promising means of overcoming the danger from attacks of rust.

Remedial measures

Of the various groups of fungi, the rusts are the most difficult to combat. For most forms, especially those infecting cereals and other agricultural crops, no satisfactory methods of control have been developed since the usual methods of disease-prevention are either unprofitable or not applicable here. Even with horticultural crops, direct remedial measures have proved successful only in a few cases, as with the apple rust, which can be successfully controlled by spraying with Bordeaux mixture. Various mixtures, such as copper sulfate (one pound to fifteen gallons of water) and potassium sulfide (one ounce to one gallon), have been recommended and tried for carnation rust, but the growers are far from being in accord as to the effectiveness of these remedies. Environmental conditions have much to do with the prevalence of rust. Thus the severity of outbreaks of asparagus rust and probably of other rusts also is dependent on the environment in which the host is growing. In greenhouse it has also been found that the environment has much to do with the presence of rust on carnations and chrysanthemums, and that the maintenance of the best cultural conditions is one of the surest means of controlling rust on these plants. This method of control is, however, applicable in the field only in a restricted degree.

While the methods of direct control of rusts have not on the whole proved very successful, the indirect method by the breeding of resistant varieties seems to offer the most promising solution of the problem. Although the so-called rustproof varieties of plants have not generally proved to be entirely resistant, yet different degrees of resistance have long been noticed by growers, and varieties particularly susceptible to rust have been gradually eliminated. The history of the carnation rust in the United States probably furnishes an illustration of this process. Twenty years ago horticultural literature was replete with discussions of the carnation rust and its control; today, however, there is no mention of this disease. At that time much was written of "rustproof" varieties, and mention is frequently made of varieties thrown out on account of rust. At the present time the rust once regarded as the "most dreaded of the carnation diseases" attracts but little attention, and within
the last few years has been scarcely mentioned in florists' journals. That a part of this result at least is due to the gradual elimination of susceptible varieties cannot be doubted, but the fact should not be overlooked that the seriousness of the early rust invasion may have been exaggerated, for even then conservative men felt impelled to warn against the agitated state of mind which caused growers to see rust in every discolored leaf. (McBride, Am. Pho. 8 p. 390, 1893; Herr, ibid. p. 980.)

**Botanical features.**

Botanically the rusts are of great interest because their life-cycle consists typically of two distinct generations. These are technically known as the gametophytic generation and the sporophytic generation, but for simplicity they may be designated respectively as the acellular stage and the telial stage, terms derived from the names of the principal spore-producing structures which characterize the two phases. Each of these generations may produce one or more spore forms. The life-cycle of a rust is best understood by means of an example. One of the most familiar is the wheat rust. If barley bushes in the neighborhood of wheat-fields are examined in spring (May and June), there will usually be found on some of the leaves yellowish spots. Within the discolored area, on the under side of the leaf, there are a number of small cup-like openings with fringed margins. (Fig. 3513.) These are termed acidia and from them yellow acinacoids, which can be seen scattered like dust around the cups, are discharged. About the same time or a little earlier, flask-like pycnidia break through the epidermis on the upper side of the leaf. These discharge minute spore-like bodies whose function is not known. They do not infect either the wheat or the barley. The acinacoid is incapable of reinfecting the barley. They can infect only the wheat and a few other grasses susceptible to this particular biologic race. On the wheat the germ-tubes of the acinacoids penetrate the stomata of the leaf and stem and produce local colonies of mycelium which gives rise to uredospores (Fig. 3514). These are one-celled spores which are produced in many generations and which serve to propagate and spread the fungus during the summer. To them the rusty appearance of infected grain-fields is due. They can infect only wheat and the other gramineous hosts of the fungus but not the barley. Toward autumn the same mycelium which produces uredospores during the summer gives rise to uredospores. These occur as black streaks and patches on the stems and leaves, upon which they remain during the winter. In spring the uredospores germinate in place and produce short germ-tubes termed promycelium from which four minute sporia are apportioned. The sporia are borne away by the wind and when they alight on the blackberry the acidia are again produced. The sporia do not reinfect grain.

Puccinia graminis represents the complete life-cycle of a rust of the most complex type. Rusts of this character, which alternate regularly between two hosts, are said to be heteroecious. Those which produce acinacoids on the same host on which the other spore forms are borne, are said to be autecious. Not all have the entire complement of spore forms, one or more of which may be dropped from the cycle. Thus, neglecting the pycnospores which, so far as known, have no significance in the life of a rust fungus, the red cedar rust (Gymnosporangium) has only acinacoids which germinate immediately or which may survive the winter and reinfect plants in spring; the blackberry rust (Gymnoconia) has only acinacoids which germinate like teleutospores. Many rusts, like some of the grain rusts, are able to maintain themselves by means of uredospores which are capable of enduring the winter. The occurrence of persistence of spore forms must be considered as a special and accidental adaptation to particular conditions, for it is not likely that any form of rust has become permanently reduced to the uredospore stage since this is merely a propagative spore-form of little morphological significance. Continuous uredospore production is likely to occur where plants are kept uninterrupted in a growing condition like carnations in greenhouses, or fig trees and species of Vitis in tropical and subtropical regions. Under such conditions teleutospores are produced with comparative rarity.

**Some common rusts.**

The following are some of the common rusts on horticultural plants:

*Uromyces carpophyllinus*, the common carnation rust, occurs on several members of the pink family but is known in America chiefly in its uredo stage on the carnation upon which teleutospores are also sometimes found. Different physiological races occur on various members of the pink family, some of the European forms on tanacies and on saponaria have acidia on *Euphorbia Herbaceana*, but in America the acellular stage of the race on *daucus* is not known. The presence of the fungus is indicated by the appearance of lead-colored pustules which appear first on the lower leaves and stems of the plants. The pasty seen yellow and discolored pustules which are produced late in the season sometimes survive the winter, but in the northern states the fungus lives through the winter and reinfects the plants in spring; the blackberry rust (*Gymnoconia*) has only acinacoids which germinate like teleutospores. Most rusts, like some of the grain rusts, are able to maintain themselves by means of uredospores which are capable of enduring the winter. The occurrence of persistence of spore forms must be considered as a special and accidental adaptation to particular conditions, for it is not likely that any form of rust has become permanently reduced to the uredospore stage since this is merely a propagative spore-form of little morphological significance. Continuous uredospore production is likely to occur where plants are kept uninterrupted in a growing condition like carnations in greenhouses, or fig trees and species of Vitis in tropical and subtropical regions. Under such conditions teleutospores are produced with comparative rarity.

*Uromyces appendiculatus*, on bean, cowpea and related genera, sometimes causes damage but not commonly. *Epicoccum nigrum* produces on the leaves, teleutospores mostly on the stems, on which they remain during the winter. The infected material should be destroyed.

*Uromyces pisi* produces its uredospores and teleutospores on the pea. The sporia produced by the teleutospore infect the dormant buds of the subterranean shoots of *Euphorbia Cupaniana* in which the mycelium becomes perennial. From the infected thionemes deformed shoots arise, on the leaves of which acidia are borne.

*Puccinia asparagi* has all its spore-forms on *Asparagus officinalis*. This is the most serious parasite of the garden asparagus. It was first noticed as a menace in the eastern United States in 1896. It has since spread over the entire country. As a result of its ravages the system of asparagus-growing has been greatly modified in some regions while in other sections the commercial cultivation of asparagus has been practically abandoned. The palmetto varieties appear to be somewhat resistant to the disease. Sprays of sulfur-soda soap, and of bordeaux mixture, and dusting with sulfur in dry regions have proved more or less successful. Ornamental species grown in the United States are not affected by this rust.

*Puccinia graminis*, the black rust of cereals and grasses, while of great importance agriculturally is of little value from a systematic point of view. It is of interest to horticulturists, however, for the reason that the acellular stage sometimes disfigures the leaves of *Berberis vulgaris* planted for ornamental purposes.

*Puccinia malvacearum*, the hollyhock rust, has only teleutospores which are produced in successive generations. The teleutospores produced during the summer germinate immediately or which may survive the winter and spread the rust. In regions where the winter is not too severe, those produced late in the season sometimes survive the winter, but in the northern states the fungus lives through the winter in the mycelial stage in the stems and petioles of *Malus domestica*, on which developing sets can be found during the entire season. Destruction...
of wild hosts and of diseased portions of plants is a partly successful method of control.

Puccinia chrysanthemi, the chrysanthemum rust, is known in the United States chiefly in the uplands on chrysanthemums of which only some varieties appear to be susceptible. The rust rarely produces serious damage, and is readily controlled by the elimination of susceptible varieties.

Gymnosporangium lasiospermum, cedar rust, apple rust. The telial stage produces the galls known as cedar apples on the red cedar. After rains in the fall the teliospores ooze from the galls in the form of horn-like gelatinous masses, an inch or more in length. They germinate in place and the spordia infect the leaves and fruits of the apple on which the telial stage is produced. No appreciable damage is caused to the cedar, but apple trees are sometimes defoliated by this rust and the damage to orchards is often extensive where cedar trees are abundant. Removal of cedar trees prevents the occurrence of this rust on the apple. The fungus can be controlled also by spraying with Bordeaux mixture.

Gymnosporangium globosum, another species much like the foregoing, is the common cause of apple rust in the East.

Cronartium ribicola has uredospores and teleutospores on various species of currants, but is chiefly of importance on account of the destructiveness of its telial stage to the white pine and other five-leaved pines. Introduced from Europe probably about 1895. Local in northeastern United States at present.

Coleosporium solidagoe is on aster, solidago, and other Composites. It is chiefly of interest because it also attacks the cultivated aster (Callistephus chinensis) causing considerable damage. The telial stage occurs on pines. The intervention of this stage is, however, not essential for the maintenance of the fungus since the uredospores persist through the winter on the rossette leaves of solidago and other Composites.

Melampsora tremulae is the common orange rust of poplars in the United States. Several races exist which have aecia on hazel, pine, and other plants. Numerous other species or subspecies of Melampsora are upon willows. The injury caused by these is not great.

Gymnosporangium interstitialts, of the blackberry, has but one spore form, the urediospores which germinate like teleutospores. The rust is exceedingly common on the blackberry and raspberry covering the whole under surface of the leaves with blisters which burst and display the brilliant orange spore-powder. The mycelium is perennial and permeates the entire host. No satisfactory remedy has been found.

Uredo fici, an unattached uredo-form which is common on fig trees, causing a rusty brown appearance and premature falling of the leaves. Where figs are grown, for fruit; or fig trees, causing the same damage results to the crop from the loss of leaves. Common also in the tropics.

HEINRICH HASSELBRING.

RÜTA (classical name of rue). Rutačae. Perennial, glandular, punctate herbs, hardy or half-hardy North, quite hardy South but of no great horticultural value.

Plants often woody at the base, with terete branched sts.: lvs. alternate, simple, 3-foliolate, pinnately cut or compound: fls. in leafy-bracted terminal or axillary panicles, numerous, yellow or greenish; calyx short, persistent, 4-5-lobed or parted; petals 4-5, limb arched, often dentate or ciliate; stamens 8-10; ovary sessile: caps. 4-5-lobed, the lobes indehiscent or dehiscent at the apex.—About 40 species, mostly in the Medit. region and a few in W. and Cent. Asia.

gravelens, Linn. RUE. Herb of Grace. Fig. 3515. A hardy perennial, woody at the base, 1½-2 ft. high; lvs. fragrant, much divided; lobes oblong, the terminal obovate; fls. yellow. July.—Prop. by division and seeds. An old medicinal plant, with a very strong aromatic odor; sometimes spontaneous in this country.

Patavina, Linn. (Hoplophyllum Patuceum, Hort.). A hardy perennial herb 4-6 in. high; lvs. glabrous, the lower oblong-spatulate, narrowed at the base, the others oblong and leafy, clustered; corymb dense; pedicels somewhat longer than the fls.; fls. golden yellow. June, July.

F. W. BARCLAY.

RUTABAGA: Brassica.

F. TRACY HUBBARD.†
SÁBAL (possibly a native name in South America, but the author of the genus does not explain). *Palmaeae*, tribe *Coryphe*. Spineless palms, low, tall, or almost stemless.

Trunk slender or robust, ringed or nearly smooth, creeping or erect, ascending at the base, clothed above with dead lf.-sheaths; lvs. terminal, orbicular or cuneate at the base, flabellately multifid; segms. linear, bifid, filamentous on the margins, induplicate in the bud; rachis short or long; ligule short, adnate to the rachis; petiole concave above, the margins smooth, acute; sheath short; spadixes large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spathes sheathing the branches and peduncules tubular, oblique at the throat: bracts and bractlets minute; fls. small, glabrous, white or green: frs. small, globose, black, the short style basal. — Species probably 20, if *Inodes* is not separated. Fla. to Venezuela, and in Mex. Here belongs the palmetto or cabbage palm of the southern states. The best botanical ac-count of the genus is Beccari's, Le Palmae Americane della tribu delle Coryphere, pp. 10-83 (1907). Most of the species can be cult. in the temperate house, but any that may come into the trade from S. Amer. would require stove conditions. *S. Palmetto* can be grown outdoors from Charleston southward. *S. texana* and *S. exul* are handsomer species, and hardy in parts of Texas.

The arboreous species of *Sabal* have been separated by Cook (Bull. Torr. Bot. Club, 28:529) as *Inodes*. These species also differ in their foliage. "The leaves of *Sabal* are adapted for standing erect and avoid resistance to the wind by being split down the middle. The leaves of *Inodes* which are held horizontal from the erect axis have attained the unique adaptation of a decurved midrib which braces the sloping sides of the leaf and effectively prevents the breaking above the ligule."

The cabbage palmetto (*S. Palmetto*) grows in groups of a few specimens to several hundreds or even thousands in the rich black soil on the banks of the St. Johns and Ocklawaha rivers of Florida, forming a glorious sight. They are found northward to South Carolina, but they attain their fullest development in Florida, where they always form an important feature of the landscape. Generally they grow in dense groups, but they are more beautiful in all their parts where they have room enough to spread. In southern Florida underneat the crown of leaves is often found a dense wreath of ferns (*Polypodium aureum*), which heightens the charm of these palms considerably. On the St. Johns the trunk is often covered with the trumpet creeper (*Campsis radicans*), or it is hidden by the dense foliage of the cross-vine (*Bignonia capreolata*), both of which form a beautiful ornament, especially when in flower. These suggestions of nature are often followed by planters who have a feeling for nature-like landscape effects. The cabbage palmetto thrives even in the poor sandy soil, and it is greatly improved by cultivation. Even good-sized trees are not difficult to transplant if the whole stem is carefully dug out and all of the roots and leaves are cut off. If the stem has been set at least 3 feet deep and the soil is kept well watered after planting, the palmetto is almost sure to live. In addition to the palmetto, all of the sabals mentioned in this work arc cultivated by the undersigned on high pine land in southern Florida. Under these conditions the sabals have proved a great success, as also all species of *Phenix* and all Coco's of the australis type, while the species of *Washingtonia* I rythea.  

3516. *Sabal Palmetto*, the cabbage palmetto of the southern states.
Livistona, and Trachycarpus have been an entire failure. S. Blackburniana is, in the judgment of some, the finest of all the fan-leaved palms that can be grown in Florida. All the species that form trunks are objects of great beauty when well grown. They need to be well fertilized, or the lower leaves will suffer and finally die, thus detracting much from the elegance of the specimen. They all grow naturally in rich black soil, but all thrive exceedingly well in the sandy pine-woods soil if well fertilized and watered; in fact, they can hardly be fertilized too much, and the more nitrogenous manure and water they get the faster they grow. When transplanted they must be set deep. In planting palms make a hollow about 6 feet in diameter and about 2 feet deep in the center. This center, which receives the plant, is the deepest point, while the ground all around is slightly sloping. Care must be taken to remove the sand after heavy rains or the crown will soon be buried and the little plant dies. As the palm first forms the trunk in the soil and as the growth is rather rapid, this precaution is not necessary after the plant has attained a few feet in size. (H. Nehrling.)

a. Trunk evident, usually tall.
b. Foliage very glaucous.

uresâna, Trel. (Inodes ursesana, Cook). Trunk 15-35 ft. high and upward of 1 ft. diam.: Ivs. glabrous, very glaucous; petiole stout, concavo-convex, unarmored, about 40 in. long, nearly 1 in. wide and nearly 3/4 in. thick; blade about 40 in. long and wide, multifid, with coarse straw-colored fibers from the sinuses, the center arcuately recurved; fr. of a single developed carpel, depressed globose, 3/4 in. or less in diam., edible, green, or when dry dingy brown and somewhat glossy, the mesocarp then corynoid; endocarp whitish straw-color, glaucous, with the persistent bases of the old fibers between the bifiid lobes: spadix very long and much branched, appearing below the Ivs.: fr. globose or inverted pear-shaped, about 1 1/2 in. long. W. Indies.—The name mauritiformis does not appear in the American trade, but S. glaucescens, Lodd., and Hort, probably belongs here, according to Grisebach. Nehrling writes: "S. glaucescens of the trade rivals S. Blackburniana in beauty and rapidity of growth. Its Ivs., though smaller, have a beautiful bluish green color."

Palmétt. Loddi. (Inodes Palmétt, Cook). CABBAGE PALMETTO. Fig. 3516. St. erect, 20-50 ft. high; Ivs. 5-8 ft. long, cordate in outline, recurved at the summit, shorter than the petiole; segms. deeply cleft; spadix spreading, shorter than the Ivs.: fr. drupe black, 3/4-4 in. long. N. C. to Fla. and Bahamas. S.S. 10:508. G.C. II. 2:777. Loudon's Gard. Mag. 5:52-7, with several figures. E.B. 35, p. 36, fig. 12:628. —S. Mocinitis, Hort., is referred to S. Palmétt by Voss, but Nehrling describes it as a stemless plant from Mex., more beautiful than the dwarf palmétt, bearing immense Ivs. on strong stalks, the Ivs. attaining a height of 6-8 ft. Others think S. Mocinitis is the same as S. Blackburniana. S. Palmétt has been confused in the European trade with S. texana. Very commonly planted as a shade and avenue tree in the southern states.

Blackburniana, Glazeb. (S. umbraulifera, Mart. Inodes Blackburniana, Cook). St. 30-40 ft. high, thickened at the middle; blade ample, orbicular, glaucous, rather rigid, shorter than the petiole; lobes about 40, cuneiform, bifiid, filamentous, rather rigid; spadix more branched than in any other species: fr. inverted pear-shaped, about 1 1/2 in. long. W. Indies. G.F. 4:307. G.C. II 2:777. Loudon's Gard. Mag. 5:52-7, with several figures. E.B. 35, p. 36. caúsiârum, Becc. (Inodes caúsiârum, Cook). Pouro Rico HAT-PALM. YARAY. Trunk to 40 or 50 ft. and 2 ft. thick, columnar or nearly so, light gray or nearly white: Ifs.-bases splitting into fibers and more or less remaining as long ribbons: blade 12-20 ft. long, the blade and petiole about equal in length but both surpassed by the infl., the petiole keeled near the end above: fr. 1 1/2-2 in. diam., grayish, with a finely rugose or nearly smooth chestnut-brown seed.

texâna, Becc. (S. mexicana, Auth., not Mart. Inodes texâna, Cook). Robust palm, to 50 ft. and 2 1/2 ft. diam. of trunk which is bright reddish brown: Ivs. 5-7 ft. across, shining and yellowish green, the segms. often parted and filamentous, the petiole stout and equaling or exceeding the blade: terminal branches of infl. slender: seed about 1/2 in. broad, with a prominent micropylo. S. Texas. S.S. 10:508.

exúl, Bailey (Inodes exúl, Cook). A strong vigorous tree with large crown of vivid green Ivs., and green trunk due to the color retained in the sheathing Ifs.-bases: Ivs. otherwise much like those of S. texâna; branches of infl. thickened: fr. solitary, with large seed not wrinkled above nor hollowed below.—Described from handsome trees planted at Victoria, Texas, probably native of Mex. Hardy and promising, princeps, Hort. (Inodes princeps, Cook). A species with a stout trunk which is covered with the persistent bases of the old Ivs.: Ivs. very large, about 5 ft. long; blade divided into about 100 segms., chartaceous, green; segms. all

SABAL

3044 SABAL
rather shortly cleft at the apex, about 3 ft. long by 1½ ft. in. across, acuminate, pointed, fruiting spadix pendent, about 6 ft. long, forming a very dense panicle; spathe tubular-funnel-shaped, striate, obliquely truncate: fr. black, shining, globose. Habitat unknown; cult. in S. Calif.—Resembles S. Blackburniana.

AA. Trunk none or creeping.

glabra, Sarg. (S. Adamsii, Guerne, S. minus or minor, Pers. Caryophyla minor, Jacq.; not Lam.). Dwarf PALMETTO. Fig. 5317. St. short, rooting in the earth so that the palm appears stemless: lvs. 2–3 ft. long; blade circular in its outline, somewhat longer than the petiole; glaucous, segments, slightly cleft at the apex: spadix erect, much longer than the lvs. 3½–6 ft. long. Black, Southern states. B.M. 1434. —Often cult. outdoors in the southern states. There are different forms, apparently unknown to the trade.

megacarpa, Small (S. Etiomia, Swingle). Scrub PALMETTO. Low shrub, the sts. elongated, creeping, and contorted; lvs. standing 4–5 ft. high, the sharp-pointed petioles exceeding the nearly orbicular blades which are 1½–2½ ft. across, deeply cleft at apex and segms., longer than body, filamenteous: fls. 2–2½ ft. long, ascending but becoming prostrate, branching; perianth yellow, white, or nearly globose, ½–1 in. diam.

The following are mostly trade names, but at present they can be only imperfectly described: S. carvelapecta, Bull. A native of Colombia. Possibly only the juvenile state has been described. Lvs. elongate, linear-lanceolate, plicate, with a bluish or glossy green color which is very strongly marked on the under surface. Nehrling says that he cannot distinguish at present his specimens of S. carvelapecta from S. glauca.—S. dehida, Hort. *This species* is described. Nehrling, "reminisces one of S. Moeuvis, although it is smaller in all its parts. The lvs. are numerous, glaucous green and c a fine fan-shaped form. Compared with the Sabals that form a trunk, these stemless species have little beauty, though they look well as foliage plants in company with eucalyptus.—The name 'Matthews' means what it is; but it appears to be unrecognized in botanical literature in connection with Sabal.—S. Gladiolosum, Hort. is S. Palmetto, at least so far as some gardens are concerned, but Bengtsson considers it an European name applied to cult. plants of S. Palmetto.—S. gigante, Hort., Pitcher & Mand. 1895, may possibly be meant for S. glauca.—S. harringtoni, Dodd. according to Nehrling, "is a more upright grower than S. Blackburniana, has a slender st. and the fl-stalks are longer and thinner. The lvs. have a bluish green color while young, changing to a fine dark green when they get older. Habitat unknown and the name has no botanical standing. —S. hastatorpora, Hort. is Livistona Hoogendoornii.—S. javanica, Hort., is possibly meant for S. javanensis, S. Sabal is an American genus and is not known in Java.—S. longifolia, Hort., according to Nehrling "has very numerous, long and slender lvs. which are bright green above and silvery below."—S. longa-pulchra, Hort., according to Nehrling, "is a stemless plant with a small trunk of S. Moeuvis and very long slender stalks." Reasoner adds that the lvs. are glossy green. The last two are known only by these trade names, and are not certainly referable to any maintained species. L. H. B. 4

SABÁTIA (named after Liberatus Sabati, an Italian botanist of the eighteenth century); also spelled Sabatia. Gentianaceous. Hardy annual or biennial (rarely perennial by stolons) herbs, making showy garden or border plants, although little grown.

Leaves opposite, sessile or clasping: fls. showy, rose-pink or purple-white, in cymose panicles terminating the branches; calyx 5–12-parted, the lobes slender; corolla rotate, 5–12-parted, usually with a yellow eye: caps. globose or ovoid, 2-valved.—About 18 or 20 species. N. Amer. and Cuba, mostly on the coastal plains, forming showy gardens or ornamental borders. The chief ornamental feature of this species. L. L. REHDER.

SACCHARUM (saccharon, old Greek name for sugar). Gramineae. The sugar-cane group, little grown for ornament, although making bold specimens. Tall grasses with stout culm and ample panicles, the branches many-jointed: spikelets small, slender, 1–4 in. long, rounded by long silky hairs.—Species 12 in tropical regions, mostly of the Old World. Differences from Erianthus in having awhinless spikelets. The most important species is the sugar-cane, which is extensively cultivated in tropical and subtropical countries for the production of sugar. Prop. by cuttings of the st. Native country unknown, but probably E. Asia. Cult. from time immemorial by cuttings, for which reason many varieties have lost the power to flower or at least to produce fertile seed. Rum is produced from the fermented molasses.

SUCCHARUM 8:261 (under the name Saccharum officinarum, Linn.). Apparently perennial, usually in brackish marshes near the coast from Long Island southward to 2 ft. high; lvs. oblong to oblong-lanceolate, blunt or somewhat acute: calyx-lobes herbaceous, 3–3½-nerved; corolla red-colored or white with yellow spot at base of each oblong-apatulate or oblaneate segm. S. Kennedyana, Fern., is the New England representative, of fresh pond-shores, earlier-flowering; freely strioliferous, to 2½ ft.: basal lvs. oblancoate-acuminate; fls. white, in round, compact, acuminate and subulate: calyx-lobes not herbaceous, linear-subulate; corolla-lobes cuneate-ovate, rounded or emarginate at summit, with much broader yellow spot. L. H. B. 4

SÁBIA (from its Bengal name, Sabja-lat). Saccidaceae. A genus of about 20 species of woody vines or sarcenose shrubs native to India, China, and Japan, with alternate petioled entire deciduous lvs. and axillary, solitary, or cymose, rather small and dull-colored, greenish, purplish, brownish, or yellow fls. followed by small blue drupe-like frs. Fls. perfect, 5, rarely 4–merous; petals short, semi-orbicular to ovate; petals oval to oblong; stamens shorter than petals; ovary superior, 2-celled, each cell with 2 ovules: drupes usually reniform, blue, solitary or 2 and slightly cohering at the base, 1-seeded; stone reticulate.—Only the following recently intro. species is in cult., but little is yet known of its cultural requirements; at the Arnold Arboretum it is growing well under ordinary conditions and has proved hardy. Prop. is by seeds and probably by cuttings. S. Schumanniana, Deis. Climbing shrub, to 10 ft.; glabrous; branchlets green; lvs. petiolar, oblong-lanceolate, rarely elliptic; flowers much smaller, broadly cuneate at the base, bright green, reticulate beneath, ¼–1 in. long: frs. greenish to greenish-purple, cup-shaped, ½ in. across, in slender-stalked, nodding, usually few-fl.d. cymes; pedicel filiform, 1½ in. long; fr. reniform, ½ in. broad; stone slightly compressed, reticulate. W. China.—The drooping blue frs., if freely produced under cult., apparently constitute the chief ornamental feature of this species. Alfred Rehder.
SACCHARUM

Spontaneum, Linn. Less tall and stout than sugar-cane, freely blooming, found in the Molucca region, where it is sometimes cultivated as a hedge-plant, and throughout the tropics of the Old World. A variety of this, S. meyliatum, is shown in Gn. 11, p. 78; 16, p. 323.

ciliare, Anders. Lvs. very narrow, channelled, glaucous, the lower erect. Intro. from India. Said to make large clumps and to be hardy at Santa Barbara, Calif., but not known to bloom there. A. S. HITCHCOCK.

SACCOLABIUM (name refers to the saccate label-

lum). Orchidaceae. Epiphytic herbs with erect leafy stems increasing in length by continued growth at the apex, grown in warm glasshouses.

Leaves distichous, leathery and fleshy, usually channelled; inf. lateral, in the cultivated species a long, densely ftd. cylindrical raceme; Fls. medium or small; sepals subequal, free, spreading, the lateral pair not decurrent on the base of the column; petals similar, sometimes wider; labellum united with the base of the column, spurred, the mouth of the spur open; pollinia on a bifid stipe.—About 20 or more species. Can be prop. by offsets and by cut-backs. Fresh stock is constantly imported.

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochin-China, India, Java, and Philippines. They are closely allied to the genera Aerides, Phalanopsis and Vanda, and require somewhat similar treatment, but do not always aclimatize themselves as readily to artificial cultivation unless given a location with more or less natural surroundings, although some of the more free-growing species, like S. ampuilaceum, S. curvifolium, S. celeste, and S. Hendersonianum, can usually be grown successfully in the cattleya or cypripedium department. The large-growing species with thick succulent leaves require a warm moist atmosphere where the winter temperature can be retained at 65° to 70° F. by night and about 75° during the day, and in the summer or growing season 10° in advance of this. All succeed best when suspended from the roof in pans, baskets or on blocks where they can have free circulation of air about them at all times, receive indirect benefit of the sun’s influence, which will harden their tissue, and where the compost may readily and frequently dry out, during the resting period especially. Grown otherwise the more succulent species, such as S. giganteum (a Vanda), make soft weak tissue, which is wet-splot, a usually fatal disease. Clean chopped sphagnum, freely interspersed with broken pieces of charcoal, is the most satisfactory growing material, and this should not be pressed in so firmly as entirely to exclude access of air to the roots, but the plants must always be firmly secured with pieces of charcoal, potsherds or other similar material, or securely fastened with copper wire to keep them in position, otherwise being more or less top-heavy they are liable to work loose, under which conditions they cannot become properly established. Shading should be applied to the glass from February until November to break the sun’s direct rays, but during the remainder of the year when the solar light is weak its direct influence will be found beneficial. In bright weather in the growing season the plants need a liberal supply of water, both at the roots and over the foliage, but during the resting period and in wet inclement weather, water and syringing must be carefully and sparingly administered. Judgment in this respect is very essential to the successful culture of these plants. The supply of succulums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis. (Robert M. Grey.)

a. Fls. rose-colored.

Hendersonianum. Reichb. f. Dwarf: Lvs. 4-6 in. long, strap-shaped, subacute, distichous on the sts. but spreading in various directions; raceme upright, about as long as the lvs.; Fls. forming a cylindrical mass, bright rose, ½ in. across; dorsal sepals orbicular, concave, lateral ones larger, obvate-oblong; petals obvate; labellum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B.M. 6222.

ampullaceum. Lindl. Fig. 3518. Dwarf: st. 6-8 in. high, with 2 rows of lvs.: Lvs. strap-shaped, channelled, apex truncate and dentate; racemes nearly erect, 4-6 in. high; Fls. deep rose-color; sepals and petals ovate, veined, spreading out flat; labellum linear-falcate, one-half as long as the petals; spur slender, straight. May. June. N. India. B.M. 5586. F.M. 13:40. J.H. III. 32:463. Var. moulemeinense, Hort., is a geographical variety with stronger growth and larger Fls.

AA. Fls. orange or scarlet-orange.

curufo!ium. Lindl. Sts. short: Lvs. linear, 8-10 in. long, 2-toothed at the apex: racemes somewhat drooping, 6 in. long, dense; Fls. 1 in. across, bright orange-scarlet; sepals and petals ovate to obvate, spreading; In the growing season the plants need a liberal supply of water, both at the roots and over the foliage, but during the resting period and in wet inclement weather, water and syringing must be carefully and sparingly administered. Judgment in this respect is very essential to the successful culture of these plants. The supply of succulums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis. (Robert M. Grey.)

AA. Fls. white, spotted with blue.

SACCOLOMIA
 giriş (Greek for sac and edge, referring to the indusia). Polyopodiaceae. A group of tropical ferns, somewhat related to Davallia. They are pinnae, divided into pinnules, often of large size, and with large axillary sori; pinnules and pinnules not jointed to their points of attachment: indusia attached along both sides at the base.

inequale, Mett. (Davallia brasilensis, Hook). A large strow fern with creeping rootstock: lv. as much as 18 in. long, three-pinnate or more. Common in the American tropics.

SADILÉRA (named after Joseph Sadler). Polypodiaceae. Arborose ferns suitable only for the warmest parts of the country. They are pinnate, divided into pinnules, often of large size, and with large axillary sori; pinnules and pinnules not jointed to their points of attachment: indusia attached along both sides at the base.

SAGE (Salvia officinalis). A sweet herb, used for seasoning, and somewhat in domestic medicine.

For at least three centuries this shrubby fibrous-rooted perennial from southern Europe has been widely cultivated in kitchen-gardens for its aromatic whilish green wrinkled and papery leaves. These are arranged oppositely on ascending or decumbent branched stems to 4 ft. high; spike-heads, are left in the cutting-bed until the fol­lowing year. For dryng upon a commercial scale, since this plan is

...
July after harvesting an early crop, such as beets, cabbage or peas. About twice in the three weeks after setting the plants, the field is raked to destroy sprouting weeds and to keep the surface loose, after which, if well done, but slight hoeing is necessary. In September, when the plants crowd each other, each alternate plant or row of plants is cut for sale and the remainder allowed to fill the space. At the first cutting each plant should make about two marketable bunches; at the second at least three. This practice not only insures placing all full of leaves at each cutting but at least doubles the quantity in the end.

In America the green broad-leaved varieties are in far greater demand than the colored and the narrow-leaved kinds. The best variety known to the writer is Hult Mammoth, which is exceptionally prolific of large leaves. It is said to produce no seed. M. G. Kains.

SAGÉNIA. A generic name for a group of tropical ferns here referred to Tectaria, from which there is no valid distinction. For S. decurrens see Tectaria decurrens.

SAGÉRÉTIA (after Augustin Sageret, French botanist, 1763-1851). Phanerogamae. A genus of about 15 species of armed or unarmed often scandent shrubs native to the warmer parts of Asia, in Amer. from N. C. to Mex., with opposite or nearly opposite, entire or serrulate, small, deciduous or persistent lvs. and with minute white fls. in terminal or axillary spikes or panicles, followed by small berry-like, mostly purple lfs. Fls. perfect, 5-merous; the hooded petals and the stamens not exceeding the sepals; disk cup-shaped, 5-lobed style: frs. a small globose drupe with 2-3 leathery nutlets.—These plants are little known in cult. S. theezans, Wimm. has been recently intro. by the Dept. of Agric.; according to F. N. Meyer it may be useful as a hedge-plant and its lfs. have a delightful fragrance which attracts numerous insects; it is apparently not hardy N., while S. pycnophylla has proved hardy at the Arnold Arboretum. The American S. minutiflora is not recorded as being in cult., but may possibly have been planted in collections in the southern states. The frs. of some species are sweet and edible. Prop. is by seeds and probably by cuttings like berchamia which it resembles in habit and general appearance. S. theezans, Brongn. Spinescent shrub, to 6 ft., with slender spreading branches: lvs. persistent, or subpersistent, short-petioled, ovate or oval, obtuse or subacute, subcordate or rounded at the base, minutely serrulate, lustrous above, glabrous or at first slightly villous beneath, ½-1 in. long: fls. sessile in villous spikes ⅔-1 in. long or sometimes longer and forming terminal panicles leafy at the base; sepals slightly pubescent outside: fr. purplish black, about ⅔ in. across. Fls. in autumn; fr. in spring. China. S. pycnophylla, Schneid. Similar to the preceding species: lvs. smaller, ⅓-½ in. long, nearly ½ in. long, sometimes acutish; fls. white, glabrous, in slender glabrous spikes ⅓-½ in. long, usually only 1-4 at the ends of the branches. W. China. S. minutiflora, Trel. (S. Macabuzoit, Brongn.). Spinescent, straggling or trailing shrub: lvs. short-petioled, leathery, ovate to ovate-oblong, acute, serrulate, pubescent while young, glabrous and lustrous at maturity, ⅓-½ in. long: fls. ⅓ in. across, in terminal and axillary slender sometimes panicked spikes: fr. ⅓ in. across, often gibbous, purple. Fls. in autumn: fr. in spring. N. C. to Fla. and Ala.

ALFRED REHDER.

SAGITTARIA (from Latin, sagitta is Latin for arrow, referring to the arrow-shaped leaves). Alismaceae. Arrowhead. Perennial hardy herbs useful for foliage effects in bogs and shallow ponds and also for their white buttercup-like flowers.

Plants of mostly erect habit, aquatic, the lvs. and scapes arising from more or less cormous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monoeious, the lvs. usually in successive whorls or dichose, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small achenes; infl. compound of sessile or peduncled clusters of 3 stalked fls. Sometimes the lvs. are floating. The number of species admitted is variable, but Buchenau in the last treatment of the genus in Engler's Das Pflanzenreich, hft. 16 (iv. 1903) describes 31. Temperate and tropical regions of the world though lacking in Afr. and Austral. Sagittarias are mostly used for colonizing in the open, but S. montevidensis—now the most popular species—is grown in indoor aquaria or plunged in open ponds in the summer. The arrowheads are perennials of easy culture, although likely to be infested with aphids. Propagation is by division, sometimes by seeds.

A. Sepals of pistillate fls. (usually in the lower whorls) erect after flowering, and the pedicels of these fls. thick: carpels not glandular.


SAGITTARIA

3519. Common arrowhead. — Sagittaria latifolia; often known as S. variabilis. (X⅓).
and lily-ponds. Tender to frost. It is sparingly naturalized in the southern parts of the U. S., on both the Atlantic and Pacific sides.

**AA.** Sepals of pistillate fls. reflexed after flowering: pedicels of these fls. slender: carpels somewhat glandular.

**BB.** Bracts at base of whorls united, as if only 1.

**S. subulata**, Buch. (S. natans, in part. S. puella, Nutt.). Slender and simple, usually only a few inches high: lvs. linear or narrowly oblongate, rigid: fls. few, usually in 1 whorl, white, ½-¾ in. across, the filaments broad. N. Y. to Ala., along the coast.—Offered by dealers in native plants. A plant once sold as *S. natans* is said to have come from the Amazon Valley; from this the form known as “New Era” was derived; and a cross of the latter with “S. lanceolata” (S. lanceolata), native in Lo., gave the form “Francis M.” *S. natans*, Pallas, the accepted species under this name, is native in N. Eu. and Siberia.

**BB.** Bracts at base of the whorls.

**c. Lvs. usually distinct and sagittate.**

**latifolia**, Wild. (S. variabilis, Engelm.). Fig. 3519. Very variable in stature and shape of lvs., ranging from a few inches to 3-4 ft. tall: lvs. mostly broad-sagittate with long basal lobes, but running into very narrow forms: fls. clear white, about 1 in. across, usually monocious, the filaments slender: achene winged, with a lateral or oblique beak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants for colonizing in bog-gardens and in lily-ponds. There is a double-flowered form known as *S. variabilis fl.-pl.*, Hort., which probably belongs here. G. 29:31.

**S. sagittifolia**, Linn. OLD-WORLD ARROWHEAD. Rhizome thick and tuberous, stolon-bearing: lvs. broad and sagittate, very variable in form and size: scapes erect, simple or branched, overtopping the lvs.: bracts narrow-ovate, free or slightly connate at base, shorter than the pedicels: petals large, white; filaments glabrous: achene monocious, the filaments slender: achene winged, with a lateral or oblique beak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants for colonizing in bog-gardens and in lily-ponds. There is a double-flowered form known as *S. variabilis fl.-pl.*, Hort., which probably belongs here. G. 29:31.

**bb.** Lvs. usually oblong or linear and not sagittate.

**d. Filaments slender, tapering upward, crenate.**

**lancifolia**, Linn. Erect and somewhat rigid, glabrous, the scapes sometimes reaching 5 ft.: lvs. lanceolate to narrow-oblong to nearly linear, nerved from the thick midrib: fls. white, in several whorls. Swamp, Del. to the tropics.

**dd. Filaments abruptly broadened, pubescent.**

**graminum**, Michx. Erect and simple, glabrous, 2 ft. or less high: lvs. reduced to phyllodia, flat, broad-linear to lance-oblong, pointed: fls. small, white, in 2 or 3 whorls. Newfoundland to Gulf.

*S. micropylina* has appeared in trade-lists as “a variety with large foliars and tall blue spikes of white fls.” Its botanical position is uncertain as there are two distinct things of this name, one a valid species, the other a large-flowered form of *S. sagittifolia*.

**F. TRACY HUBBARD.†**

**SAGUÉRUS** (East Indian name). *Palmææae*. An older name for Arénga, but discarded by the "nomina reicienda" of the Vienna rules. *Arenga mindorensis*, Becc. (Saguérus mindorensis, O. F. Cook), has recently been intro. by the U. S. Dept. Agric, from the Philippines. It is described as a palm 5-10 ft. high, and probably of decided ornamental value for greenhouses and probably also in S. Calif. and S. Fla. Yet little known in this country.

**SÁGUS RÚFFIA**: Raphia.

**ST. JOHN’S-WORT**: Hypericum.

**SAINTPAULIA** (from the discoverer of the plant, Baron Walter von Saint Paul). *Genérvaceæ*. Hairy often stemless perennial herbs, used for greenhouse flowering, the blossoms providing an attractive blue.

Leaves long-petioled, ovate; peduncles radical (or axillary in the caulescent species), 1-5 in. high, bearing several (or 1) fls. in a loose cyme: calyx small, deeply 5-lobed; corolla wide-campanulate, tube short, the lobes elliptic, blue; perfect stamens 2; ovary hairy: caps. oblong, loculicidally 2-valved; seeds small, ellipsoid.—Four species, Trop. Afr.

The end of March is a good time to propagate saintpaulias, when the ripened leaves should be cut off with about an inch of the stalk attached, and inserted in the sand-bed, covering only a small part of the leaf-blade. The sand should not be kept too wet during the process of rooting. Their propagation from seed and general culture is similar to that of gloxinia. The plants may be flowered the entire year or given a period of rest by partly withholding water. (G. W. Oliver.)


**kewensis**, C. B. Clarke. Lvs. entire, with numerous long white hairs: calyx-lobes linear: caps. 2 or 3 times as broad as the preceding and more shaggy, white-hairy. Trop. Afr. B.M. 7408. R.B. 20:100 (both as *S. ionantha*).—Very closely related to *S. ionantha* and confused with it.

*S. puella*, Engler, and *S. Guettarda*, Engler, of German East Africa, appear not to be in cult. **F. TRACY HUBBARD.**
SALAD PLANTS

SALAD PLANTS are those with soft and edible leaves or stems, or both, that may be used raw or in the preparation of uncooked dishes.

The principal salad plant in America is lettuce, which is used exclusively, but not always expertly, for salads. For full directions for growing lettuce in the garden and under glass, see Lettuce and Forcing. Next to lettuce is the best-known salad plant in this country is probably endive, which is excellent, especially when well-blanched plants are to be had in the winter. Endive is much like its relative, as regards its freshness, either in the garden or in the salad-dish. Like endive, it is frequently seen in the larger city markets. The common dandelion should be mentioned in this category. When forced and blanched it makes a salad fit for the most cultivated epicure. For ordinary home cultivation and use, however, the common garden cress (Lepidium sativum, not water-cress, nor upland cress) ranks next to lettuce in value. Its rapid growth and high flavor equally recommend it. This plant is said to be a great favorite in English gardens and forcing-houses, where it is grown in mixture with white mustard and is pulled very young and eaten roots and all. Corn salad is another plant sometimes grown in gardens and used for salad-making. It is most acceptable to those who do not relish the pungency of mustard and cress. Chives is used by many persons as an ingredient of lettuce and other salads; also young onions. Many other plants are used in various places and by various persons for salads.

Besides the salad plants proper, many vegetables are used in a cooked or raw condition for salads. Such are cabbage, cauliflower, brussels sprouts, potatoes, lima beans, beets, Jerusalem artichoke, and the like. With salad plants may also be included pot-herbs, or "greens." The plants especially to be mentioned in this category are swiss chard, beet-tops, spinach, kale, endive, witloof and mustard. Many other plants find occasional or local favor. See Greens.

The only general cultural directions which can be given for salad plants are that blanching is often desirable and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm light, good and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm light, good soil, and the best mechanical condition, is necessary for the same reasons.

F. A. WAUGH.

SALICORNIA (Latin, salt and horn; saline plants with horn-like branches). Chenopodiaceae. Glasswort. Marsh Samphire. A group of about 12 widely scattered species of leafless seaside herbs, hardy or tender, annual or perennial. This and other chenopods which grow in large quantities in the Medit. region were formerly used in making soap and glass, as they yield a large percentage of soda. The ashes of such plants were known to the trade as barilla. The species have probably never been regularly in culture and have no horticultural interest.

MARSH SAMPHIRE. A group of about 12 widely scattered species of leafless seashore herbs, hardy or tender, annual or perennial. This and other chenopods which grow in large quantities in the Medit. region were formerly used in making soap and glass, as they yield a large percentage of soda. The ashes of such plants were known to the trade as barilla. The species have probably never been regularly in culture and have no horticultural interest.

SALISBURY: Ginkgo.

SALIX (ancient Latin name of willow). Salicaceae. Willow. Dioecious trees and shrubs, planted for the foliage and interesting habit, for shade, screens, and cover; flowers in catkins, mostly in spring and in many species very early.

Erect, or some arctic and alpine species prostrate, glabrous, pubescent or tomentose; leaves simple, alternate, mostly elongated and pointed, the stipules persistent and prominent or caducous; buds with a single bud-scale; fls. in lax scaly spikes (aments or catkins), each fl. subtended by a single entire scale and nearly or quite destitute of perianth; the staminate fl. with 1, 2, or 3-6 stamens; the pistillate fl. of a single pistil composed of 2 carpels and 2 more or less divided stigmas; at maturity the pistil dehisces, setting free the small appendaged seeds.—Species and species-like hybrids probably 300, widely spread in the northern hemisphere and a few in the southern hemisphere; no native species are reported in New Zeal, and Austral. In temperate regions, they are mostly plants of water-courses, shores, and swamps; but a good number run into the far N. and the high elevations where conditions of moisture are maintained. The wood is light, soft, and porous. For the staminate and pistillate fls. of willow, see Fig. 1528, Vol. III. The catkins or "pussies" are also shown in Figs. 3521 and 3522 herewith. In rare cases, a willow may be monoecious.

Many hybrids have been described based on specimens found in nature that presented characters intermediate between recognized species. Artificial hybrids have also been made between many species. The dioecious habit of the species seems to facilitate cross-pollination, and it is probable that the intermediate forms so frequently met with and designated in the monographs as varieties are natural hybrids. Upward of one hundred hybrid willows have been described as growing in Europe. Although as many or even more species occur in America, fewer hybrids have been detected here. The hybrids described as growing in America are for the most part between native species and those introduced from Europe. Because of the hybridity and the fact that the sexes are separated, the genus Salix is considered to be very critical and difficult for the systematist.
The role that the willow plays in the north temperate regions is to a certain extent analogous to that of the eucalyptus in sub-tropical regions; it flourishes in wet ground and absorbs and transpires immense quantities of water. It has been used to plant around cesspools for sanitary effect. But while most of the species occur spontaneously in wet ground or along stream-banks, the willows may be cultivated in various situations. The white willow (S. alba) has been used very effectively to fix stream-banks against erosion. (Figs. 3523, 3524.) Its root-system is very extensive and when well established withstands the effect of heavy rapid streams and, becoming anchored in the muddy banks, grow readily. It is one of the most aggressive trees in occupying such places. Willows may also be propagated by seed. The small seeds are very small and contain a green and short-lived embryo. A very short exposure of the seeds to the air will so dry them out that they will not germinate. The safest way to secure seedlings is to plant the seeds in a moist bed of sand or peat moss and cover with a thin layer of the same material. A very high percentage of the seeds will germinate in this manner. S. alba, S. discolor, and S. viminalis appear to be the favorite species for this purpose. Basket willow is now extensively planted in central New York, and considerable manufacturing of this material is under way. It is probable that the Chinese and Japanese willows recently described will yield useful forms for American planting; in Plants Wilsonianae, III, pt. 1, describing Chinese plants, Schneider admits regularly 183 species.

Temperate, Tropical and South Temperate zones are the species increase in size. Some of the species of North Temperate, Tropical and South Temperate zones are large trees. The arborescent species all form wood very rapidly. Specimens of white willow which may not be of great age look venerable from their great thickness of trunk and size of top. The wood is light in weight and color, finely and evenly porous. The wood has been extensively used in manufacture of gunpowder. It has also been used for many other purposes. Certain species have been extensively cultivated for many years in Europe for materials with which to manufacture baskets. S. viminalis appears to be the favorite species for this purpose. Basket willow is now extensively planted in central New York, and considerable manufacturing of this material is under way. It is probable that the Chinese and Japanese willows recently described will yield useful forms for American planting; in Plants Wilsonianae, III, pt. 1, describing Chinese plants, Schneider admits regularly 183 species.

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3524. Same tree as in Fig. 3523, in summer dress.

3525. Old roadside trees of Salix alba.

for slower-growing trees that require partial shade while young. The red and yellow branches of certain willows are very bright and cheering in winter. The weeping forms are very popular, but they are often planted with little sense of fitness. The cultural remarks under Ficus will apply to willows. The species of willows are readily propagated by cuttings. It has been suggested that the brittleness at base of twigs of some species, notably the black willow (S. nigra), is an adaptation to facilitate the natural distribution of the species. Certain it is that twigs broken from the tree by the wind are carried down streams and, becoming anchored in the muddy banks, grow readily.
1. BONPLANDIANA, Kunth. A branching shrub or low tree with coriaceous lvs. 5-6 in. long, dark green above and glaucous beneath: aments usually precocious in the axis of mature lvs. Native of Mex. and the S. W. U. S.

2. nigra, Marsh. BLACK WILLOW. Fig. 3526. Tree, 30-40 ft. high: bark flaky, often becoming shaggy: twigs brittle at base: buds small: lvs. lanceolate, green both sides, nearly siliquary--white while young, The forms of this species not easily distinguishable from one another, can be readily distinguished from the following species.


4. lucida, Muhl. Shrubs or small trees, 6-15 ft. high: branches yellowish brown and thick trunk, not excurrent in habit: branches yellowish brown: lvs. ashy gray and glaucous beneath, 2-4 in. long, elliptical. Eu. N. Asia, seldom bearing good seed, slender; scales deciduous. Eu. N. Asia. Gn. 19, p. 517; 55, p. 89.—Frequently cult. and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hundreds of this willow some 50 years ago. Many of these occur now throughout the country, the trees being 40-50 ft. high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. decipiens, Hoffm. Twigs yellow: buds black in winter: lvs. smaller and brighter green. Probably a hybrid with another species.

5. alba, Linn. WHITE WILLOW. Fig. 3527; also Figs. 3523-3525. Large tree, with short and thick trunk, not excurrent in habit: branches yellowish brown: lvs. ash-gray and silky throughout, giving a white appearance to the whole tree, 2-4 in. long, elliptical. Eu. Gn. 55, p. 57; 61, p. 7.—Hereford, associated with the next species, from which it differs in color of twigs and vesture and color of lvs., as also in its general habit. It is only occasionally seen in Amer. Var. splendens, Anders. (S. alba var. regalis, Wimm. 'Regalis, Hort.'). Lvs. densely silky on both sides, nearly silvery-white while young. The forms of this species not easily distinguishable from one another, can be readily distinguished from the following species.

6. vitellina, Linn. (S. blanda, Anders.). YELLOW WILLOW. Becoming a very large and venerable appearing tree, the rather short trunk often 4 ft. or more in diameter. It is often pollarded. The crown is deliquescent and thin, and driven in the ground will soon establish itself and grow into a tree, Var. decipiens, Hoffm. Twigs yellow: buds black in winter: lvs. silky-hairy when young, glabrous when mature, glaucous beneath, the whiteness intensified after the lvs. fall: aments appearing with the lvs. Abundant in E. N. Amer.

7. salicaria, Linn. (S. viridis, Fries. S. Russetiana, Smith). BRITTLE WILLOW. Fig. 3526. Tree, 50-60 ft. high, excurrent in habit and of very rapid growth: branches brown, obliquely ascending: buds medium size, pointed: lvs. large, lanceolate-acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glaucular serrate: aments appearing with the lvs. (the staminate tree rare in Amer.), seldom bearing good seed, slender; scales deciduous. Eu. N. Asia. Gn. 19, p. 517; 55, p. 89.—Frequently cult. and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hundreds of this willow some 50 years ago. Many of these occur now throughout the country, the trees being 40-50 ft. high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. decipiens, Hoffm. Twigs yellow: buds black in winter: lvs. smaller and brighter green. Probably a hybrid with another species.

8. babylonica, Linn. (S. alba).—Displaying many variations, the most obvious of which are: Var. aurea, Salis. (var. aurantia, Hort.), branches golden yellow, especially just before the lvs. appear in spring. Var. britzensis, Hort., bark red. These as well as other choice varieties are grafted. Var. pendula, Hort. (S. aerea pendula, Hort., S. alba var. stellata pendula, Rehd. S. babylonica aurea and S. babylonica rosea, Rehd.). Tree of weeping habit, similar to S. babylonica ramulis aureis, with yellow branches. M.D.G. 1898:88. Gn. 55, pp. 15, 22. S.H. 2:301, 371.

9. babylonica, Linn. (S. pendula, Moench). NAPOLIEN'S WILLOW. Fig. 3527. A tree of weeping habit, 30-40 ft. high, with long slender olive-green or purplish branches: buds small, acute: lvs. 2-6 in. long, attenuate at base and apex: aments appearing with the lvs. slender, the staminate green, 1 in. long, caps. small. China. Gn. 1, p. 371; 34, p. 527; 39, p. 73; 55, p. 92. S.H. 1:261. F.E. 19:574. G.W. 2, p. 31.—Long known in cult. and often grown in cemeteries. Tender N. Var. annularis, Forbes, lvs. twisted back so as to form a sort of ring.

10. salamoni, Carr. (S. babylonica var. Salamoni, Carr.; sometimes erroneously spelled Salamoni or Salamoni). Hybrid between S. alba and S. babylonica. Similar to S. babylonica, but less pendulous: tree having branches and pendulous branchlets: lvs. similar to those of S. babylonica, but sparingly silky-pubescent on both sides: pistillate catkins with more pubescent.
a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely minor. Large shrub, 12-18 ft. high, forming dense thickets but not growing in clumps: branches turning near anthesis, becomes more so as the capsule mature, an and above: caps. sessile, clothed when young with glabrous or somewhat hairy toward the base, longer leafy branches, very loosely flvd.: fists of terminal interval between the fascicles, first appearing in May and often bearing a second set of fascicled sparsely canescent to extremely canescent, streams and lake-shores: twigs smooth and denticulate, deciduous: aments of late spring on short lateral peduncles, which bear 4--6 of S. babylonica. Of garden origin. 

11. blanda, Anders. (S. Pétzoldi, Hort. S. babylonica var. doroasa, Rowen; possibly also S. pendulina). WISCONSIN WEEPING WILLOW. A hybrid of S. babylonica and S. fragilis. Tree with spreading limbs and pendulous branches; branches brownish green or brown: lvs. lanceolate or narrow-lanceolate, long-acuminate, serrulate, glabrous, dark green above, glaucous beneath, 3-6 in. long and 14-34 in. broad: fists with the lvs.; stamens 2; ovary short-stalked, glabrous, with one gland at the base, half as long as the pedicel. Of garden origin. 


13. Sáafa, Forsk. EGYPTIAN WILLOW. A tree in general appearance like S. alba or S. babylonica. Several varieties have been described. The mature lvs. are bright green above and glaucous beneath, 3-5 in. long and over 12 in. wide. N. E. Afr., where it is frequently cult. along highways. — Intro. into Italy many years ago. 

14. longifolia, Muhl. (S. rébna, Rich., not Huds. S. interiér, Rowlee. S. flerdélía, Sarg., and other recent authors in part, not Nut.). Fig. 3527. Varying in stature from a low shrub to a small tree, usually growing along streams and lake-shores: twigs smooth and brown to densely tomentose and gray: buds of medium size, brown to densely tomentose and gray: lvs. lanceolate or narrow-lanceolate, 3-5 in. long and 14-34 in. broad: fists and reddish purple young wood. 

15. argophylla, Nutt. (S. longifólia var. argophylla, Anders. S. flerdélía var. argophylla, Sarg. S. hindíša, Benth.). Tree or large shrub, 12-18 ft. high, forming dense thickets but not growing in clumps: branches nearly glabrous and exceedingly tough: lark turning from brown to bright yellows, pale brown to densely white, just before blooming, making a thicket of it a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely minorly and remotely denticulate, clothed equally on both sides with an appressed silky pubescence, which more or less conceals the veins; stigmas obsolete: scales oblong and obtuse in the staminate ament, narrower and more acute in the pistillate; lower half of the filament densely gray-hairy: caps. lanceolate, covered with straight appressed silky hairs, closely sessile; stigma sessile; mature caps. often nearly glabrous. Occasionally the lvs. remain upon the plant over winter, the young shoots appearing in their axils in spring. Ament surpassed in length by its leafy peduncles; appearing in May in Ore. and N. Calif. and flowering intermittently all summer. This species is distinguished by its narrowly lanceolate, entire lvs., obsolete stipules, small and rather narrow aments, coarse scales, and hairy caps. S. argophylla occurs on the Pacific slope from S. Calif. to Brit. Col. It is a western representative of the long-lvd. willows. Not advertised, but a beautiful species common along streams and irrigation ditches. 

16. balsamifera, Bbl. Figg. 3527. A much-branched clear-looking shrub, with shining colored twigs, sometime aromatic foliage: glabrous: lvs. short-oval to lance-oblong, rounded and sometimes somewhat cordate at base, glandular-serrulate, thinish and fragrant, dark green above and pale or glaucous and also prominently reticulate beneath: fertile aments becoming lax and open, the slender pedicels of the carpels much longer than the glands, the style short. Along the northern borders of the U. S. and far northward; an attractive species. G.F. 6:29 (reduced in Fig. 3528). 

17. Cáprea, Linn. GOAT WILLOW. Fig. 3529. A small tree, 12--25 ft. high, with upright branches: lvs. large, 2-5 in. long, 1-3 in. wide, rounded or subcordate at base, rugose, very variable: aments appearing before the lvs., large and showy, especially the staminate ones. Eu., Asia. — The typical form often occurs in yards where it has sprouted from the stock upon which the more popular but scarcely more ornamental variety, pendula, has been grafted. Var. pendula, Hort. KILMARNOCK WILLOW. Dwarfed form, grafted on stock about 3 ft. high, and forming a weeping shrub. Often planted in yards. S. multínérmis is supposed to be a hybrid, and probably belongs with S. Cáprea. S. Cáprea var. trícolor, Hort., is said by F. W. Kelsey to be a round-headed tree, with "tri colored foliage," probably a form of S. aurita. S. palmáfólia, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green lvs. and reddish purple young wood. 

18. discolor, Muhl. PESSY WILLOW. Figs. 3521, 3522, 3527. A shrub or short-trunked tree, 10-20 ft. high: buds very large and nearly black: lvs. smooth and bright green above, whitish beneath, irregularly crenate-serrate: aments appear early in spring, before the lvs., closely sessile, enveloped in long silky hairs. E. N. Amer. — Worthy of more extended cult. and thriving in dry ground. 

19. rostráta, Rich. (P. Bobbétána, Sarg.). Fig. 3527. A small tree, 10-20 ft. high, with short but distinct trunk: buds of medium size, conical, brownish lvs. dull green and downy above, prominently veined and hairy beneath: aments appearing with the lvs., the staminate beautiful golden when in flower; scales narrow
and shorter than the pedicels: caps. long-rostrate. E. N. Amer.—Prefers dry soil and can be used to good advantage against walls and in rockeries.

20. **humilis**, Marsh. **Prairie Willow**. A shrub, 3–8 ft. high, varying much in stature, and in size and shape of lvs.; branches hairy: lvs. oblanceolate to oblong, nearly entire, more or less revolute: aments densely and many-fld. E. N. Amer.—Grows in dry situations.

21. **tristis**, Ait. **Dwarf Willow**. Fig. 3527. A diffuse shrub, 1–1 1/2 ft., with long deep-set root: branches gray, slender: lvs. small, 1 in. long, linear-lanceolate, very short-petioled: aments small and rather few-fld.; stamens reddish. N. E. N. Amer.

22. **sericea**, Marsh. **Silky Willow**. A shrub usually 4–8 ft. high, diffusely spreading from base: branches often reddish: buds obtuse and rounded at apex, cylindrical: lvs. very silky beneath, sometimes becoming less so at maturity: aments densely fld., appearing with the lvs.; stamens often orange-red: caps. short-pedicelled, ovate-oblong, nearly truncate at apex. N. E. N. Amer.—This species hybridizes freely with *S. cordata*, and several natural hybrids have been described.

23. **petiolaris**, Smith, not Hort. Fig. 3526. A low shrub, 3–5 ft. high: branches slender, the whole plant much slenderer than *S. sericea*, with which it frequently grows: buds smaller and more pointed: lvs. only slightly silky when young, soon glabrous, more evidently toothed: aments rather loosely fld.: caps. rostrate and pointed, distinctly pedicelled. Cent. and N. E. N. Amer.—*S. petiolaris* of the trade is *S. incana*.

24. **viminalis**, Linn. **Osier Willow**. A shrub or small tree, 10–20 ft. high: branches slender and straight: lvs. linear-lanceolate, beautifully silvery, 4–10 in. long; margins revolute, entire: aments appearing before the lvs., golden yellow. Eu., Asia.—Most often seen in plantations for basket material, for the production of which the plants are cut near the ground every year. Willow-culture in experienced hands is often profitable. (For details, see Simpson, *Osier Culture*, Bull. 19, Div. of For., U. S. Dept. Agric. 1898.) This species does not thrive in this country as well as in Eu.

25. **candida**, Fluegge. **Hoary Willow**. Fig. 3526. A shrub, 2–5 ft. high: young branches hoary, becoming smooth and red with age: buds reddish, rounded at the apex: lvs. lanceolate or linear-lanceolate, 2–4 in. long, dark green and wrinkled above, covered below with dense white tomentum, revolute: aments sessile, appearing before the lvs.: staminate of reddish anthers: caps. densely white-woolly, with red style and stigmas. N. Amer.—This species hybridizes freely with *S. cordata*, and several natural hybrids have been described.

26. **myrtilloides**, Linn. Fig. 3526. A shrub, 2–5 ft. high, with rather slender brown twigs: lvs. oblong or elliptic-obovate, usually obtuse at both ends, entire and smooth, reticulate-veined: aments rather few-fld.: caps. reddish, glabrous. N. E. N. Amer. and Eu. Usually grows in cold peat-bogs.—Probably not in cult. The plant sold under this name is probably some form of *S. purpurea*, which *S. myrtilloides* closely resembles in general appearance.

27. **cordata**, Muhl. (S. *rigida*, Muhl.), **Heart-leaved Willow**. Fig. 3530. A large shrub or small tree, 10–30 ft. high: branches stout: buds large, flattened against the branch: lvs. oblong-lanceolate, green on both sides, finely serrate, glabrous and rather rigid at maturity: aments rather slender, appearing with the lvs.: caps. glabrous, greenish or brownish. N. Amer.—This is a variable species and undoubtedly some of the forms included in it are hybrids; several supposed natural hybrids have been described. Var. *pendula*, Hort., is a decumbent form.


29. **incana**, Schrank (*S. petiolaris*, and *S. rosmarinifolia* of American gardeners, but not of botanists). Shrub or small round-topped tree, with long, slender branches: lvs. linear, revolute, 2–5 in. long, very narrow, green above, white-tomentose beneath: aments long and slender, appearing with the lvs.: caps. glabrous; filaments of stamens more or less connate. Eu.—This species is frequently grafted upon hardy stock (*S. Caprea*) when sold from nurseries.

31. sitchenisis, Sans. Stretta Willow. A shrub, 10-12 ft. high and more; lvs. obovate, glabrous, clothed beneath with a soft white down. The aments appearing after the lvs., large, cylindrical and graceful, also satiny. N. W. N. Amer.—This willow, which, so far as known, has not been used as an ornamental plant, is one that would be at once novel and beautiful. The nomenclature here given is provisional. Salix sitchenisis, the type of the genus, is preserved in plants in culture.

32. Cotettii, Kerner. A low shrub differing from S. rehus mainly in the larger size of the whole plant as well as the lvs. Cent. Eu. G.W. 9, p. 342.

33. herbaeae, Linn. A very dwarf species usually not more than an inch or so in height, forming dense mats; lvs. orbicular, serrate, usually emargnate at both base and apex. Alpine regions of Amer. and Eurasia, White Mts., N. H.

34. myrsinites, Linn. (S. Jactuati, Host). An alpine shrub a foot or less high, either erect or more or less creeping; lancesolate, coriaceous, shining, green both sides. Arctic and alpine regions.

35. pyreneaca, Gouan. A dwarf caulescent shrub usually more or less depressed in habit, with slender brown shining twigs; lvs. membranous, about 1 in. long and half as wide, entire, ciliata on the margin. In the alpine regions of the Pyrenees.

36. repens, Linn. A shrub of variable stature and vestiture: lvs. oval to linear, entire or remotely serrulate, shining above, silver-silky or glabrous beneath, stipules wanting. N. Eu. and Asia. Var. argentea has silver-silky lvs. G.L. 22:325.

37. reticulata, Linn. A depressed shrub with few oval or orbicular lvs. glaucous beneath, green above, rugose-runcinate: aments slender, borne on a long peduncle. Arctic regions of both hemispheres.

38. retusa, Linn. (S. seryphylofoia, Scop.). A depressed shrub: lvs. characteristically "parallel"-veined, oblong or slightly retuse at the apex, entire, less than 1 in. wide. Alpine regions of Eu. and Asia.

S. aglaia, Hort.—S. daphnoides.—S. ammopolola, Linn. (S. triandra, Linn.). Usually shrubby, to 12 ft.; branchlets glabrous, 5-6 in. long, the lvs. lanceolate, glabrous, pale green or white below, to 3 in. long; fls. shortly before or with the lvs.; stamens 3; ovary long-stalked, glabrous. Eu.—S. Biberi, Steenb. An ornamental dwarf species: lvs. oblong or oval, 1/2-1 in. long, mucronate, dark green and glabrescent above, silvery with silvery margined hair beneath; aments 1-2 in. long, produced in Oct. and Nov. before the fall of the lvs. China.—S. phylloides, Dode. A hybrid between S. babylonica and S. retusa. Salix retusa, the type of the genus, is preserved in plants in culture.

SALPICHROA (Greek, tube and skin; in reference to the form and texture of the flower). Syn. Salpichroma. Solanaceae. Shrubs, subshrubs, or herbs, sometimes grown in the greenhouse and now used for outdoor planting in southern California.

Leaves often small, erect, long-petioled; fls. white or yellow, 2-3 in. long (Section Salpichroma) or only about 1/2 in. long (Section Perizoma); calyx tubular or short, 5-cleft or -parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, ample, often short induplicate-valvate; berry ovate or oblong, 2-celled; seeds numerous, compressed.—About 10 species, extra-trop. S. Amer. The species described below is said to have the advantage of being an exceedingly rapid grower, with a thick mass of foliage and will thrive in alkali soil and under intense heat. The small white berries are sold everywhere in Paraguay as "cock's eggs." It grows with astonishing rapidity from the fleshy roots, which, however, are destroyed by frost.

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rhomboides, Miers (Salpichroma rhomboides, Miers). A half-hardy climber, somewhat wooly, with green, flexuous branches: lvs. small (blade: 2-3 in. long), ovo-v - rhomboid: fls. small, usually less than 1/2 in. long, solitary, nodding, white; corolla short, centri­nate at the middle, high, and at the throat, and bearing on the inside a fleshy, woolly ring: berry ovate-oblong, yellowish or white, edible, but of poor flavor. Argentina. G.C. III. 24: 450. R. H. III. 8: 45. C. 39: 367. F. E. 32: 448.

The plant appears to be offered as Withania origenifolia, although the genus Withania itself has good stand­
SALPÍGLOSSIS (Greek, tube and tongue; alluding to the form of the corolla and the appearance of the style). Solandraceae. Viscous-pubescent half-hardy annual, biennial, or perennial herbs, chiefly used for garden flowers, but sometimes also grown in the greenhouse; of rich and attractive colors.

Plants about 18 in. high, erect, covered with short glandular hairs: lvs. entire, wavy-margined, dentate or pinnatifid: fls. long-stemmed, large, funnel-shaped, ranging in color from various shades of purple and blue, through numerous reds and yellows to creamy white, and usually beautifully marbled and penciled with several colors; calyx tubular, 5-crested, corolla funnelform, widely bell-shaped at the throat; lobes 5, pleate, emarginate; stamina 4, didynamous: caps. oblong-ovoid; valves 2-crested.—About 8 species, natives of Chile.

The usual species in cultivation is *S. sinuata*, which was formerly divided into about 6 species mainly on the color of the flowers. *S. sinuata* has greatly increased in size of flowers and range of color until it is at the present time amongst the very finest half-hardy annuals. The varieties of salpiglossis require the general treatment given half-hardy annuals. They prefer a deep light rich soil not given to sudden extremes of moisture and dryness. The seeds may be sown indoors by the middle of March or later, or may be sown outdoors in early spring. Care must be taken that the early sown plants do not become stunted before being planted out. They bloom for several weeks in late summer. The flowers are useful for cutting and last well. The plant is also excellent as a greenhouse annual for late winter bloom. Seeds for this purpose may be sown in late summer. (F. W. Barchay.)


*S. atropurpurea*, Graham. St. procumbent at base, then erect, about 2 ft. high: lvs. scattered, various in shape, lanceolate-elliptical, elliptical, or ovate-elliptical, scattered, assected, the segments generally blunt and entire: fls. deep rich purple on rather long pedicels. Chile. B.M. 2921. Included in 8 *S. sinuata* by many authorities—*S. atropurpurea*, Hook. (S. *picta*, Sweet. S. *straminea* var. *picta*, Hook.). Included in 8 *S. sinuata* by many authorities from which it differs in the color of the corolla, which is whitish tinted yellow at the throat and often purple-veined. The top of the style of *S. straminea* is toothless while that of *S. sinuata* is toothed. Chile. B. M. 1965. Probably not in the trade. (F. Tracy Hubbard.)

SALSIFY (Greek, trumpet, referring to the shape of the calyx). Melastomaceae. Erect glabrous branching herbs, including the warmhouse foliage plant known to the trade as *Bertolonia marginatae*. Leaves often unequal, oblong or lanceolate, long-petiolated, under surface pubescent. Fls. spicate, on terminal, simple or dichotomously branched peduncles, second, sessile or pedicellate; calyx glabrous, tube tubular or campanulate, 10-ribbed, the lobes short, tuberculate outside; petals 5, oblong or obovate; stamina 10; ovary free, oblong, 3-celled; caps. 3-edged, included in the perete, thickened, ribbed calyx.—Four species, Guiana, Brazil, and Peru.

*margaritacea*, Triana (Bertolonia *marginatae*, Hort. Bull. Gravcsia *guithia* var. *marginatae*, Nichols.). Tender perennial herb: st. 1½-4 in. high, erect, usually 4-angled, simple: lvs. long-petiolated, thin-membraneous, ovate, base rounded or frequently distinctly emarginate-cordate, upper surface dark dull green, white-spotted between the veins, lower surface dull green, reddish or bright red; slender-branched, the branches red, rather long; fls. white or sometimes whitish rose; calyx-tube purplish, 10-ribbed, the ribs red; segms. green with pink tips; petals erect or erose at base: caps. pale, obscurely 3-sided. Brazil. F.S. 16:1697.

*S. longifolia*, Triana (Bertolonia *longifolia*, Cham.). St. short, herbaceous: lvs. oblong, rarely ovate-oblong, base rounded or slightly cordate, upper surface bright green, lower surface paler, searly-pubescent; cymes terminal; fls. white: caps. pale, 3-silled. Brazil.—S. *secunda*, Schrank & Mart. St. subshrubby, erect; lvs. narrow-ovate or ovate-oblong, base rather obtuse or short-acute, upper surface light green, lower surface paler: cymes terminal and axillary; fls. unknown: caps. pale red-brown, narrowly oblong, subcilindrial. Brazil. (F. Tracy Hubbard.)

SALPIGLÓSSIS
SALSOULA (Latin, sols, salty; the plants grow in salty places). *Chenopodiaceae*. Weedy annual and perennial branching herbaceous plants of some 50 species of very wide distribution, mostly on seashores and in saline soils, of no horticultural interest. Leaves narrow, usually awl-shaped or long-pointed, commonly fleshy; fls. very small, sessile in the axils (Fig. 3533), perfect, provided with 2 bractlets; calyx 5-parted, the segments winged on the back; petals 0; stamens usually 5; styles 2: fr. a flattened utricle, with a horizontal seed. Of interest because it includes the Russian thistle, *S. Káli*, Linn., var. tenuifólia, Mey. (*S. péstifer*, Nels.), now a widespread weed along railway rights of way and very abundant in the prairie and plains regions; of relatively recent intro. from Eurasia. With good tillage and short rotations it is not to be feared; when young or bowing, it may have some value as forage. It is a bushy annual (Fig. 3534), and when broken off in autumn forms one of the tumble-weeds, and is carried long distances before the wind.

SALVIA (Latin name used as far back as Pliny, meaning to be well or healthy, referring to the medicinal properties of some species). *Labbiáceae*. Herbs, subshrubs, and shrubs, certain of which are of economic use, such as sage and clary, while others are grown for ornament both indoors and out.

Leaves entire, dentate-incised or pinnatisect; the floral lvs. are frequently changed to bracts, rarely similar to the cauline lvs.; floral whorls 2- to many-fl., variously arranged, spirate, racemose, paniculate or rarely all axillary; fls. variously colored, rarely yellow, and various-sized from large and showy tubular or campanulate, 2-lipped; corolla-tube included or exserted, limb 2-lipped; perfect stamens 2, the connective linear, transversely articulate with the filament: nutlets ovoid-3-edged or minute; calyx ovate, tubular or campanulate, 2-lipped; corolla and calyx are of different colors. The bracts range from minute and deciduous to a larger size and more attractive color than the fls. There are usually about 6 fls. in a whorl, sometimes 2, sometimes many. In spite of these and many other wide variations, few attempts have been made to split up Salvia into many genera, presumably from the feeling that the structure of the stamens makes the Salvia a natural, not an artificial group.

Cultivation of salvias. (Wilhelm Miller.)

Three salvias are cultivated for their leaves, which are used in seasoning and also in medicine. These are the common sage, *S. officinalis*; clary, *S. Sclarea*; and *S. Horminum*. For commercial cultivation of *S. officinalis*, see Sage.

Clary is a perennial plant, but is cultivated as an annual or biennial. The plants run to seed the second year, after which it is better to pull up the old plants. The seed may be sown in spring, in drills 12 to 20 inches apart or in a seed-bed, from which the seedlings are picked out in May. In August the first leaves may be gathered and the plants will continue to yield until June or July of the following year.

Clary (*S. Sclarea*) and its near relative, *S. Horminum*, are plants of exceptional interest. They are cultivated for their culinary and medicinal value and also for ornament, but their ornamental value lies not in the flowers (which are usually insignificant) but in the colored bracts or floral leaves at the tops of the branches. The various varieties are known as the Purple-top clary, Red-top clary; also Red sage and Purple sage. The two species (*S. Sclarea* and *S. Horminum*) seem to be much confused in the catalogues.

Among the salvias grown for ornament there are two large cultural groups, the hardy and the tender. The hardy species are mostly border plants, blooming in spring and early summer. The tender species are generally used for summer bedding, sometimes for conservatory decoration in winter. Many of them bloom in summer and late fall, especially when they are treated as half-hardy annuals.

As regards color of fls., there are also two important groups, the scarlet-flowered, and the kinds with blue, purple, violet, white, or variegated flowers. Of the scarlet kinds, *S. splendens* is the most called for; of the blue-flowered kinds, *S. patens* is the most popular of the bedding class, and *S. pratensis* the most sought of the hardy class. *S. patens* probably has the largest flowers of any of the blue-flowered kinds in cultivation. The most widely used of all salvias cultivated for ornament is *S. splendens*, or scarlet sage. This is
one of the most brilliant red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places to light up dark woody recesses. It should have a dark background of some kind by way of contrast. A well-mown and clean plot of saget may be maintained in full splendor from the middle of July to frost. It is propagated by either cuttings or seed. It is rather troublesome to keep cuttings or plants over winter, as they are particularly liable to attacks of aphis and red-spider. It is, therefore, important to get seeds of an early-blooming variety of compact habit, and to sow the seed early indoors or in a frame in time to get good plants to set outdoors in May. A good raceem is over a foot long, with 30 or more flowers in a raceem, and 2 to 6 flowers in a whorl, each flower being 2 inches or more long. Some varieties have erect raceemes, others pendulous, and there are white varieties, together with some intermediate colors. A poorly managed bed of scarlet sage gives few flowers in September and is cut off in a short time by frost. Wet seasons delay the bloom, and, if the soil is too rich in nitrogen, the plants will make too much growth and the flowers will be late and relatively few. The same principles of cultivation apply to other tender salvias used for bedding. Florists sometimes lift a few plants of scarlet sage before frost, pot them and find that they make attractive plants under glass for a month or two. One advantage that S. splendens has over many other red-flowered salvias is that its calyx is as brilliant scarlet as the corolla.

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**SALVIA**

**Key to Genera and Sections.**

A. *Salvia* without a hairy ring inside.

B. Anterior portion of connective deflexed, linear, longitudinally connate or closely approximated, subulate.


**CC. Calyx tubular or campanulate.**


**AA. Calyces with a hairy ring inside.**


**2. officinalis** Linn. Sage. Hardy, white-woolly subshrub, 6-12 in. high: st. shrubby, the flowering branches compact, 1-2 in. high, subshrub, filamentous, 3-4-fl.; calyx pedicellate, campanulate, somewhat 2- or 3-lipped, 5-toothed, viscosous-pubescent; corolla with the upper lip yellowish, white or streaked, the lower violet. July. S. Spain. B.M. 5017. F.S. 13:1344.

**3. grandiflora** Linn. Sage. Hardy, white-woolly subshrub, 6-12 in. high: st. shrubby, the flowering branches compact, 1-2 in. high, subshrub, filamentous, 3-4-fl.; calyx pedicellate, campanulate, somewhat 2- or 3-lipped, 5-toothed, viscosous-pubescent; corolla with the upper lip yellowish, white or streaked, the lower violet. July. S. Spain. B.M. 5017. F.S. 13:1344.

**4. ringens** Linn. Sage. Hardy, white-woolly subshrub, 6-12 in. high: st. shrubby, the flowering branches compact, 1-2 in. high, subshrub, filamentous, 3-4-fl.; calyx pedicellate, campanulate, somewhat 2- or 3-lipped, 5-toothed, viscosous-pubescent; corolla with the upper lip yellowish, white or streaked, the lower violet. July. S. Spain. B.M. 5017. F.S. 13:1344.
Canary lsls.—Probably not in common cult. colored; corolla purplish, the galea somewhat falcate. 

3. grandiflora, Edling. Shrub. 2 ft. or more high: st. woody, white-lanate; the flowering branches tomentose: lvs. entire, petiolate, ovate, acute, the base broad-rotund or cordate, pubescent, the lower ones lanate beneath; floral lvs. herbaceous or the uppermost membranaceous, ovate, acute: racemes sub-simple: floral whorls 6-10-fld., distinct; calyx campanulate, colored, striate, hispid; corolla blue. July. June, July. Asia Minor.—Rare in cult. The name is sometimes used in horticulture for plants which belong under S. aurea var. grandiflora or S. splendens var. grandiflora.

4. ringens, Sibth. & Smith. Hardy shrub, 1-2 ft. high: sts. glabrous or spreading, pilose at base, viscoso-pubescent above: lvs. petiolate, irregularly pinnate, the segments unequal, ovate-oblong, base rotundate, both surfaces villous, scarcely canescent beneath, the petioles long-ciliate; floral lvs. membranaceous, deciduous: raceme simple: floral whorls 2-fld., lax, remote: calyx campanulate, villose, viscid, the teeth rather acute; corolla reddish purple or light blue, the tube recurved-ascending, the throat very broad. Summer. Greece. Gt. 2:226.

Section 2. HYMENOPACE.

5. aurea, Linn. Shrub, 3 ft. or more high, white-tomentose: lvs. ½-1 in. long, petiolate, ovate-subrotund, obtuse, entire or sinuate, leathery, hoary; floral lvs. sessile, villous, persistent: racemes dense, 2-4 in. long, somewhat branched; floral whorls 3-fld., approximately: calyx broad-campanulate, villous, the lips membranous dilated, veined, and colored, the lobes ovate-rotundate; corolla very beautiful, golden yellow, the galea somewhat falcate. July. S. Afr. B.M. 182. G.C. II. 26:745.—Intro into Calif. According to one grower the fls. are at first sulfur-yellow turning very quickly to a dusty color.

6. canariensis, Linn. Shrub, about 6 ft. high: st. shrubby, white-lanate; lvs. petiolate, lanceolate, hastate-triangular, subglabrous; floral lvs. ovate-lanceolate, membranaceous and colored: racemes branched: floral whorls 2-fld., distinct, about 6-fld.; calyx incurved-campanulate, the lips dilated membranaceous, colored; corolla purplish, the galea somewhat falcate. Canary Isls.—Probably not in common cult.

7. glutinosa, Linn. (S. subulata, Wall.). Perennial. about 3 ft. high: st. herbaceous, erect, glutinous-pilose, divergently branched; lvs. petiolate, the lowest 7-8 in. long, the upper smaller, ovate-oblong, acuminate, dentate, the base cordate-sagittate; floral lvs. ovate, acuminate: racemes simple; floral whorls about 8-fld.; calyx lobes elliptic-oblong, pilose, viscid; corolla pale yellow, often 1½ in. long, the tube exserted with its throat broadened. July. Eu. and Asia.

8. nipponica, Miq. Herb. 6-12 in. high, slightly branched: sts. ascending-erect; lvs. petiolate, opposite, ovate-trilobed or triangular from a truncate cordate-base, the basal lobes horizontal-spreadmg, the midlobe ovate, larger or equal, all short-acuminate, dentate-crenate, sparsely hirtellus-pubescent above and especially so on the nerves beneath; cauline lvs. 1-3½ in. long; floral lvs. ovate, entire: racemes rather lax, 2-4 in. long; floral whorls frequently 4-fld.; calyx obconic- or subcampanulate-tubular, pilose, glandular-punctate; corolla whitish glandular, punctulate when dry, tube half exserted. Japan.

9. yunnanensis, C. H. Wright. Perennial herb, about 1 ft. high: rhizomes creeping, bearing fusiform tubers: lvs. 1½-3 x ½-1 in., the radical frequently very long and slender-petioled, obtuse, crenate, green above, purple beneath: spikes simple; floral whorls 4-6-fld.; calyx glandular; corolla coeruleobalt, 1 in. long, pubescent outside. China.

10. hians, Royle (S. himalayaca, Hort.). Fig. 3535. Hardy perennial, about 2 ft. high: st. herbaceous, erect, villous: lvs. long-petioled; ovate, broadly cordate-sagittate or truncate; floral lvs. ovate, acuminate: racemes somewhat branched; floral whorls 6-fld.; calyx campanulate, striate, bluish, glutinous; corolla...

11. Przewalskii, Maxim. Sts. ascending, 3–5 ft. high, herbaceous, pubescent, glandular above; radical lvs. long-petioled, crenate-dentate, hoary, the teeth all subulate-spinose; corolla white, the upper lip reddish, tube contracted at the middle; connectives not toothed. S. Eu., N. Afr., and the Orient.—Probably not common in cult. S. athiopica, Brot., not Linn., equals S. argentea, which see.

15. argentea, Linn. (S. palastra, Desf.). Biennial, 2–4 ft. high; sts. herbaceous, erect, villous; lvs. radical and lower villose, 6–8 x 4–6 in., broad-ovate, sinuate-lunate; corolla white, the uppermost abortive; calyx campanulate, striate, the teeth all subspinosae; corolla showy, rose-white, whitish, purplish or yellowish, the galea or upper lip much longer than the lower. June. Medit. region of Eu. and Afr. F.C. 3:112. Gt. 73, p. 517.—For some reason this species is considered a hardy perennial by American gardeners, and it is a very decorative plant.

16. verbascifolia, Bieb. (S. microstegia, Bois. & Bal.). Perennial; sts. herbaceous, erect, villose; lower lvs. petiolate, broadly ovate, base cordate, sinuate-lunate, erose, thick, very wrinkled, scarcely lanate above, white; corolla white, beset with blue hairs, galea very large and falcate. Caucasus region. Var. kurdica, Hort., is offered in the trade.

17. Montbréti, Benth. Perennial subshrub, low; sts. erect, the base white-lanate, the top viscous-villose; lvs. lanceolate, the lower petiolate, the upper clasping, crenate or obscurely pinnatifid-dentate, lady white-lanate above, densely so beneath; floral lvs. very broad, lanate beneath; racemes simple; floral whorls 6–10-fl.; calyx white-lanate, vious-pubescence; corolla blue. Asia Minor and Syria.

3536. Salvia pratensis. (XIV)
SALVIA

18. bicolor, Lam. Biennial, sometimes perennial (?), hardy; sts. herbaceous, erect, 2-3 ft. high, scarcely branched; lvs., the lowest petiolate, broad-ovate, incise-dentate, pinnatifid or pinnate-lanceolate; the upper sessile, lanceolate, all cordate at base and glabrous-pubescent; floral lvs. ovate-lanceolate, acuminate, red-veined; racemes 1½-2 ft. long, many-fl.; floral whorls distinct, about 6-fl.; calyx campanulate, striate, glabrous, the teeth subulate-acuminate; upper lip of corolla hooded, bluish violet dotted with yellow, the lower white, said to fade quickly to a rusty brown. May-July. Spain and N. Afr. J. M. 1774. G. M. 40:487. P. M. 9:271.

19. dichroa, Hook. f. Half-hardy perennial; sts. 2-3 ft. or more high, quadrangular with obtuse thickened yellowish angles, which are retrorse ciliate; radical lvs. petiolate, oblong-ovate or ovate-lanceolate, obtusely and very irregularly sinuately serrate, pubescent; upper caule lvs. sessile-oblung or elliptic-oblong; floral lvs. ovate, long-acuminate, red-veined; raceme about 4-5 in. long; floral whorls 2-3-fl.; calyx subcampanulate, glandular-pubescent, strongly ribbed, green; corolla 1-1½ in. long, upper lip bright blue, arcuate, pubescent, lower lip 3-lobed, the lateral lobes pale blue, the midlobe of corolla hooded, bluish violet dotted with yellow; the lower lip white. 'A plant which grows 2 ft. high and with deep bluish-purple flowers.' Presumably an error for S. splendens, Wild. (S. splendens, Wild.), a white form, is offered in the trade. Var. rosea, Hort. (S. sylvestris var. flore-dabo, Hort.), is a white-fl. form.

20. pratensis, Linn. Hardy perennial, 2-3 ft. high; sts. herbaceous, subsimple, pubescent to nearly naked; lvs. few, the lower long-petiolated, ovate-oblong, 4-5 in. long, double-crenate, the base subcordate; floral lvs. minute, orbicular: racemes short, 1-1½ in. long, paniculate, long-peduncled, nodding after anthesis; floral whorls about 6-fl., approximate; calyx reflexed, pubescent; corolla violet, the galea straight and spreading. July. S. E. Eu. B. M. 2438.

21. virgata, Ait. (S. gigantea, Desf.). Hardy perennial, 2 ft. or more high; sts. herbaceous, erect, branched, pubescent-villosous: radical lvs. petiolate, broad-ovate, base cordate; lower caule lvs. short-petioled, broad ovate-oblong, base round or cordate, upper ones sessile and smaller, the uppermost cordate, clasping; all the lvs. erose-crenate, rather glabrous above, pubescent or hispid on the nerves beneath; floral lvs. ovate-acuminated somewhat reflexed: racemes branched, elongated, few-fl.; floral whorls 6-fl., distant; calyx short-peduncled, campanulate, striate, villous-villosous; corolla light blue, the tube included. S. E. Eu. and the Orient. Var. alba, Hort., a white form, is offered in the trade.

22. sylvestris, Linn. Hardy perennial, 6 in. to 3 ft. high; sts. herbaceous, paniculate above; lvs. often small, scarcely 2 in., sometimes 3-4 in. or more long, the lower petiolate, the upper sessile, all oblong-lanceolate, crenate, base rounded or frequently cordate, glabrous above, paler, pubescent or canescent beneath; floral lvs. orbiculate, acuminate, colored: racemes elongated, somewhat branched; floral whorls 6-10-fl., distinct; calyx ovate-tubular; corolla purple-violet. Aug. Eu. and Asia. Var. alba, Hort. (S. sylvestris var. flore-dabo, Hort.), is a white-fl. form.

23. nemorosa, Crantz (S. virgina, Hort., not Ait. S. virgina nemorosa, Hort.). Fig. 3537. Perennial, 2-3 ft. high, much branched: radical lvs. short-petioled, cuneate sessile, lanceolate, 2½-3 in. long, the upper lvs. gradually reduced in size, glabrous and dull green above, pale and finely pubescent beneath; fls. small, in very long slender spikes terminating all the branches, up to 16 in. long; floral whorls approximate, 6-fl.; corolla bright violet or purple. June-Oct. Eu. and W. Asia. G. M. 56:714. R. H. 1913, p. 471. —The fls. are sometimes described as being brassy purple. Var. alba, Hort., is said to grow 18 in. high and to have larger spikes of white fls. This may be the same as S. sylvestris var. alba, as S. nemorosa, Linn., is a synonym of S. sylvestris.
All American species.

Section 7. Calosphace.

Herbs, subshrubs or shrubs.

A. Lvs. pubescent: corolla-tube slightly exserted, straight, ventricose or broadened above, the lips subequal or the upper longer.

Subsection Erianthina.

(See also Nos. 36, 39, 43 and 44.)

AA. Lvs. seldom pubescent (rugose in No. 36, 39, 43, and 44).

b. Corolla about 5½ in., occasionally a little longer.

Subsection Brachyanthis.

c. The lvs. cordiform

c. The lvs. linear, lanceolate, or ovate-lanceolate.

d. Calyx densely white or violet-lanate.

e. Floral lvs. lanceolate-linear; floral whorls about 8-fld.

EE. Floral lvs. broad-ovate; floral whorls 10–20-fld.

29. uliginosa

BB. Calyx rugose (rugose in Nos. 36, 39, 43 and 44).

Calyx pubescent or slightly tomentose but not densely lanate.

Calyx not inflated, usually pubescent.

Subsection Longiflorae.

c. Base of some or all the lvs. hastate or angulate-cordate.

d. Under surface of lf. hispid or pubescent.

DD. Under surface of lf. glabrous.

CC. Base of lvs. sometimes cordate, but not angulate or so.

DD. Calyx not inflated, usually tubular-campanulate.

E. Lvs. membranaceous

EE. Lvs. more or less coriaceous.

F. Tube of corolla not ventricose.

GG. Tube of corolla ventricose.

a. Corolla usually bluish, purple, or violet.

h. The lvs. cuneate or ovate-oblong, tomentose above.

II. Under surface of lf. pubescent

II. Under surface of lf. glabrous

GG. Corolla usually scarlet or crimson, sometimes in shades of purple (cf. No. 33).

H. Lvs. ½–2 in. long.

1. Blade of lf. ovate or oblong-oblong.

II. Blade of lf. narrowed-oblong to linear-lanceolate.

i. Lvs. more than 1 in. long

Subsection Brachyanthis.

27. azurea, Lam. (S. acuminata, Michx., not Cav.). Perennial, 1–6 ft. high; sts. herbaceous, erect, glabrous: lvs. petiolate, oblong-lanceolate or linear, rather obtuse or acute, base long-narrowed, somewhat serrate, base surfaces green and glabrous; floral lvs. lanceolate-linear, deciduous; racemes simple, elongated; floral whorls distant, about 6-fld.; calyx green or bluish, subsessile, tubular, striate, the 3 teeth rather acute; corolla blue. Aug. S. C. to Fla. and Texas. B.M. 1728. Var. grandiflora, Benth. (S. Pitcheri, Torr.), which differs in being cineraceous-puberulent, in its denser infl. and tomentulose-sericaceous calyx. G.C. II. 14:665. Gn. 19:600; 61, p. 300. G.Z. 26:121.—Probably the plant formerly offered as S. Pitcheri var. angustifolia, Hort., belongs here. It is quite probable that some of the material in the trade as S. azurea var. grandiflora is in reality S. farinacea. Var. grandiflora alba, Hort. (S. azurea var. alba grandiflora, Hort.), is a white-fld. form of the variety.

28. farinacea, Benth. Perennial, 2–3 ft. high; sts. herbaceous, erect, tomentose: lvs. petiolate, ovate-oblong, or lanceolate, rather obtuse, irregularly serrate-crenate, rather glabrous, both surfaces green or the lower crenate; floral lvs. small, deciduous; racemes elongated, simple; floral whorls many-fld., subsecund, remote or the uppermost approximate; calyx subsessile, tubular, purplish colored, densely white-lanate; corolla purple or violet, the tube scarcely exserted. Summer. Texas, where it is reported as growing in rich soil. G.M. 56:711. G.Z. 26:121.—A showy frequently cultivated species, the fls. quite attractive, the darker corollas being set off by the mealy violet-white calices. Var. alba, Hort., is a white-fld. form with the midlobe of the lower corolla-lip obcordate, 2-lobed.

29. uliginosa, Benth. Sts. herbaceous, erect, 2–6 ft. high, virgate, branched, glabrous or villous: lvs. 2–4 in. long, petiolate, oblong-lanceolate, acute, serrate, base narrowed, glabrous or pubescent; floral lvs. membranaceous, broad-ovate, acuminate, deciduous; racemes dense, long-peduncled, somewhat branched; floral whorls many-fld.; calyx campanulate, variable, sometimes colored; corolla blue or white, tube somewhat or nearly included. Brazil, Argentina, and Uruguay. B.M. 8544. Gn. 77, p. 484. G.M. 56:711. R.R. 1912, p. 469.


Subsection Erianthina.

31. leucantha, Cav. Fig. 3535. Shrub, about 1½–2 ft. high; st. shrubby, with elongated branches which are subtended, and white-lanate, the wool finely caducous: lvs. short-petiolate, lanceolate-linear, acute, crenate, base rotundate, pubescent and rugose above, white-lanate beneath; floral lvs. ovate, acuminate, deciduous; raceme elongated, often purplish, 6–10 in. long; floral whorls many-fl.; the lower remote; calyx subtrigose, ovate, densely lavender- or violet-lanate; corolla white, white-lanate outside. June. Mex. B.M. 4318. Gn. 21:328.—Probably not very common in cultivation, at least in N. Amer.
Subsection LONGIFLORA.

Nobles.


33. Sessei, Benth. (S. Rokéitii, Scheidw.). Fig. 3535. Subshrub, about 1½ ft. high: st. shrubby with rather glabrous branches: lvs. petiolate, oval, obtuse, base rounded or cuneate, irregularly crenate in the center, subglabrous; floral lvs. ovate, acuminate, ciliate, deciduous; racemes elongated, more than 1 ft. long; floral whorls 2-fl.d.; calyx tubular, striate-nerved, pubescent, frequently colored; corolla deep crimson or when older purplish, the midlobe of the lower lip, which is large and obcordate, two small white spots. Summer. Mexico. B.R. 1370. L.B.C. 15:1798. G.W. 15, p. 48.

34. Grégoii, Gray. Shrub, 1-3 ft. high: st. shrubby with glabrous or very slightly pubescent branches: lvs. petiolate, oval, obtuse, base rounded or cuneate, irregularly crenate in the center, subglabrous; floral lvs. ovate, acuminate, ciliate, deciduous; racemes elongated, more than 1 ft. long; floral whorls 2-fl.d.; calyx tubular, striate-nerved, pubescent, frequently colored; corolla deep crimson or when older purplish, the midlobe of the lower lip, which is large and obcordate, two small white spots. Summer. Texas and Mexico. B.M. 6812. Var. alba, Hort., is a white-fl.d. form.

36. fulgens, Cav. (S. cardinális, HBK.). CARDINAL SALVIA. MEXICAN RED SALVIA. Perennial shrub, 2–3 ft. high: the numerous branches almost glabrous or pilose-blanco: lvs. petiolate, 1–3 in. long, ovate, acute, crenate-serrate, base cordate, pubescent above, white-tomentose or lanate beneath; floral lvs. sessile, ovate, deciduous; racemes 6–12 in. long; floral whorls 6-fl.d., rather distant; calyx pedicelled, tubular-campanulate, pubescent, corollas showy scarlet, about 2 in. long, villous. July. Mexico. B.R. 1356. L.B.C. 20: 1810.—The fls. are darker red than those of S. splendens and the calyx is said to be dull colored and conspicuously striate. Apparently not very frequently cult. Var. Boucheana, Benth. (S. Boucheana, Kunth), has the lvs. narrowly deltoid-ovate, truncate or subcordate at the base. Mex.


Cyanex.


41. *cyanea*, Benth. St. shrubby: branches 4-angled, hoary-pubescent or glabrous: lvs. petiolate, ovate, acuminate, serrate-crate, pubescent, or frequently canescent beneath; floral lvs. ovate, acuminate, membranaceous, deciduous: racemes simple: floral whorls lady 6–10-fl., subsecund: calyx tubar, bluish, glandular-villous; corolla blue, the tube exerted and ventricose. Mex and Cent. Amer.

Tubuliflorum.

42. *Goudotii*, Benth. (S. *lantanaefolia*, Hort., not Mart. & Gal.). Shrub, about 2 ft. high, with the branches red-puberulent or glabrous: lvs. about 3 in. long, ovate or ovate-lanceolate, acuminate, serrate-crate, base narrowed, both surfaces pubescent; floral lvs. lanceolate-subulate, deciduous: racemes simple: floral whorls 6–10-fl., subsecund: calyx tubular-campanulate, the teeth ovate, ciliate-margined; corolla red, more than 1 in. long. Colombia. R.B. 25:121.

43. *coccinea*, Linn. (S. *rásec*, Vahl). Annual or sometimes perennial and subshrubby: st. herbaceous, erect, 1–2 ft. high, canescent-pubescent: lvs. petiolate, 1–2 in. long, ovate, acute, crenate, base cordate, pubescent above, hoary-tomentose beneath; floral lvs. ovate, acuminate, deciduous: racemes simple: floral whors remote, 6–10-fl.; calyx tubular-campanulate, striate, often purplish, the teeth acute; corolla scarlet, glabrous. July. S. C. to Fla. and Texas, Mex. W. Indies, Drop. Amer., and cult. and occasionally escaped in India and Austral.—Probably all of the material grown as this is not true to name, possibly the larger part of it is in reality *S. splendens*. Var. *bicolor*, Hort., has the upper lip white, the lower lip brilliant carmine-red. Var. *lactea*, Hort., has white f., and *S. major*, Regel (S. *filamentosa*, Tausch. S. *Roemeriana*, Hort., not Scheele), becomes a subshrub up to 4½ ft. high, is apt to be less canescent-pubescent and has larger bright scarlet-red f., June to late autumn. Gt. 7:292. Var. *nana*, Hort., is a dwarf much-branched form. Var. *nana carmesina*, Hort., is offered in the trade. Var. *nana compacta*, Hort., is a dwarfer and more bushy form than the variety proper.

Var. *pseudo-coccinea*, Gray (S. *pseudo-coccinea*, Jacq.), grows 2–4 ft. high, and has the st., petioles, and often the margins of the floral lvs. conspicuously beset with hirsute hairs. Mex. and Cent. Amer. B.M. 2864.


Hortatan.

45. *patens*, Cav. Half-hardy perennial, 1–2½ ft. high: sts. herbaceous, erect, pilose: lvs. petiolate, ovate-
Section 11. Notosphace.

51. japonica, Thumb. Perennial subshrub, about 1 1/2 ft. high; sts. herbaceous, erect, branched, glabrous; lvs. 3-4 in. or more long, petiolate, pinnatisect, the segments ovate, acuminate, the base narrow, incised-dentate or pinnatilobate, glabrous; floral whorls 4-5 in. long, many-fld., subsimple; floral whorls distinct, about 6-fld.; calyx tubular-campanulate, glabrous, striate; corolla dark lilac or blue (?), the tube scarcely exerted. Japan. Var. alba, Hort., is a white-fld. form.

Section 12. Hemisphecia.

52. verticillata, Linn. Perennial, 2-3 ft. high; sts. herbaceous, erect, pilleose-hispous; lvs. the base cordate, lanceolate: racemes branched, often a foot or more long; floral whorls 20-40-fld., remote; calyx villos, corolla lilac-blue, the tube included. July and Aug. Eu., Asia Minor and Caucasus region.

The following species have been cultivated, or are not sufficiently known to be classified: S. angustifolia, C. (See 1). S. amplexicaule, Cav. (See 1). S. amplexicaulis, Hort. (See 1). S. arborea, Hort., is a tree-like form of the scarlet sage, but growing in a tree-like form. Possibly only a variant of S. splendens. S. aspera, O. Ktze. (See 1). S. auriculata, Hort., is offered in the trade. S. candelabra, F. H. (See 3). S. candida, Hort., is offered in the trade.—S. candidissima, Vahl (S. odorata, Willk.) (See 3). Subsp. or herb, about 3 ft. high, with ovate-lanceolate or orbicular lvs.: corolla white. Ort. 

53. conifera, Hort. (Sec. 5). Perennial herb, 3-4 ft. high with ovate-lanceolate leaves; corolla bright purple. Caucasus.

54. balearica, Hort. (Sec. 5). Perennial, 2-3 ft. high, with ovate-lanceolate leaves; corolla yellow spotted with purple. Syria. B. M. 3808 -8.


Subgenus IV. LEONIA.

Section 8. Echinosphace.

47. carduacea, Benth. Fig. 3535. Perennial, 1 ft. or more: sts. herbaceous, erect, subsimple, white-lanceolate, long-petioled, the base angulate, broad subhastate-cordate, rather thick, pubescent above, reddish or whitish and soft-villous beneath; lvs. small: racemes branched; calyx 2-fld.; calyx campanulate, pilose, the teeth aristate-acuminate; corolla deep blue, pilose, the midlobe of the lower lip fimbriate. July. Calif. B. M. 4874. G. C. II. 19: 56. Gn. 65, p. 365; 70, p. 238. A. G. 25: 589.—A unique species on account of its whistle-like foliage.

Section 9. Pycnosphace.


Section 10. Heterosphace.

49. lyrata, Linn. Hardy perennial with a thickened root: sts. herbaceous, erect, 8-24 in. high, subsimple, pilose: radial lvs. 2-3 in. long, lirate, crenate-dentate, both surfaces hispidulous: cauline lvs. few, oblong-lanceolate, the base long-narrowed; lvs. oblong-linear; racemes subsumers, disrupted; floral whors 6-fld., lax, distant: calyx tubular-campanulate, nodding, pilose; corolla blue-purple, about 1 in. long. May and June. Conn. to Ill., south to Fla. and Texas.—Not frequent in cult.


51. juliflora, Linn. White-flowered, 5-8 ft. high, with ovate-lanceolate leaves, glossy, white to blue; corolla yellow and purple. 2 ft. high. Plants are offered in the trade.—S. argentea, Vahl (Sec. 2). Subshrub or herb, about 1 ft. high, with ovate-oblong lvs. which are hoary-tomentose beneath: calyx often purplish; corolla blue, the lip very broad. Mex. 808, L. B. C. 6: 576.—S. controversa, Pobl. (Sec. 7). Subshrub or herb, 3-5 ft. high, with ovate-oblong-cordate lvs.: corolla brownish-purple, about 1 in. long. Probably Mex. 2574. F. H. 11: 1418.—S. phorata, O. Ktze. (Sec. 6). Subshrub or herb, about 3 ft. high, with ovate-cordate leaves: corolla reddish-violet.ハードyイン S. England and Ireland. Botanically unknown—S. petiolaris, Linn, (Sec. 5). Sts. herbaceous, white-lanceolate at base; lvs. deeply pinnatifid, nearly or entire, subacute-crenate, the base cordate, densely many-flowered, the lobes oblong-linear, the teeth aristate-acuminate; corolla dark blue, the midlobe of the lower lip fringed. July. Calif. B. M. 4874. G. C. II. 19: 56. Gn. 65, p. 365; 70, p. 238. A. G. 25: 589.—A unique species on account of its whistle-like foliage.

Section 11. Notosphace.

51. japonica, Thumb. Perennial subshrub, about 1 1/2 ft. high: sts. herbaceous, erect, branched, glabrous; lvs. 3-4 in. or more long, petiolate, pinnatisect, the segments ovate, acuminate, the base narrow, incised-dentate or pinnatilobate, glabrous; floral whorls 4-5 in. long, many-fld., subsimple; floral whorls distinct, about 6-fld.; calyx tubular-campanulate, glabrous, striate; corolla dark lilac or blue (?), the tube scarcely exerted. Japan. Var. alba, Hort., is a white-fld. form.

Section 12. Hemisphecia.

52. verticillata, Linn. Perennial, 2-3 ft. high; sts. herbaceous, erect, pilleose-hispous; lvs. the base cordate, lanceolate: racemes branched, often a foot or more long; floral whorls 20-40-fld., remote; calyx villos, corolla lilac-blue, the tube included. July and Aug. Eu., Asia Minor and Caucasus region.

The following species have been cultivated, or are not sufficiently known to be classified: S. angustifolia, C. (See 1). S. amplexicaule, Cav. (See 1). S. amplexicaulis, Hort. (See 1). S. arborea, Hort., is a tree-like form of the scarlet sage, but growing in a tree-like form. Possibly only a variant of S. splendens. S. aspera, O. Ktze. (See 1). S. auriculata, Hort., is offered in the trade. S. candelabra, F. H. (See 3). S. candida, Hort., is offered in the trade.—S. candidissima, Vahl (S. odorata, Willk.) (See 3). Subsp. or herb, about 3 ft. high, with ovate-lanceolate or orbicular lvs.: corolla white. Ort. 

53. conifera, Hort. (Sec. 5). Perennial herb, 3-4 ft. high with ovate-lanceolate leaves; corolla bright purple. Caucasus.

54. balearica, Hort. (Sec. 5). Perennial, 2-3 ft. high, with ovate-lanceolate leaves; corolla yellow spotted with purple. Syria. B. M. 3808 -8.
Salvia (Antonio Maria Salvini, 1633-1729, Italian scientist). "Marsiliaca." An interesting plant for the small home aquarium. Salvia is a genus of fern-allies found mostly in the tropics and comprising about a dozen species, only one of which, *S. natans*, Linnaeus, is cultivated.

Plants floating, with slender stems, bearing apparently 2-ranked, oblong leaves 4-6 lines or even 1 inch long; upper surface of leaves covered with papillose or minute warts; lower surface densely covered with brown, papillose hairs. The plant is supposed to have no true roots. What look like roots are believed to be finely dissected leaves; one of these occurs with each pair of the foliage-leaves. Many aquatic plants have these 2 types of foliage, e.g., the water lettuce, *Vallisneria spiralis*. Salvinia looks much like a flowering plant but it is a spore plant and has 2 kinds of spores, large and small ones. These spores are produced in small oval bodies known as sporocarps, each of which contains a solitary macrosorophore. The other sporocarps in the cluster contain numerous microsporocarps, each of which contains numerous microspores.

The plant is of easy culture in summer, but many persons have lost it over winter by not understanding its habits. It is an aquatic fern, and often dies in the winter after forming a broad crop. Secure it 2 to 3 feet full of foam and then fill the pan with water. After the water has cleared place the salvinias on the surface. In the winter watch for the formation of the spore-capsules. These grow in masses near the top of the clusters of root-like leaves. After the plants die the spore-capsules will remain in the soil. The plant often passes the winter in greenhouses in a growing condition, producing no spores.

Samanea (a corruption of its native Spanish name of zanam). *Leguminosae.* Spindleless or rarely spiny trees or shrubs of the American tropics, where one or two of them are much planted for shade.
SAMBUCUS (old Latin name for the elder, also spelled Sabucus). Caprifoliaceae. Elder. Ornamental mostly woody plants grown for their handsome foliage, showy clusters of white flowers, and the attractive red or black berries.

Deciduous shrubs or small trees, with stout very pithy branches, rarely perennial herbs: lvs. opposite, odd-pinnate, with serrate lfts., with or without stipules and stipels: fls. small, usually perfect, white, in terminal compound cymes or panicles, usually 5-merous, rarely 3- or 4-merous; calyx-lobes minute; corolla rotate with short tube and oval to obovate-lanceolate lobes; stamens with short filaments; ovary inferior, 3-5-celled; style short, 3-5-lobed: fr. a drupe with 3-5 1-seeded nutlets.—About 20 species in the temperate and subtropical regions of both hemispheres. Some species, particularly S. nigra and S. canadensis, possess medicinal properties; the fr. of these species and also that of S. cerulea is used in cookery, also elderberry wine is made from it. The hard wood, the large pithy shoots which are easily hollowed and the pith are put to various uses. Monograph of the genus by Count Schwerin in M.D. 1909, pp. 1-56.

The elders are large and rather coarse shrubs, rarely tree-like, or perennials spreading by suckers, with pinnate foliage and large flat or panicked clusters of white or creamy white small flowers followed by red or black, rarely glaucous or in some varieties green or yellow fruits. They are well adapted for mass planting by root-cuttings; the perennial species and also S. nigra is used in cookery, also elderberry wine is made from it. The hard wood, the large pithy shoots which are easily hollowed and the pith are put to various uses.

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b. Berries black or dark purple, rarely green or white: path white: cymes flat.

c. Fr. not glaucous.


cc. Fr. glaucous.

3. cerulea, Raf. (S. glauca, Nutt.). Large shrub or small tree, occasionally to 50 ft.: branchlets rather slender, bloomy when young: lfs. 5-7, oblong, long-acuminate, coarsely serrate, the lower lfts. often 3-parted or pinnate, bright green, glabrous, 2-6 in. long: fls. yellowish white, in flat cymes 4-6 in. wide: fr. sub-globose, 1/4-in. thick, blue-black, whitened by a thick bloom. June, July; fr. in Aug. and Sept. Brit. Col. to Calif., east to Mont. and Utah. S. 5:222. G.W. 8:116. Var. velutina, Schwerin (S. velutina, Durand). Young branchlets and lvs. covered with a dense and short whitish pubescence. Calif. Var. neo-mexicana, Reich. (S. glauca var. neo-mexicana, S. Nels. S. inter-media, Carr.). Lfs. 3-5, narrow-lanceolate, grayish green, slightly pubescent beneath. New Mex., Ariz. M.D. 1909:8, fig. 1.—This species is similar to S. canadensis, but habit looser and taller, very striking with its large clusters of bluish white fra.; the typical
4. racemosa, Linn. Red-Berried Elder. Shrub, to 12 ft.; branches light brown; young branches glabrous or nearly so, 2–3½ in. long; infl. ovate or oblong, dense; lfts. 5–7, ovate or elliptic to ovate-lanceolate, glabrous, 2–3 in. long; fls. yellowish white: fr. scarlet. fr. ⅛ in. across, 3-seeded; nutlets yellowish white, minutely rugose. April, May; fr. in June, July. Eu. to E. Asia. H.W. 3, p. 133. R.F.G. 12:781.

Var. nana, Carr. Dwarf compact form. Var. plumosa, Carr. Lfts. incised serrate to about the middle, teeth long and narrow, purplish when unfolding. Var. plumos-aurea (S. rosiflora Crafts, Barbour). Allied to S. pubens; shrub, to 10 ft.: lfts. oblong to lanceolate, pubescent on the veins beneath; fr. ⅛ in. thick; nutlets broadly ovoid, smooth. W. China.—Handsome with its clusters of bright red fruit; it spreads rapidly by suckers and may become a weed difficult to eradicate, therefore it should not be planted where it is likely to become troublesome.

6. Schweriniana, Rehd. Herbaceous or suffruti-ose, stoloniferous, glabrous, 3–5 ft.: lfts. 5–7, oblong-lanceolate, the lower ones short-stalked, the upper ones adnate and decurrent, acuminate, very unequal at the base, serrate, 3–5 in. long; cymes flat, long-stalked, 5-rayed. pubemous: fr. salmon-red, 3-seeded, ⅛ in. thick. nutlets broadly ovoid, smooth. W. China.—Handsome with its clusters of bright red fruit; it spreads rapidly by suckers and may become a weed difficult to eradicate, therefore it should not be planted where it is likely to become troublesome.

grown upon sandy or gravelly soil, and watered frequently and plentifully with weak salt- and soda-solutions. It may be propagated by root-division, but better by sowing the seed as soon as ripe, the plants being thinned to stand from 1 to 1 1/2 feet asunder in rows 2 to 4 feet apart.

Golden samphire (Inula chromium), a native of the marshes and seacoast of Great Britain, is an erect hardy perennial, 1 to 1 1/2 feet tall, with small, fleshy leaves and yellow flowers in small, umbel-like clusters. Though grown and used like true samphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family Compositae.

For marsh samphire, see Salicornia. M. G. RANS.

SANDERSONIA (named after John Sanderson). Liliaceae. Herb, suitable for the greenhouse: sts. suberect, simple, leafy: lvs. linear-lanceolate: lvs. showy, orange, solitary in the axils, without bracts; perianth persistent, urn-shaped to globose, somewhat inflated; stamens 6; ovari sessile; fr. unknown. — One species, S. Afr. Treatment the same as for gloriosas.


SANGUINARIA (Latin, blood; referring to the yellowish red juice of the plant). Papaveraceae. Bloodroot. Low spring-blooming perennial used for borders and for rock-gardens.

nobilis, Hook. Plants stout, erect, smooth, except the infl.: st. 4-angled: lvs. 3-9 in. long, oblong-ovate to oblong-lanceolate, obtusely toothed, narrowed into winged petioles, compast: lvs. 2 in. long, yellow, in heads subtended by bright red bracts, the heads forming a panicle. Ecuador. B.M. 5594. F.S. 23:2437. G.W. 10, p. 610. G.Z. 11:16. H.F. 8:936. Var. glauca, Lem. (var. variegata, Hort.). Lvs. variegated with pale yellow or white along the veins. F. 1867, p. 154. I.H. 14:528 (as S. nobilis); 16:580.— A hothouse plant which is very attractive when well grown, but which becomes straggling and weedy if neglected. Grown mostly for its foliage. S. parvibracteata, Sprague & Hutch. Allied to S. nobilis, from which it differs in having wingless petioles, smaller bracts with fewer (3-5) fls. and longer staminodes. Corolla yellow. Trop. Amer. HEINRICH HASSELBRING.
SANGUISORBA (Latin, blood and drink up, from reputed styptic properties in folk-medicine). Rosaceae. Chieflv perennial herbs, grown as salad plants and also sometimes in the hardy border. Leaves unequally pinnate; stipules adherent to the petiole; fls. small, often polygonal or denticulate, crowded in a dense head or spike at the summit of a long, naked peduncle; calyx-tube persistent, with 4 broad petal-like spreading deciduous lobes; petals none; stamens 4–12; achene (commonly solitary) inclosed in the 4-angled dry and thickish calyx-tube.—About 35 species, natives of the North Temperate Zone. See Petunia.

SANSEVIERIA (after Raimond de Sangro, Prince of Sanseverio, born at Naples 1710. The spelling Sanseveria is not the earliest). Liliaceae. Bowstring Hemp. Herbaceous perennials, essentially tender foliage plants, although beautiful in flower, adapted to the coolhouse. They are grown for the stiff erect fls., which are usually variegated.

Rhizome short, thick, sometimes stoloniferous: lvs. in a basal rosette, this umbelliform, frequently elongated, rather flat or terete; scape simple, tall, stout; fls. greenish white, medium-sized or long, clustered in an often dense raceme; perianth-tube slender, sometimes very long; stamens 6; ovary free, 3-celled.—Trop. and S. Afr. and India. The most recent treatment is by N. E. Brown in Kew Bulletin, 1916, where 54 species are described. The genus is important in yielding fiber.

Sansevierias are easily propagated by division or they may be raised from leaf-cuttings about 3 inches long. These cuttings form roots in sandy soil after about one month, after which a long stolon-like bud is formed, which produces the new plant at some distance from the cutting. Sansevierias are well adapted to house decoration, since they require much sunlight. A rather heavy soil suits them best.

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SANTALUM (from the Persian Chandal which in turn is derived from the Sanscrit Chandana, the name of the tree). Santalaceae. Evergreen glabrous trees or shrubs. S. album, yields the sandalwood: lvs. opposite, rarely alternate, coriaceous: fls. axillar in or terminal, trichotomous, parceulate, dicous; perianth campanulate or ovoid, lobes 4, rarely 5, valvate with a tuft of hair on their face; stamens 5–9, sheathed between the lobes. The wood is white or citron-colored, sweet-scented when dry, and is esteemed in India as a perfume.

SANTOLINA (derivation of name doubtful). Often, but incorrectly spelled Sancotila. Compositae. Shrubs or rarely herbs, natives of Eu. and Asia, mostly in the Medit. region, sometimes grown in the open for ornament.

Leaves alternate, aromatic; margins tuberculose, dentate or pinnately lobed, often finely divided: fl.-heads yellow or rarely white, of disk-fls. only, many-flled; involucre campanulate, squarrose, indurate, appressed. About 8 species.

Santolina is valuable for its distinct foliage and is used in the South for specimen planting and in the North for summer bedding and borders. Cuttings for the latter purpose are usually taken in the spring from plants wanting in a frame but may be taken before frost in the fall. They are easily rooted in sand.


S. alpina, Linn., is Anthemis montana, Linn., which makes a pretty ground-cover and has yellow fls., but appears not to be in the trade. (G. 75, p. 220.) S. strobophylla, Wild. In erect stems, branches leafless: lvs. in 4 vertical ranks, toothed: involucres scales lanceolate. S. Eu. G. 30/25.

SANTIVALIA (after a noble Italian family). Compositae. Usually low, much-branched herbs grown for their attractive yellow flowers.

Leaves opposite, petiolate, mostly entire: heads of fls. small, solitary, with yellow or sometimes white rays; involucres short and broad, of dry or partly herbaceous bracts; receptacle from flat to subulate-conical, at least in fr.; its chaffy bracts concave or partly conduplicate: achenes all or only the outer ones thick-walled, those of the rays usually 3-angled, with the angles produced into rigid, spreading awns or horns, those of the disk often flat and winged.—About 4 species, natives of the S. W. U. S. and Mex. May be grown as an annual in the open, but if given protection it will sometimes flower the second year. Sanvitalias are of easy culture but prefer a light or sandy soil in full sunlight.

SAP (3071) SAP

SAP, a term applied to the juices of living plants. Sap is composed of water containing mineral salts absorbed from the soil, and organic substances chiefly constructed within the plant. The water pressure by which the sap is forced from the soil by the roots or other absorbing organs may contain potassium, sodium, magnesium, calcium, iron, and nitrates, phosphates, sulfates, and chlorides. The different processes and the different reactions that take place in separate tracts of tissue are responsible for the fact that the sap is not alike in composition throughout the body of the plant.

The mineral elements and their salts may be found in nearly all saps. The limits of this article do not permit the enumeration of the large number of organic substances which may be found in the sap of various species. The more important of such compounds may be grouped under the acids, sugars, or carbohydrates and proteins. Many plants are of economic importance because of the materials dissolved in the sap. The sap of the sugar maple, for example, contains over 3½ per cent of sugar, while the sugar-beet and sugar-cane have a sap in which the proportion is very much higher.

The popular expression of "ascent of sap" refers to the fact that water entering the living cells of the roots is forced into the woody tissues or non-living elements through which it passes upward to the leaves at a rate which may vary from a few inches to over a yard an hour. (See Transpiration.) The forces operative and the mechanism of the flow are not perfectly understood.

Among other facts of interest it may be mentioned that the sap-current may pass through dead sections of stem, although it is equally certain that the sap that takes place in living cells furnish at least a part of the motive power.

The flow of sap from the sugar maple and other trees in the early spring, before the soil has thawed and while it is yet too cold for the living matter of the plant to show any great activity, is not due to the bleeding pressure, but to the expansion of the gases and liquids in the trunk and branches of the tree due to the direct warming action of the sun's rays. During the day the bubbles of air in the wood-cells become heated and expand, driving the sap from the wood-cells into the auger-hole which has been bored into the tree. At night the trunk of the tree cools slowly and the flow ceases, to be begun again next day.

The exudation pressure by which water or sap is forced from the living cells is exhibited in the bleeding which ensues when stumps and branches are cut away. The pressure which produces bleeding is often called root-pressure, although it is exerted by any part of the plant. Bleeding is exhibited by a large number of trees at the beginning of the growing season, and is also especially noticeable in the vine, dahlia, castor-oil plant, calla, nicotiana, and corn.

The amount of bleeding exhibited by any plant may be found if the stem is cut and bent over in such a manner that the end is thrust into a tumbler or small vessel, which will serve to collect the escaping sap.

Interesting records of measurement of the amount of bleeding are available. A specimen of Petasites patellaris gave off over sixty-three pounds of water in twenty-four hours; an Agave americana yielded twelve and one-half pounds in twenty-four hours. The pulque of Mexico is the preparation of sap which collects in the center of the mature rosette of agave when a cavity is cut into it.

The range of concentration of sap as denoted by its osmotic properties varies widely. Cacti and other succulents have a sap which would set up a pressure of only three to twelve atmospheres. Indian sandal shrubs may have a sap which would set up a pressure of over 3,000 atmospheres.
hundred atmospheres. The concentration is greatest in mature leaves, and in the lila this may be from twelve to twenty-five atmospheres, while the roots of the same plant may not show more than four or six atmospheres. var. fistulosus, D. F. MacDougal.

**SAPINDUS** (Latin, soap and Indian, alluding to use of the fruit as soap in India). *Sapindaceae. Soapberry.* Trees or shrubs, sometimes somewhat climbing, of economic use and sometimes used as ornamentals.

Leaves alternate, without stipules, abruptly pinnately compound, in one to four pairs; the lfts. entire, rarely serrate: rachises or terminal or axillary: fls. polygamous, regular; sepal 4-5, in 2 rows; petals 4-5, naked or bearing 1 or 2 glabrous or villous scales and gland near the apex; stamens 8-10; berry fleshy or leathery: seeds frequently globose, with a horny testa and no aril, black or nearly so.—About 15 species, tropical regions of the world.

The fruit has an alkaline principle known as saponin which makes it useful for cleansing purposes. The fruit was much used in eastern countries before the introduction of soap and is still preferred for washing the hair and cleansing delicate fabrics like silk. The seeds of some species are used for making rosaries,buttons, and the like.

The soapberry trees in cultivation are evergreen or rarely deciduous trees with pinnate, rather large foliage and with terminal large panicles of small whitish flowers followed by berry-like globose orange-brown to black fruits. With the exception of *S. Drummondii* which has proved fairly hardy in sheltered positions as far north as Massachusetts, they can be grown in subtropical regions only, but *S. Mukorossi* is apparently somewhat harder than the rest. They are sometimes planted for ornament in the southern states and in southern California and some, particularly *S. Mukorossi* var. carinatus, may possibly be profitably planted for their fruits which are rich in saponin. They do well in rather dry and rocky soil. Propagation is by seeds which germinate readily and by hardwood cuttings in early spring.

A. Lfts. oblong-obovate, 4-9; rachis usually broadly winged: petals without scales.

**Sapindaria**, Linn. A small tree, to 30 ft., with rough grayish bark: lfts. oblong-lanceolate and acute to elliptic-ovate and somewhat obtuse, opposite or alternate, entire, glabrous, veiny and lucid above, tomentose beneath, 3-4 in. long; rachis usually winged; panicle 7-10 in. long; sepal round, petals ovate, hairy: fr. ¾-3¼ in. across, globose, keeled, orange-brown, translucent. Fls. in Nov.: fr. in spring. *S. Fla.*, W. India, and S. America. Cult. in N. Fla. and S. Calif. S.S. 2:74, 75.

AA. Lfts. acuminate, 7-19; rachis with narrow margin or margins: petals with 2 scales. b. Trees evergreen.

**marginatus**, Wildl. A tree reaching ultimately 60 ft. in height: lfts. very short-stalked or nearly sessile, 7-13, lance-oblong, acuminate, glabrous above, puber beneath and somewhat pubescent on the midrib, 2-5 in. long, the upper nearly opposite, the lower alternate; rachis narrowly margined or margins: fls. white, sometimes tinged with red, in pyramidal panicles; petals ciliate, ovate to ovate-lanceolate; filaments villos: fr. yellow, translucent, globose, keeled, ½ in. across. May, June. S.C. to Fla. S.S. 18:828.—Cult. for ornament in *S. Fla.*

**Mukorossi**, Gaertn. Tree, to 60 ft.: lfts. 8-13, stalked, the stalk ½-3 ½ in. long, oblong-obovate to oblong-lanceolate, oblique and cuneate at the base, glabrous, reticulate beneath, 3-6 in. long; rachis with narrow margins: panicles 2-8 in. long; sepal subovate to ovate, obtuse, petals ovate to ovate-lanceolate, acute, ciliate; filaments villos: fr. globose, yellow or orange-brown, about ¼ in. across, slightly keeled. China, cult. in Japan. S.I.F. 1:71. Var. carinatus, Radlk. (S. littlta, Trabat). Fr: more fleshy, strongly keeled.—According to Trabat this variety is cultivated in Algeria for its fr. which contains nearly 38 per cent of saponin; the trees come into bearing in 8–10 years and a tree may yield 60–120 pounds of berries every year.


**SAPIUM** (the Latin name used by Pliny for a resiniferous pine). *Euphorbiaceae. Tropical trees and shrubs cultivated for their economic products and sometimes for ornament.*

Glabrous: juice milky and poisonous: lvs. alternate or rarely opposite, simple, denticulate to entire; stipules small, 2 conspicuous glands at the apex of the petiole and on each of the acule-like bracts: fls. generally in terminal spikes, the pistillate singly below, the staminate 2-3-lobed, the lobes imbricate; stamens 2-3, filaments free: ovary 1-3-celled, 1 ovule in each cell; a 3-parted central column remaining after dehiscence of the capsule: seed without a caruncle.—Nearly 100 species, in the tropics of both hemispheres, chiefly in Amer. Two intro. species are now found wild in *S. Fla.* Related to *Sapindus, Hura*, and *Houmulanthus.*

In their native country a number of species of Sapium are utilized in many ways. They are chiefly important as a source of rubber. *S. Jenmanii* is the chief source of rubber in British Guiana, where it is found in the alluvial forests in humid situations. It does best in well-drained clayey peat. *S. verrum*, once common in Colombia, has been cut for the rubber until it is now rare, but does well under cultivation in higher altitudes, yielding ten to eighteen pounds of raw rubber to each tree. A number of other species are used for rubber in South America. *S. Pavonianum* yields a medium grade. It is easily grown but is scarcely in culture. *S. sebiferum* is cultivated, especially in China, for the wax of the seed-covering which is used for candles, soap, and cloth-dressing. The wood of this and other species is utilized. Some of the "jumping beans" are seeds of Sapium which contain insect larva. Sapum may be propagated by seeds or by cuttings. The best varieties are sometimes top-grafted on seedling stocks.


**Jenmanii**, Hom. A large tree; lvs. oblong-lanceolate, abruptly and obtusely acuminate; glands of the petiole short, sessile; lateral lfs. veins more curved than in the preceding species and the ovary 1-celled: style not persistent. British Guiana.
SAPODILLA

Achras Sapota, Linn., of the family Sapotaceae, generally considered one of the best indigenous fruits of the American tropics. The tree is commonly cultivated, as well as naturalized, on the Florida Keys, and the fruit (Fig. 3545) is offered in south Florida markets.

Botanically the sapodilla is closely related to the maneye sapote (Liane maneye), the tia (L. nervosa) and the star-apple (Chrysophyllum Cainito), fruits which are well known in various parts of tropical America. The tree is evergreen, stately, with a dense rounded or conical crown sometimes attaining a height of 50 to 30 feet, horizontal or drooping at the ends of the branchlets; the wood is hard and very durable, timbers in an excellent state of preservation having been found in the Mayan ruins of Yucatan. The bark contains a milky latex known commercially as chicle.

SAPODILLA 3073

which is secured by tapping the trunk, and is exported in considerable quantities from Mexico to the United States, where it forms the basis of chewing-gum. The leaves are borne upon slender petioles up to 1 inch long, the blades entire or emarginate, ovate-elliptic to elliptic-lanceolate in outline, rounded-cuneate at the base and commonly obtuse at the apex, 2 to 5 inches long, glabrous, of rich green color, the midrib prominent on short finely pubescent pedicels in the leaf-axils.

The sapodilla is the name applied in the United States to Achras Sapota, Linn., of the family Sapotaceae, generally considered one of the best indigenous fruits of the American tropics. The tree is evergreen, stately, with a dense rounded or conical crown sometimes attaining a height of 50 to 30 feet, horizontal or drooping at the ends of the branchlets; the wood is hard and very durable, timbers in an excellent state of preservation having been found in the Mayan ruins of Yucatan. The bark contains a milky latex known commercially as chicle.

The flavor of the sapodilla is difficult of description, likened to that of a pear by some writers, and with a peculiar character common to several sapotaceous fruits. Some of the early writers were enthusiastic in praising it, the Spanish historian, Oviedo, going so far as to call the sapodilla the best of all fruits. More recently Firminger, an Anglo-Indian horticulturist, wrote that "a more luscious, cool and agreeable fruit is not to be met with in this or perhaps any country in the world," while Descourtis says it is "melting, and has the sweet perfumes of honey, jasmin, and lily-of-the-valley." In Florida it is a general favorite, especially among residents of the Keys, and in numerous other parts of tropical America it assumes considerable importance among cultivated fruits.

The tree is considered by Pittier to be indigenous in Mexico south of the Isthmus of Tehuantepec, in Guatemala, and possibly in Salvador and northern Honduras, being especially abundant in the lowlands of Tabasco, Chiapas, and the western part of Yucatan, which are the principal centers of production in the southern part of the state. The common name is derived from the Nahual word zapotl or tzicozapotl, the latter meaning "gum zapotl," and surviving to the present day in the precise form chiezasapotl, by which the tree is commonly known in southern Mexico; zapotl was the name given by the Aztecs to all soft sweet fruits. In Spanish-speaking countries the sapodilla is frequently called nispero, which name properly belongs to the European medlar. In the British West Indies the tree is known as sapotilla; in Brazil one form of the fruit is called sapotl, another sapota. The German name for the tree is Breiteiphaben, the French sapotiller, and the Dutch mispelboom.

From its home in tropical America, the sapodilla has been carried around the globe, and though less commonly cultivated in the Orient than the papaya, it is grown in many regions, particularly in some parts of southern India, where, according to Macmillan, it thrives up to elevations of 3,000 feet, though in Ceylon it is seldom productive above 1,500 feet and succeeds best on the coast. In Ecuador its cultivation is said by Pittier to extend into the temperate belt at altitudes of more than 8,000 feet. Its culture in Florida is limited to the southern part of the state, approximately the section south of Palm Beach on the east coast and the Manatee River on the west. Mature trees have passed uninjured through temperatures of 28° F., according to Reasoner. A notable advantage of the tree for some parts of the West Indies is the fact that the branches are tough and not easily broken by hurricanes. In California it has not yet fruited, though in favored locations specimens have occasionally attained an age of several years without being injured by frost. Even in the tropics, however, the tree grows very slowly, and in California the cool winters greatly hinder its development. It seems probable that it may yet be fruiting in protected foothill regions, but its culture in most parts of southern California is not recommended. The soil best adapted to the sapodilla seems to be rich sandy loam, but it thrives almost equally well on light clay and on the shallow sandy soil, underlaid with soft limestone, which is found on the lower east coast of Florida. Even though grown under the most favorable conditions, the trees rarely come into bearing until six to eight years of age, if seedlings, and in some sections do not attain a greater ultimate height than 20 to 30 feet. They should not be set either on chalky or calcareous land, because of their close compact growth. As a general
employed, their judicious use will doubtless improve

fruit at especially desirable times of the year. From
such seedlings one should select the best for propa­
gation. After three or four weeks the stock may be
examined to see that the eyes are well developed.

incision and renders it difficult to do the
work properly. Waxed tape should be used for wrap­

after they have
made their second leaves, can be potted off

ready for the first year or two, when they are
ready to be set out in the open ground.

the sapodilla as they have with most of the other
tropical fruits, but experiments in Florida have shown
that it can readily be budded, using as stocks seedlings of the same
species.

Seeds, if kept dry, will retain their vitality for several
years, and are easily transported through the mails to
any distance. They should be planted in shallow flats of
light sandy soil, covering them to the depth of ½ inch. In warm weather germination takes place within
a month, and the young seedlings, after they have
made their second leaves, can be potted off and carried
along in pots for the first year or two, when they are
ready to be set out in the open ground. If to be budded,
they may be planted in nursery rows about 3 feet
apart, 18 inches apart in the row. In south Florida,
May has proved to be a favorable season for budding;

in strictly tropical regions the work can probably be
done at any time, provided the stock plants are in
active growth. Budwood should be chosen from young
branches which have begun to lose their greenish color and
assume a brownish tinge, and should be carefully
examined to see that the eyes are well developed.

Shield-budding is the method used, the details being
practically the same as with the mango; buds should be
chosen from young branches which have begun to lose their greenish color and
assume a brownish tinge, and should be carefully
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SAPONARIA
BB. Fls. rose or white.
c. The plants not cespitose.
d. St. stout, erect.

**officinalis**, Linn. BOUNCING BET. Fig. 3546. Perennial: sts. 1½–2½ ft. high, leafy, simple, clustered, glabrous; lvs. mostly oblong-lanceolate, 3-nerved; fls. light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petal-lobes obovate, entire, notched at apex. July, Aug. Eu.

Var. *albo-plena*, Hort., is a double white-flowered form growing 2 ft. high, leafy, simple, clustered, glabrous; lvs. mostly oblong-lanceolate, 3-nerved; fls. described as white tinted rose by some, as deeper colored than the type by others, grows 1½ in. high. All summer and fall. Var. *caucasica flore-pleno*, Hort. (*S. caucasicajiorepleno*, Hort.), is said to have double reddish-purple fls. July–Sept.

**dd. St. slender, decumbent.**


Var. *spendidens*, Hort., has large fls. which are a more intense rose than the type. Var. *spendidissima*, Hort., has large deep rosy crimson fls. Var. versicolor, Hort., is a form in which the fls. are at first pure white later becoming rose. A cross between a white-flowering variety and var. *splendens*. R.H. 1913, p. 308.

**cc. The plants cespitose.**

d. **Lvs. obovate-elliptic.**


dd. Lvs. linear.

caspitosa, DC. Cespitose: sts. 2–3 in. high, nearly naked, fl.-bearing at the top: lvs. linear, glabrous, mostly radical, hardly dentulate: fls. rather umbellate, rose; calyx cylindrical, villous, deeply lobed, lobes acute; petals emarginate at the top, the blade very narrow. Pyrenees. G.C. II. 15:501.

**S. papillosa**, Hort. John Saul, is botanically unknown.—S. pulvinaris, Desvaux, (S. hianswith, Hort., S. Pulvillus, Boiss.). Densely cespitose-pulvinate; sts. low, 3–7-ft. lvs. small, linear, subcoriaceous; inf. hirsute; fls. bright rose. S. Sundermannii, Hort., closely resembles S. heliophila, but has rather larger fls. and more of them. June—S. Wettsteinianum, Hort., is closely allied to S. cespitosa, possibly only a form of it, but has pale purple fls. and a shorter calyx. Its habit is very compact and it is only 2–3 in. high.

F. Tracy Hubbard.
acute pubescent segments, and a four- or five-petaled greenish corolla, valvate in the bud, with small oblong-elliptic acutate concave petals; the stamens are as numerous as the petals and alternating with them, with short filaments and small oblong anthers; the ovary is superior, five-celled, bearing at its apex a three- to five-lobed sessile stigma.

The fruit, when of a choice variety, is as large as a good-sized orange, and somewhat resembles a quince in general appearance. The tender yellow or yellowish greenish flesh is as thick as thin, more or less smoother or scaly, surrounds the soft cream-colored pulp, of melting and delicate texture and pleasant but peculiar flavor, sweet and lacking any trace of acidity, with sometimes a touch of bitterness. The seeds, normally five in number, an inch long and half as wide, are oblong to elliptical in form, light yellow in color, reticulated on the surface; their number is frequently decreased by abortion to two or three. In the tropics the fruit ripens in July and August, in California usually not before October; it is picked when fully mature but while still hard, and must be laid away for a few days before it is mellow and ready for eating. Because of its thin skin and the delicate texture of the flesh it does not ship so readily as some other fruits, even while still carefully packed, it can be sent considerable distances. It is commonly used while fresh, and an over-indulgence in it is thought by the Mexicans to induce sleep, but it is doubtful whether there are grounds for this belief. The white sapote is popular among the Mexicans, especially in the region around Guadalajara, and is regularly found in the markets.

The hardness of the tree is attested by its behavior in southern Europe; it has fruited at La Mortola, and is cultivated in other points on the Riviera; it is also said to have fruited in the island of Jersey. In Mexico it flourishes up to altitudes of 7,000 feet, according to von Mueller.

Although introduced to California from Mexico about 1810, it has not yet become extensively cultivated in that state, and large specimens are rather rare. One of the oldest trees, thought to have been planted about a century ago, is growing on De la Guerra Street in Santa Barbara. Although uncared for amidst the most unfavorable surroundings it bears regularly; its fruits, however, are small and practically worthless. A number of trees of considerably lesser age—most of them planted about 1880—are in bearing in various parts of southern California, and while some produce small, inferior fruits others produce large ones of delicious flavor. After it comes into bearing the tree commonly produces regularly and abundantly. It has shown itself to be remarkably drought-resistant, though it naturally succeeds much better when irrigated in the dry season. It seems to prefer a well-drained sandy loam, but thrives on heavy clay if the drainage is good, and in south Florida has done well on shallow sandy soil underlaid with soft limestone. In this latter state it produces regularly and abundantly.

The terminal bud should be pinched though it can get along with little water if necessary. Stock plants should be selected from young, vigorously growing seedlings, with stems about \( \frac{3}{3} \) inch in diameter at the base. Budwood is taken from the ends of the branches, using fairly well-matured wood which has assumed the ash-gray color. The buds are cut about 1 1/2 inches long. In the spring, just as the bud begins to open, they may be unwrapped, and then re-wrapped loosely, leaving the bud exposed so that it may start into growth, at the same time lopping back the stock to a point 3 or 4 inches above the bud. In the tropics budding can probably be done at almost any season; in California spring and summer, when the stock plants are in most active growth, are the best times.

Three named varieties have been established in California—Harvey, Parroquia, and Gillespie. Of these Harvey is the largest and probably the best; the tree is very prolific, and individual fruits sometimes measure \( \frac{3}{2} \) inches in diameter. W. H. POTENOE.

**SAPROPHYTE** (Greek, rotten, and plant, i.e., living on dead organic matter). A dependent, or heterotrophic, plant (whether bacterium, fungus, or higher plant) subsisting upon the decay of dead organic materials. A holosaprophyte is a plant which lives exclusively on dead organic food. One which is only partially dependent on dead organic food and also feeds independently, as an autophyte, is appropriately called a partial saprophyte. The customary classification which includes under the term "saprophyte" all bacteria that do not subsist on living plants or animals no longer corresponds with facts. The integrity of the classification has been destroyed by the discovery of certain bacteria in the soil, as the nitrifying bacteria, which are able, even without sunlight, to appropriate the carbon dioxide of the atmosphere. Saprophytes intergrade with parasites on the one hand so closely and with the autophytes on the other that the distinction of them is often difficult. For example, it is supposed that the chestnut blight (Endothia parasitica) was originally saprophytic, but has recently assumed a virulent parasitic development. Among the fungi we class as saprophytes all plants which live upon a dead or decaying organic substratum. Such are the baker's yeast (Saccharomyces cerevisiae), the mushroom (Agaricus campestris), and the stinkhorn (Phallus impudicus). Most mushrooms and toadstools are saprophytes. Some of the flowering plants possessing ectotrophic mycorrhiza (Indian pipe, Monotropa uniflora) and endotrophic mycorrhiza (Neottia Nidus-avis, Corallorhiza invena, Epipogium aphyllum, snow-plant, Saracodes sanguineus and Thamn Aseroe) are also classified as saprophytes. A few algae are from young, or dead, or decaying organic substratum. For this reason trees propagated by some vegetative means should be planted. Shield-budding is successfully practised, the method being essentially the same as with the avocado. Stock plants should be selected from young, vigorously growing seedlings, with stems about \( \frac{3}{3} \) inch in diameter at the base. Budwood is taken from the ends of the branches, using fairly well-matured wood which has assumed the ash-gray color. The buds are cut about 1 1/2 inches long. In the spring, just as the bud begins to open, they may be unwrapped, and then re-wrapped loosely, leaving the bud exposed so that it may start into growth, at the same time lopping back the stock to a point 3 or 4 inches above the bud. In the tropics budding can probably be done at almost any season; in California spring and summer, when the stock plants are in most active growth, are the best times.

**SARACA** (from Sarac, the name of the genus in India). Imaginum. Unarmed trees (or tall climbing shrubs?), grown in the warmhouse. Leaves abruptly pinnate, the lfts. leathery, often few-paired; stipules small, caducous; fls. yellow, rose, or scarlet, racemose, the racemes in short very branched panicles which are often lateral; calyx-tube elongated, strongly incurred, 5-lobed; petals 4; stamens 4 to 10; ovaries 3-5-lobed, hairy; stigmas 3-5, free; ovary stipitate, ovules many; legume oblong or elongated, flat-compressed or turgd, leathery to somewhat woody, 2-valved.—About 6 species, Trop. Asia.
Indica, Linn. A medium-sized tree: lfts. 6-12, oblong or oblong-lanceolate, acute or obtuse, 3-9 in. long, entire, short-petioled: fls. orange-red, fragrant, collected in compact, roundish panicles which are shorter than the lvs.; stamens usually 6 or 7, inserted on the calyx and flowering at the summit of the calyx-tube; style long, curved; bracte red, appearing as a calyx: pod 4-10 in. long, 4-8-seeded; seeds oblong, compressed, 1½ in. long. Inda and Malay. BM. 3018 (as Jostea Asoca).

It has flowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Intro. into S. Fla.

casinifora, Baker. A shrubby tree: lfts. 10-12, rigidly subcoriaceous, the upper oblanceolate-oblong, acute, 1 ft. or more long, the longer shorter, more oblong; corysts solitary or in pairs, nearly sessile, dense, 4-6 in. broad: fls. scarlet: stamens 7. India. Intro. into S. Fla.

F. Tracy Hubbard.

Sarcanthus (name from Greek words signifying flesh and flower, in allusion to the fleshy nature of the blossom). Orchidaceae. A small genus related to Vanda, and owing to the smallness of the lvs. seldom cult.; sepals and petals similar; labeldum firmly united with the base of the column, spurred, with 2 small lateral lobes on a longer corona and nodose lober folia and habit of vanda. Give plenty of water in the growing season. They should have basket cult., with fern-root, and a temperature of 65° to 85°. When at rest, give very little water and reduce the temperature to 55°. Cult. practically as for Vanda.

tereuliolus, Lindl. (Luisia tere, Lindl.) St. 1 ft. high, with cylindrical lvs. 2-4 in. long; raceme bearing 7-8 inconspicuous fls.; sepals and petals oblong, dull green, with red disk; labeldum slipper-shaped, white, lateral lobes edged with red. Sept. China. BM. 3371. S. sativus, Rolfe. Distinguished by its inflated spur, which is much longer than the seeds of the lps.; sepals and petals green, with 2 dark brown stripes; front lobe of lip light yellow, side lobes white. Annam.—S. robusta, O'Brien. Lvs. narrowly oblong, about 6 in. long, spike few-fl.; fls. cream to blush-white, marked with claret-purple. Bernsen. G.C. Ill. 83-25.

Heinrich Hasskberg.

Sarcocephalus (Greek, flesh and head, alluding to the fleshy heads of fruit). Rubiaceae. Shrub or trees sometimes climbing, suitable for warmhouse culture or hardy in the extreme southern United States.

Branches suberete or obtuse quadrangular; lvs. opposite, rarely in whorls of 3, subcoriaceous; heads terminal and axillary; fls. white, pink or yellow and flesh-colored, teeth 5-6 hairy; calyx narrowly funnel-shaped, rather fleshy, 5-lobed; anthers 5, subcissile; disk inconspicuous; ovary 2-celled; syncarpium fleshy.—About 30 species. S. sexangularis, Auct. A tree with long branches or often a shaggy shrub 10-25 ft. or more high; lvs. elliptical, short-cissile; fls. in terminal heads, white, pale pink or yellowish, fragrant; calyx-teeth furnished with alternating filiform-clavate appendages: fruiting head 2½-3½ in. in diam., deep red with brown granulated surface. Trop. Afr.—Edible, the peach or country fig of the natives of Sierra Leone. S. ovata, Elmer. Tree, 18 ft. high, with rigid branchlets; lvs. glabrous, leathery, ovate or elliptic, acute at the base, obtuse at the apex, 2½ in. ind. capitata, pedunculated; fls. red; calyx with ciliata, pellucid and deciduous appendages; corolla glabrous, nearly ½ in. long. Philippines. Said to be intro. into Calif.

Sarcochilus: Thrixpermum.

Sarcochilus (Greek, flesh-like, alluding to the fleshy fruit). Orchidaceae. A genus of parasitic orchids, of which the Indian-pipe or corpse-plant is an example. Few species are known in this family, and they are all local or rare. The snow-plant derives its popular name from its habit of shooting up and blossoming as soon as the snow melts away in the spring. They are handsome evergreen shrubs with ovate to lanceolate entire lustrous leaves, rather insignificant whitish flowers in axillary clusters and red or purple berry-like fruits. S. ruscifolia and S. Hookeriada var. humilis have proved hardy in sheltered positions at the Arnold Arboretum, while S. saligina is tender. They do not seem particular as to the soil and do best in partly shaded situations. Propagation is by seeds or by cuttings which root easily.

A. Lvs. distinctly 3-nerved, caudate-acuminate.


B. Lvs. obscurely veined.


ruscifolia, Stapf. Shrub, to 6 ft.: lvs. ovate to elliptic-ovate, acuminate, rounded or broadly cuneate at the base, dark green and lustrous above, 1½-2 in.; petioles ½-3 in. long; fls. in, usu­ally 4-fl. racemes: fr. subglobose, dark scarlet. Oct.—Feb. Cent. and W. China. Var. chinensis, Rehd. & Wilson (S. saligina var. chinensis, Franch.). Lvs. elliptic-ovate to elliptic-lanceolate, cuneate or broadly cuneate at the base, 1½-2½ in. long. W. China.

Alfred Reeder.

Sarcodes (Greek, flesh-like). Monotropaceae. S. saginata, Torr. (Fig. 3248), is the Snow-Plant of the Sierra Nevadas. It is a low and fleshy plant growing 3-12 in. high and entirely devoid of green lvs. It belongs to that strange family which comprises the fleshy and parasitic plants, of which the Indian-pipe or corpse-plant is an example. Few species are known in this family, and they are all local or rare. The snow-plant derives its popular name from its habit of shooting up and blossoming as soon as the snow melts away in the spring; these are handsome evergreen shrubs with ovate to lanceolate entire lustrous leaves, rather insignificant whitish flowers in axillary clusters and red or purple berry-like fruits. S. ruscifolia and S. Hookeriada var. humilis have proved hardy in sheltered positions at the Arnold Arboretum, while S. saligina is tender. They do not seem particular as to the soil and do best in partly shaded situations. Propagation is by seeds or by cuttings which root easily.


SARCODES

SARCORDIA (name refers to the fleshy corona).

Sarcoëdes (Dendrobium cymboïdium, Lindl. D. pendulum, Lodd.). Raceme few-flowered; lvs. pale yellow or straw-color, the lip yellow, suffused with rose or purple, with 2 lanceolate lateral lobes and a strongly curved, fleshy, obovate to oval, thin-lipped; calyx-lobes 5, obtuse, the middle one obovate; tinctorial, the outer lobes 5, obtuse, the middle one obovate; tepals rhombic, acute. Trop. Himalayas.

George V. Nase.

SARRACENIA

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SARRACENIA (named after Mart. Sarmiento, a Spanish botanist). Euphorbiaceae. A glabrous shrub, creeping or clambering over trees and rocks, to be grown in a moist greenhouse; sts. slender; lvs. opposite, rather fleshy, entire or few-toothed: lvs. red, peduncled at the axes, solitary; calyx free, 5-parted, segments narrow; corolla-tube elongate, ventricose, limb slightly oblique, lobes 5, rounded, spreading; stamina 2, posterior perfect, 2 anterior staminodial; disk obsolete; ovary 5-loculed. —One species. Chile, S. repensa, Ruiz & Pav. Sts. slender; lvs. rather small, somewhat fleshy; lvs. scarlet, axillary and solitary; calyx 5-parted; corolla-lobes 5, rounded and spreading; stamina 2, posterior perfect, 2 anterior staminodial; ovary 5-loculed. —One species. Chile, S. repensa, Ruiz & Pav. Sts. slender; lvs. rather small, somewhat fleshy; lvs. scarlet, axillary and solitary; calyx 5-parted; corolla-lobes 5, rounded and spreading; stamina 2, posterior perfect, 2 anterior staminodial; ovary 5-loculed. —One species. Chile, S. repensa, Ruiz & Pav.

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amongst fine hairs may occur. This area excretes a slightly viscous juice, which accumulates in the pitcher cavity, and which, as Mellichamp showed, readily wets and drowns any insect that falls into it. The lowest part of the pitcher in all species bears long delicate down-directed hairs that incline insects to move upward; and even the entire leaf may be of a dark crimson-purple hue, and correspondingly attractive. Minute honey-glands occur over the exterior, which forms therefore the "alluring surface." But these are specially abundant over the inner lid surface, where they are interspersed with down-directed hairs that incline insects to move on to the upper part of the tube. So this inner lid area has been termed the "attractive surface." The upper third to half of the tube is extremely smooth, and affords little foothold for insects, which often tumble from it into the pitcher cavity. So this has been called the "conducting surface." Beneath it in S. purpurea is a wide glandular surface that is absent in the other species, although in some of them glands scattered inches across, and in color from pale lemon-yellow, as in S. minor, to deep crimson, as in S. Drummondii and S. rubra. Each lasts from eight to twelve days. The five spreading sepals inside three small bracteoles are move or less petaloid; the petals are large pendent banners, the stamens are numerous and disperse an abundant pollen which early falls into the umbrelloid cavity of the style. The pistil consists of a five-celled ovary that is covered outside by crystalline nectar-secreting warts, and within bears many ovules; a style that expands above into a large umbilicate structure with five marginal notches, at the base of each of which is a minute dry peg-like stigma. The entire pistil after pollination matures in about three months into a many-seeded capsule. Cross-pollination seems always necessary for formation of good seeds. This act, as well as hybridization of distinct species, can readily be effected if pollen from one flower that has been wetted by nectar from its own ovary surface is placed on the dry stigma of a flower on another plant. All of the seven species cross readily with each other, alike in the wild state and under cultivation, if flowers mature about the same time. Thus at various localities in western Florida and in Alabama, where the tall handsome species S. flava, S. Drummondii, and S. Sledgei grow, the writer has found hybrids at times to be nearly as abundant as either parent. The numerous artificial hybrids between the species, that are themselves fertile and give rise to second hybrids in which the characters of at least three parents may be blended, also afford a means of hybridization. The seeds germinate readily in about four weeks if sown with chopped sphagnum moss on a moist sandy muck. After production of the linear cotyledons, each seedling plant forms pitched leaves that successively increase in size till good specific characters are shown by the second year.

The larvae of certain moths, flies, and beetles at times prey on the pitchers, while the rhizomes may be excavated and destroyed by still another type. Careful detection and destruction of the infested leaves or pieces of rhizome are recommended. Mosquitos also may breed in the liquid of the pitchers of S. purpurea. All of the species succeed well under cultivation if grown in pots filled with fine sandy muck, from which, while decaying, humic acid constituents are evolved. Alkaline waters are always detrimental. In this respect they require the same treatment as do other swamp or semi-swamp plants of the eastern states. They should also have a bright sunny southeastern exposure, should be kept near the glass if grown in greenhouses, and the pots should stand permanently in about an inch of water. All can endure a temperature that approaches the freezing-point in winter.

The writer has monographed the genus in Engler's "Pflanzenreich," Vol. 4, No. 110 (hft. 34, 1908). A useful synopsis, along with some helpful figures, was given by Masters in 1881 (G.C. II. 15, 16. 1881).

The sarracenias have always excited the interest of the curious, and many of the native haunts have been depleted. In his "New England's Rarities," 1672, Josselyn gives a picture (Fig. 3549) of what he calls the "Hollow Leaved Lavender," and the following account of the plant we now call Sarracenia purpurea: "It is a Plant that grows in salt Marshes overgrown with Moss, with one straight stalk about the bigness of an Oat straw, better than a Cubit high; upon the top standeth one fantastical Flower, the Leaves grow close from the root, in shape like a Tuska, hollow, tough, and always full of Water, the Root is made up of many small strings, growing only in the Moss, and not in the Earth, the whole Plant comes to its perfection in August, and then it has Leaves, Stalks, and Flower, as red as blood, excepting the Flower which hath some yellow admixt. I wonder where the knowledge of this Plant hath slept all this while, i. e. above Forty Years."
INDEX.

1. SPECIES.

A. Pitchers erect: fls. yellow or whitish yellow.


2. Siedgei, Macfar. (S. Gronovii var. alata and S. flavâ var. cespitosa of authors). Pitchers erect, 12-30 in. long, trumpet-shaped, green with purple veins above, or greenish purple through lid; lid vertical or often slightly incurved, ovate-cordate; wing as in last; fls. 1½-2½ in. wide; petals whitish yellow to yellow, often fading to white. Moist savanna lands of west side of Alabama and Mobile rivers to E. Texas, often covering wide areas of marshland.

—Very uniform in structure, but varying in color from green to dark red in the pitchers; often confused in the past with S. flavâ, which does not occupy the same area. Presently known growing with S. Drummondii in nature to form S. arcuata.

3. flavâ, Linn. Pitchers erect, 10-34 in. long, trumpet-shaped, with prominent longitudinal veins, yellow-green to green, often crimson throat or deep crimson throughout; lid ovate-oblong, slightly inflexed over mouth, with strong coral-like ribs; Savanna swamp from west side of Alabama and Mobile rivers to E. Texas, often covering wide areas of marshland.

—Very uniform in structure, but varying in color from green to dark red in the pitchers; often confused in the past with S. flavâ, which does not occupy the same area. Presently known growing with S. Drummondii in nature to form S. arcuata.

B. Pitchers spreading: fls. crimson to purple-red.

4. rubra, Walt. (S. Sweetii, DC. S. Gronovii var. rubra, Wood. S. minor, Sweet). Pitchers erect, in long, slender, enlarging upward, tubular above, green to purple-veined over upper part of tube and lid; lid ovate, slightly concave and inflexed over mouth; wing rather wide, nearly uniform, from middle to top of pitcher: fls. 1½-1⅔ in. wide, petals crimson, scent of sweet violets. Moist to dry savanna lands of the Carolinas, S. Ga. to W. Fla.; the most delicate and graceful species of the genus. B.M. 3515. L.B.C. 12:11. Var. arcuata, DC. Lid ovate, apex acuminate. All transitions occur between this and the type species.


AA. Pitchers erect to decumbent: fls. crimson to purple-red.

5. rubra, Walt. (S. Sweetii, DC. S. Gronovii var. rubra, Wood. S. minor, Sweet). Pitchers erect, in long, slender, enlarging upward, tubular above, green to purple-veined over upper part of tube and lid; lid ovate, slightly concave and inflexed over mouth; wing rather wide, nearly uniform, from middle to top of pitcher: fls. 1½-1⅔ in. wide, petals crimson, scent of sweet violets. Moist to dry savanna lands of the Carolinas, S. Ga. to W. Fla.; the most delicate and graceful species of the genus. B.M. 3515. L.B.C. 12:11. Var. arcuata, DC. Lid ovate, apex acuminate. All transitions occur between this and the type species.


B. Pitchers spreading: fls. crimson to purple-red.

6. purpurea, Linn. The common pitcher-plant of the N. and the one on which the genus was founded. Fig. 3551. Pitchers ascending, in rosettes of 3-6, 2-10 in. long, widest toward middle, narrow below and upward, green to dark purple; lid upright or slightly inclined outward with fine hair-like hairs over inner lid or attractive surface; wing broad, prominent; fls. 1½-1⅔ in. wide; sepals and petals greenish purple to purple. In wet sandy muck or by swamp margins from Labrador and Minn. to N. Fla and Ala.; flowering from fourth week in March to third week in March in N. Fls. to second week in Aug. in Lab. B.M. 849. L.B.C. 4:308. F.S. 10: 1076. G.C. II. 15:821. Mn. 1:81. G.L. 27:179.—Very variable in coloring from bright green in shady places to dark purple in sunny situations. According to Lod­ diges, writing in 1825, this species was “cultivated before the year 1640 by Tradescant, who was gardener
7. psittacina, Michx. (S. calceolata, Nutt. S. pulchra, Croom). Pithers procumbent in radial rosettes, 2–6 in. long, enlarging from base to hooded apex, green with dull purple and white veins or areoles to claret-purple throughout; apex of tube psittacoid, forming with fused lid an incurved margin to pitcher-oriifice; wing narrow to wide vertical in position: fls. 5½–13½ in. wide, greenish-purple to purple. Often abundant in pools of springs of Ga., N. Fla., and westward to La. F.S. 7:268, des.; 20:2063. F. G.C. II. 15:816. F. 1877, p. 254.—This species flourishes well under cult., when treated as a semi-aquatic, with that is its roots largely submerged in water.

II. NATURAL AND ARTIFICIAL HYBRIDS.


9. arcostis, Macfarl. (S. Slechtii × S. Drummondii). Pithers elongate-tubular, green below, purple-veined and areolate above and curved lid. Lid circular-cordate, margin somewhat undulate, with fine white hairs within: fls. 2–2½ in. wide, yellowish-purple.—This is the species wherever both parents occur near each other. It is specially abundant from near Mobile, Ala., westward for 50 miles. It is readily in cult. if grown like both parents, with the roots largely submerged in waters that have a humic acid reaction.


11. Cattabeli, Ell. A hybrid between S. flava and S. purpurea, that is common throughout the southern states. It was first described by John Ray fully 200 years ago from specimens sent to him from this country. The writer has noted as many as 117 specimens, going near Pensacola, Fla. It is only rare, and produces pitchers and flowers that are the most striking and beautiful of the genus.


13. Claytonii, Nichols. Origin and parentage unknown; it is thus described by Nicholson: "Pitchers beautifully colored vinous purple and red, veined to crimson.


16. crispita, André. A name of doubtful value, that seems to have been inadvertently used by different authors. Probably either Slechtii or a hybrid of S. flava with S. minor. The writer has gathered undoubted examples of the last-named cross near Summerville, S. C. Pitchers erect, green with whitish areolations above, lid broadly ovate, somewhat constructed over orifice: fls. bright yellow.

17. decora, Hort. A probable cross between S. psittacina and S. minor, and so of like or more recent parentage with S. formosa.

18. excelsa, Nichols. A probable hybrid between S. minor var. albicaulis and S. Drummondii.

19. exculta, Nichols. A hybrid of like parentage as S. Moorei, which see.

20. exornata, Nichols. Said to be a hybrid of S. purpurea with S. crista-poa.

21. Firchami, Hort. A beautiful hybrid said to be a cross between S. Drummondii and S. rubra, and which combines details of both parents in pitcher and fl. The writer has collected a single wild example near Milligan, Fla., where the former parent is common and the latter is sparse.

22. flambeau, Hort. A hybrid of doubtful origin and parentage, colored as described. Possibly a cross of S. purpurea with S. minor, and so of like origin as S. Smaragdiana.


24. illustrata, Nichols. Lvs. elongate-tubular, veins becoming deep greenward, lid cordate, slightly acuminate, with crimson veins. Between S. flava var. picta and the hybrid S. Stevensi, so with 3 parts of S. flava "blood" and 1 of S. purpurea.

25. Maddisoniana, Nichols. A hybrid with the same parentage as S. formosa, but in reversed relation. Pitchers ascending, short, with dull purple veins and whitewhish areoles upward, encased end of tube and fused lid richly white and purple-veined.

26. Mandallana, Hort. A natural hybrid with like parentage to S. Moorei. Widely and across areas from N. Cent. Fla. to the Alabama River. It is so widely to be found wherever both parents are common. A tall form, with crimson throat of S. flava var. Kupiana, and the crimson and white areolations of S. Drummondii. It grows well under cult. First sent out by Pitcher & Anda.

27. melanorrhida, Veitch. A cross between S. Stevensii var. purpurea, and S. purpurea, so with 1 part parentage of S. flava and 3 parts S. purpurea. Pitchers ascending, long, widening from base to mouth, lid erect or slightly incurved with undulate margin and crimson veins showing short hairs, top of pitcher and lid crimson-green with dark crimson himid veins, wings prominent, broadest in middle.


The artificial hybrids were sent out by Bull. The writer has got a few like plants growing wild near Bay Minette, Ala., where both parents are common.

29. Morelei, Mast. This, the first artificial hybrid produced, was raised by Mose of Glensie, as a cross of S. flava with S. Drummondii. Pitchers tall, erect, tubular, with strong veins, light green below, crimson-veined and faintly white-areolate above with usually rich crimson posterior throat area; lid crimson, and white-areolate with slightly undulate margin and humped hairs on areoles, as in S. Drummondii. Shape and coloring of S. S. Mandallana is a natural hybrid of similar parentage. G.C. III. 1: 722; des.; 16:44.

30. Patersonii, Hort. A hybrid raised by Patterson, orchidologist of Bridge of Allan, Scotland, and with parentage like No. 28.


32. Porphyroneilia, Hort. Probably a synonym of, and of like origin as S. purpurea.

33. Sanderi, Nichols. An artificial cross of S. Drummondii var. rubra with S. Cookiana of unknown parentage.

34. Sanderiana, Hort. A garden hybrid of S. Drummondii var. rubra and S. Fairchildii, distributed by Sande. Cult. at Kew, and of great beauty.


36. Sazanamiana, Nichols. A hybrid with the same parentage as S. Catesbiana and with S. purpurea.


39. S. minor. A beautiful but complex cross of S. Courtl (S. purpurea × S. psittacina) with S. melanorrhida, that is a hybrid of S. Stevensii (S. purpurea × S. flava) with S. purpurea. It more or less combines characters from all of the 3 species-parents, and is delicately colored pale green, white, and crimson.

40. Wilsoniana, Nichols. Of same hybrid origin as S. Stevensii and others.

41. Wringleyana, Veitch. Reputed to be a garden cross between S. psittacina and S. Drummondii or the converse.

J. M. M'CALLANNE.
Deciduous; lvs. alternate, entire or 3-lobed, slender-petioled; fls. dioxeous, rarely perfect, apetalous; calyx 6-parted; stamens 9, the 3 inner ones furnished at the base with 2 stalked, orange-colored glands; staminodes 3 or wanting; anthers opening with 4 valves; ovary superior, 1-loculed; fr. an oblong-ovoid, 1-seeded, dark blue drupe surrounded at the base by the thickened scarlet calyx. Two species, one in E. N. Amer. and one in China.

The sassafrases are handsome trees of pyramidal habit with rather large, entire or 3-lobed leaves and small yellow flowers in few-flowered racemes appearing in spring with the leaves and followed by ornamental dark blue fruits on red fleshy stalks. The native species is hardy North, while the Chinese, one which is still little known in cultivation, is somewhat tenderer. The American sassafras usually affords light lands, although it may grow in clay loams. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright red color in autumn, and on account of its decorative bright-colored fruit. It prefers, at least in the North, a warm and sunny position. It is not easily transplanted when old on account of its long tap-roots. Propagation is by seeds soon as ripe; also by suckers, which are often freely produced, and by root-cuttings.

variifolium, Kunze (S. officinalis, Nees. S. Sassafras, Karst. Laurus Sassafras, Linn.). Figs. 3552 (winter tree), 3553. Tree, 30-60, or occasionally 90 ft. high; young branches bright green, pubescent; lvs. oval and entire, or 3-lobed almost to the middle, oblong, silky-pubescent when young, glabrous when mature. Fls. yellow, ½ in. across, glabrous inside, without stamnodes, in several-flowered racemes, umbellate when unfolding, afterward at the base of the young branchlets; stamine fls. without rudimentary pistil; staminodes wanting fls. 4-6; fls. milky, April, May. Maine to N. Mass. to S. C. and Ky.


SATUREIA (the old Latin name used by Pliny), also spelled Satureja. Syn., Calamintha. Lamiaceæ. Savory.

Hardy aromatic herbs and subshrubs, grown in borders for their flowers and also as pot-herbs. Leaves entire, narrow and small or toothed, or broad and larger: floral whors either axillary or in terminal spike-like racemes; calyx campanulate-tubular or tubular, rarely campanulate, 10-13-nerved, 5-toothed, sometimes 2-lipped; corolla-tube short or long, exserted, upper lip flat, entire or emarginate, lower lip expanded, 3-cleft, with flat lobes, the midlobe usually larger and emarginate; stamens 4: nectlets ovoid, smooth.—About 160 species in the warmer regions of both hemispheres.

A. Plants annual.

Ácinos, Scheele (Calamintha Ácinos, Clairv.). Annual, herbaceous, about 6 in. high; lvs. opposite, cut, base narrow, subsegmented, green on both sides; floral lvs. similar, exceeding the fls.: floral whors about 6-fl., distinct; calyx 3-4 lines long, deeply 3-4-nerved, hispid; corolla purple-blue, scarcely exceeding the calyx. Eu., Caucasus.—Escaped from cult. in N. Amer.

hortensis, Linn. (Calamintha hortîensis, Hort.). Summer Savory. Annual herb, pubescent; lvs. erect, about 6 in. high or a little more; lvs. oblong-linear, acute, base narrowed to a short petiole; floral lvs. similar, floral whors lady's somewhat 6-fl., in dense interrupted spikes; calyx sebaceous-hispid on the nerves; corolla sparsely pubescent outside, scarcely exceeding the calyx. Eu., and widely escaped from cult.

AA. Plants perennial.

b. Lvs. ovate, oblong-linear or spathulate.

montana, Linn. (Calamintha montâna, Lam. C. officinalis, Moench.). Winter Savory. Subshrub, glabrous or slightly sebaceous-pubescent: sts. woody at base; branches erect or ascending, 6-12 in. high; lvs. oblong-linear, acute or inferior spatulate or cuneate, obtuse; upper and floral lvs. narrower; floral whors many-fl., lacinately dissected, in a spike or raceme; calyx campanulate, 10-nerved or rarely obscurely 13-nerved; corolla white or purple. Eu., N. Af., and widely cult.


B. grandiflora, Scheele (S. grandiflora, Meech.). Herbaceous perennial: lvs. ovate, serrate: sts decumbent, branching from the base: lvs. in axillary whors, quite large, 1½ in. long, with a straight tube; upper lip flattened, purple. June, July.

F. TRACY HUBBARD.
SAUROPOUS (Greek for lizard foot). Euphorbiaceae.

Tropical shrubs rarely cult.: lvs. alternate, simple: fls. in axillary clusters, apetalous, sepals imbricate; no rudiment of a pistil in the staminate fls.; disk absent from the pistillate fls.; styles almost entire; ovules 2 in each of the 3 cells of the ovary: fr. more or less fleshy.—About 20 species of Trop. Asia and South Sea Isls. Related to Phyllanthus. S. albicans, Rümme, occurring in many varieties from Ceylon to the Philippines, has edible fr. and has been in cult. in Eu.

J. B. S. NORTON.

SAURURUS (Greek, lizard's tail, referring to the curve of the spike of fls.). Saururaceae. Lizard's Tail.

Perennial marsh herbs, suitable for the bog-garden.

Erect: lvs. heart-shaped, converging-ribbed, petioled, without distinct stipules; fls. of 3-4 carpels united at base and indehiscent; seed usually solitary.—Two species, one in N. Amer., the other in Asia.

crēnum, Linn. SAURURUS cernuus. (X3)

N. E. BR. Petiole up to 15 in. long, rose, the Begms. ovate or orbicular-ovate; stamine fls. from the pistillate fls.; styles almost entire; ovules 2 in each of the 3 cells of the ovary: fr. more or less fleshy.—About 20 species of Trop. Asia and South Sea Isls. Related to Phyllanthus. S. albicans, Rümme, occurring in many varieties from Ceylon to the Philippines, has edible fr. and has been in cult. in Eu.

J. B. S. NORTON.

SAUSSUREA (named after Theodor de Saussure, 1767-1845, or for his father, Horace Benoit de Saussure, 1717-1767). Compositae. Anther 3-4 mm. long, purple or pink, glabrous or tomentose herbs of various habit, some of the species adapted to the warmhouse, others to the coldframe.

Tuber undivided: lvs. few, on the lower part of the st., rarely many at the sides of the tall st.; fls. medium-sized or rather large, in often densely fl. spikes; bracts membranaceous or somewhat leaffy, sometimes imbricate in the young spike and often strongly reflexed, in a dwarf species overtopping the fls.; sepals free, rather similar to the petals; labellum erect, broad-coneave, galeate or cucullate undivided: caps erect, oblong, not beaked.—About 125 species, India, Mascarene Isls., Trop. and S. Afr. Most of the species, of which several are more or less commonly cult. abroad, succeed well in a coldframe, in a compost of turfy peat, fibry loam and sand with plenty of drainage. Prop. by division of roots, made as fresh growth is commencing.

crēnum, R. Br. One to 2 ft. high: st. stout: lvs. 2, radical, subcentral, ovate or orbicular-ovate: fls. many or rather few, with several ovate or spathaceous sheaths; spikes oblong, 3-8 in. long, dense, many-fl.; fls. large, pink or rose-colored; sepals and petals united at base, oval, spathaceous-oblong, obtuse, lateral sepals larger; petals elliptic-oblong; lip cucullate. S. Afr. B. M. 1512. G. C. III. 4:697. G. W. II. 2, pp. 349, 350.

crēnum, Don. St. 6-30 in. high, usually very sparsely haired: lvs. few, oblong to linear-oblong, 4-10 x 2-4 in., rather fleshy, sessile: spike 1-6 in. long, densely fl.; bracts oblong or lanceolate, much larger than the fls.: fls. fragrant, white to rose-pink; sepals linear-oblong, obtuse; petals rather narrower, lip superior, broadly ovate, mucronate and strongly reflexed on the back; blade 14-16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, yellow within and with crowded oblong purple or black spots. Himalayas. B. M. 4465 and 2446, F. S. 13:1334 (both erroneously as S. gutatum).

S. gutatum, Schott. Petioles 3 ft. long; fl. segments 8-10 in. long, 4 in. wide, oval, lateral smaller; spathe-tube 3-4 in. long, purple on the back: blade 14-16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, purple on the back, yellow within and with crowded oblong purple or black spots. Himalayas. J. F. 1:12. B. R. 1017 (as Arum venosum).

venéndum, Schott (S. similènsis, Schott.). Petioles spotted, 3½ ft. long; fl. segments 8-10 in. long, 4 in. wide, oval, lateral smaller; spathe-tube 3-4 in. long, purple on the back: blade 14-16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, purple on the back, yellow within and with crowded oblong purple or black spots. Himalayas. B. M. 4465 and 2446, F. S. 13:1334 (both erroneously as S. gutatum).

S. bréviispica, N. E. Br. Petiole up to 15 in. long, rose, the Begms. of blade 5-6, 4-6 in. long, narrowly linear-lanceolate, caudate-acuminate; spadhe shortly stalked, the tube swollen, 1½ in. long, pale yellowish green, family rose-splotted, the limb narrow, convolute, twisted, arching. 4-6 in. long, pale greenish or rose-bright red at throat; spadix as long as spathe, slender, rose below, orange above. Himalayas. B. M. 7190.

JARED G. SMITH.

SAUSSUREA (named after Theodor de Saussure, 1767-1845, or for his father, Horace Benoit de Saussure, 1717-1767). Compositae. Anther 3-4 mm. long, purple or pink, glabrous or tomentose herbs of various habit, sometimes planted in the garden for ornament.
Leaves unarmed, alternate, entire, toothed, pinnatifid or pinnatisect: heads narrow or broad, sometimes crowded on the dilated top of a simple st., peduncled, or sessile, solitary, corymbose or panicled; fls. purple or bluish, all perfect and similar, tube slender, limb narrow, 5-cleft; involucre ovoid-oblong, globose or hemispheric, bracts not spinescent: achenes glabrous, oblong, 4-ribbed.—About 200 species, temperate regions of Eu., Asia, and N. Amer., mostly in the mountains. S. gossypiphora, Don. Perennial, densely long yellow or whitish matted woolly; st. 6–12 in. high, hollow, clavate, often 4 in. broad at top: lvs. sessile, linear, removably toothed or punctate-margined; heads very many, cylindric; involucre-bracts linear-oblong, shining: achenes narrowly obovoid. Himalayas and China. G.C. III. 51:85. S. leucodoma, Diels. Plant 4–9 in. high: lvs. basal, narrowly pinnate, upper almost linear, the blade being entirely sacrificed to the development of the abundant cottony tomentum in which practically the whole plant is smothered, the fl.-heads alone are free of it and form a compact mass 2–3 in. in diam. China. G.C. III. 51, suppl. Feb. 10. S. Velichkova, Drumm. & Hutchins. Herb, 2–3 ft. high, with about 2–5 leafy scapes from a tufted crown: fls. st.-rigid, flocose upward: lvs., the lowest, 10 x 2 in., oblong-linear, green above, loosely hairy below; the upper ovate-lanceolate; bracts bluish-pink or purplish; heads nearly ovoid, over 1 in.; florets deep purple. China. B.M. 3831. G.C. III. 50:88. F. Tracy Hubbard.

SAVES PRAGA. Rockfoil. Chiefly perennial herbs, but a few species are annual and a few others biennial, while some others are subshrubby; useful for border planting, rockeries, and alpine gardens, and much prized by fanciers, particularly abroad.

Plants usually with more or less developed caudicles which are either at the base or at the summit. Including Re- gina and Peliphiillum, genera which are maintained as distinct by Engler in his last treatment of the group. Saxifragaceae. Saxifraga. Rockfoil. (Latin, rock and to break; said by some to refer to the fact that many of the species grow in clefts of rock, by others to the supposition that certain spe- cies were once used for breaking stones. C. A. S. and P. C. A. are commonly clustered at the base and most often alternate on the stems, very variable in shape: infl. panicle, corymbose, racemose or solitary: fls. as a rule not large, white, yellow, red, pink, or purple; calyx either free or partly adnate to the base of the ovary, the tube short or elongated, 5-cleft or 5-parted; petals usually equal but occasionally decidedly unequal; stamens 10, rarely 5: fr. a 2-beaked, 2-celled caps. opening down or between the seeds, or sometimes 2 almost separate foli- cles; seeds numerous.—About 400 species from a horti- cultural viewpoint or approximately 250 botanically speaking. Temperate (principally alpine) and northern boreal regions, rare in Asia, very few in S. Amer. and lacking in Austral., S. Afr., and the Pacific Islands. In preparing the following treatment of the genus and in the arrangement of species, Engler, in Engler & Prantl's Pflanzenfamilien, has been followed with the exception above mentioned, while the specific delimitation is largely based on Engler's Monographie der Gattung Saxifraga, 1872, with cultural and other horticultural information drawn from Irving & Malby's Saxifrages. The true saxifrages, so-called (excluding Bergenia and Peliphiillum), have been separated into several genera at different times. The horticultural species men- tioned in this treatment which are native of N. Amer. have been divided among the following genera: Saxifraga, Muscari, Brachyscome, Micranthes, Spatialaria, Leptopis, Heterisia, Peliphiillum and Antaphylla. See Small in N. Amer. Fl., vol. 22, pt. 2, 1907.

Saxifrages are various in habit and stature, but they are mostly low and spreading with rosulate or tufted root-leaves. Most of the species in cultivation are grown as rock-garden plants, although the large-leaved members of the Megasea or Bergenia section are some- times used as border-plants. Owing to the small attrac- tion given to rock-garden and alpine cultivation in the handbooks, the saxifrages are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are likely to suffer from the dryness and heat of the American summer. Partial shade in summer is essential for the best results with most of the species. In winter the stools should be given ample covering of leaves. The most useful kinds for this country are the species of the Megasea section. These are low plants of bold habit, and are admirably adapted for rockwork and for spring forcing under glass. Fig. 1819, Vol. III, shows a clump of these plants in the lower left-hand corner.

The alpine species are mostly dwarf plants with more or less persistent foliage. Many of them, as S. oppositifolia, make dense moss-like mats; others, of which S. Asson may be taken as a cultural type, produce a dense rosette of leaves at the surface of the ground, from which small plants arise. Amongst these species the saxifrages are very interesting because of the vari-colored or sil- very effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade. Most saxifrages make stolons and offshoots freely, and by these the plants are easily propagated; they are also increased by division. Some make bulbs and multiply in this manner.

The number of species of saxifrage cultivated abroad in rockeries and alpine gardens is very large and there are many fanciers who have made very large collec-
f. foliage. Succeeds best in a rather sheltered spot.

ligulata, orbicular or obovate, 2-12 in. diam., base cordate, mar-

vory handsome species because of its purple scapes and

erect. June. Sikkim (India), 10,000-15,000 ft. B.M:

. 3.' purpurascens, Hook. f.

3. purpurascens

AA. Margin of If. distinctly cordate although

BB. Base of If. usually narrowed to the

calyx and pedicel pubescent or puberulent


S. crassifolia

AA. Margin of If. not ciliate, but more or less

BB. Base of If. not ciliate, but more or less

undulate or crenate; lvs. not pubescent.

Closely allied to S. cordifolia, but differing in the broader calyx-lobes and in the rounder petals.

Var. Albiflora (Megasea cordifolia var. alba, Hort.). Fls. delicate bluish-pink, not true white. Var. grandiflora, Hort. Said to be unusually handsome in

BB. Scape and inf. pubescent

AA. Margin of If. distinctly cordate although

BB. Base of If. usually narrowed to the

calyx and pedicel pubescent or puberulent

1. cordifolia

BB. Scape and inf. pubescent.

AA. Margin of If. ciliate: lvs. sometimes pubescent.

8. ligulata

AA. Margin of If. ciliate: lvs. sometimes pubescent.

BB. Base of If. narrowly cordate although


AA. Margin of If. ciliate: lvs. sometimes pubescent.

BB. Base of If. narrowly cordate although


AA. Margin of If. distinctly cordate although

BB. Base of If. usually narrowed to the

calyx and pedicel pubescent or puberulent

8. Betckheyi

AA. Margin of If. distinctly cordate although

BB. Base of If. usually narrowed to the

calyx and pedicel pubescent or puberulent


AA. Lower lvs. 7-11-lobed; the lobes acute. 6. Cymbalaria

AA. Lower lvs. 3-7-lobed; the lobes obtuse or very shortly apiculate. 7. Hestiana

AA. Lower lvs. 3-7-lobed; the lobes obtuse or very shortly apiculate.
abundantly and is suitable for moist spots in rockwork or along streams. Some, possibly much, of the material cult. under this name is really Cymbalaria moschata, Boiss., which has not been frequently cult.

SAXIFRAGA

July. Eu. and in the Rocky Mts., S. Canada to Colo. and Utah.—A very common and widespread European species which has not been frequently cult.

Section V. Neprophylhum.

a. Basal lvs. cuneate or spatulate. 11. lactea
b. Basal lvs. cordate or reniform. 12. granulata

3556. Saxifraga Stracheyi, as the flowers are appearing in earliest spring. (×1½)

11. lactea, Turcz. Cespitose, 4-6 in. high; sts. erect, glandular-pubescent below, panicle above: lvs. light green, lower cuneate, 3-5-parted, lobes oblong, very obtuse, horizontal-spreading; upper 3-parted, lobes linear, obtuse: infl. axillary, with pedicels much longer than the fls., 2-fl., the terminal fl. exceeded by the lower; fls. white (milky white according to trade-lists); calyx-lobes ovate, obtuse, longer than the tube; petals obovate-cuneate, lightly 3-nerved, 3 times longer than the calyx-lobes. June. Siberia.—Probably not in general cult.


13. rivularis, Linn. Cespitose, the sts. ascending 1-3 in. high, more or less villous: basal lvs. with petioles 3-5 times longer than the blades, reniform, incise-lobed, lobes obtuse, petals with broad ciliate stipules; upper lvs. short-petioled, 3-lobed: infl. long, peduncles arising from the axils of the lower lvs., almost as long as the whole st.; fls. at the top short-pedicelled or sessile: fls. 1-5, white (often tinged purple), erect; calyx short-glandular-pilose or rather glabrous, tube hemispherical, lobes ovate, obtuse, shorter than the tube; petals obovate-oblong, twice as long as the calyx-lobes. July, Aug. Circumboreal, in N. Amer. to the White Mts. and in the Rocky Mts. to Mont.

Section VI. DACTYLOADES (MUSCAIUA).

a. Lower lvs. undivided or short 3-5-pointed; petals mostly small (see also S. moschata and S. globularia, which have some of the lvs. undivided).

b. Plants loosely cespitose, with indeterminate secondary shoots borne in the V-arios.
**SAXIFRAGA**

**aa.** Infl. a few-fl., panicle borne on a fl-st. about 1 in. high............. 14. tenella **bb.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**cc.** Infl. 1, rarely 2-fl., borne on a fl-st. 5-4 in. high.............. 16. muscoides

**dd.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**ee.** Axils of the lvs. of the secondary shoots with buds of undeveloped cataphylla. 3-lbl., rarely 2-fl., borne on a fl-st. 5-4 in. high.............. 14. decipiens

**ff.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**gg.** The lvs. all undivided.. 28. spathulata

**hh.** Axils of the lvs. of the secondary shoots with buds of undeveloped cataphylla. 3-lbl., rarely 2-fl., borne on a fl-st. 5-4 in. high.............. 14. decipiens

**ii.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**jj.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**kk.** The lvs. of the secondary shoots without buds of undeveloped cataphylla. 3-lbl., rarely 2-fl., borne on a fl-st. 5-4 in. high.............. 14. decipiens

**ll.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**mm.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**nn.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**oo.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**pp.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**qq.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**rr.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**ss.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**tt.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**uu.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**vv.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**ww.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**xx.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**yy.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

**zz.** Plants densely cespitose: scape 1-fl.d. or few-fl., paniculate............. 15. aphylla

Subsection HOLOPHYLLA...

14. tenella, Wulf. Lax, cespitose, 2-4 in. high, with foliose, prostrate or erect caulicles: sts. erect, slender, glabrous: lvs. yellow- or apple-green, shining, thin but rather stiff, lower and also caulescent, linear-subulate, cuspitate-aristate, margin setulose-ciliate or glabrous, glandulose-ciliate toward the base: infl. terminal, few-fl., panicules with slender pedicels longer than the fls.: fls. white or yellowish white; calyx-lobes triangular, acute, equaling the tube, glabrous; petals obovate-oblong, recurved above, 3-nerved, twice as long as the calyx-lobes. June, July. Mountains of Cent. Eu.

15. aphylla, Sternb. (S. leplophylIla, Froel.). Loosely cespitose, about 1 in. high with numerous sparingly foliate caulicles with rosettes at the top: sts. scarcely glandular or pubescent: lvs. light green, rather thin, entire or 3-5-crustate, the divisions ovate-lanceolate, obtuse: infl. almost leafless 1-fl., rarely 2-fl., glandular scapes: fls. light yellow; calyx-lobes ovate, acute; petals linear, acute, equaling the calyx-lobes. June, July. Mountains of Cent. Eu.

16. muscoides, All. Densely cespitose, 1-2 in. high, with short caulicles: sts. columnar, densely imbricate-foliose, ashy pilose: lvs. linear, rounded-obtuse, base attenuate, when dried 3-nerved, apex cuneate; infl. numerous, terminal, few-fl., racemes or more seldom several-fl., panicked with very short pedicels: fls. white or yellowish white (rarely citron-yellow or purple); calyx-lobes ovate, obtuse, petals rounded-obovate, very obtuse, smoothly emarginate, 3-nerved, twice as long as the calyx-lobes. July, Aug. High mountains from the Pyrenees to Austria. Gn. 76, p. 615.—Frequently confused with S. moschata and S. cespitosa. A strictly Alpine species forming a dense moss-like cushion, the uppermost lvs. of which are reddish toward the base and fresh green toward the apex and are rather fleshy. Suitable only for alpine-gardening. Var. folius-variegatus, Hort., is a form with yellow-and-white variegated lvs. Very likely this really is a variety of S. moschata.

17. androsacea, Linn. Cespitose, 1-3 in. high (possibly more), with the basal and lower lvs. aggregated and sessile: lvs. dark green, shiny, spatulate or obovate, cuneate, apex entire or 3-5-toothed, the teeth short and acute, the central twice longer than the lateral, when dry 5-11-nerved, margin ciliate, at the top glandulose-ciliate; cauline lvs. oblong-lanceolate: infl. numerous, almost naked, sparsely glandular, 1-3-fl., rarely 5-fl., scape: fls. small, clear white or greenish white; calyx-lobes ovate, obtuse, the base and margins glandular; petals obovate-oblong, 3-nerved, at the top emarginate, the uppermost portion reflexed, twice longer and broader than the calyx-lobes. June-Aug. Mountains of S. and Cent. Eu., also the Baikal region of Asia.
**SAXIFRAGA**

**Subsection AXILLIFLORAE.**

18. *ajugifolia*, Linn., also spelled *ajugaefolia*. Cespitose, about 3–6 in. high; st. decumbent, rooting; lvs. sparsely glandular-pilose, light green, rather thick and fleshy; orbiculate-digitate, 3–5-parted, attenuate to the flat petiole, lobes lanceolate, acute; infl. 1–3 slender, nearly simple, few-fl. scape arising from the axis of the lower lvs.; bracts linear, entire, acute; pedicels very short, puberulent; fls. rather small, whitish or clear milk-white; calyx-lobes ovate, acute; petals ovate-oblong, 3-nerved, very shortly clawed, twice longer than the calyx-lobes.

May–July. S. Eu.

19. *perdurans*, Kit. Cespitose, 1½–3 in. high; st. procumbent; lvs. rather thick, bright green, the lower surface striated purple at the nerves, those of the young shoots and the lower cauline similar, without glands, wedge-shaped, attenuate to the flat petiole, palmately 3–5-parted, lobes horizontal spreading, oblong, obtuse, muticous, faintly 3-nerved; refl. a solitary, axillary, sub-simple, few-fl. scape with a reddish base and one partially clasping fl.; bracts 3-parted or entire; fls. 1–6, cymose, white; calyx-lobes roundish; petals spreading, oblong, 3-nerved, more than twice as long as the calyx-lobes. June, July. Mountains of E. Cent. Eu.—Closely allied to *S. ajugifolia*.

**Subsection CERATOPHYLLAE.**

20. *geranioides*, Linn. (*S. palmata*, Hort., not Smith and others). Biennial or perennial, cespitose, 2–10 in. high, with numerous furtaceous subwoody, leafy caulicles; st. erect, somewhat pilose; lvs. bright green, lower rather pilose, suborbicular or reniform, palmately 3–9-divided with the lateral lobes bifid, lobes lanceolate-acute or 2–3-toothed, base of the ciliate petiole dilate; calyces cuneate-ovate with narrow lobes; infl. subcorymbose, many-fl., with pedicels shorter than the fls.; fls. white, campanulate; calyx-lobes erect, linear-lanceolate, acute; petals obovate-oblong, long-clawed, more than twice longer than the calyx-lobes. May–July. Mountains of Eu.—Best prop. by seed. A showy little ground-cover; plant suitable for terraces and the like.

21. *pedatifida*, Ehrh. (*S. cuspidata*, Schleich.). Cespitose, 2–8 in. high, with furtaceous, subwoody, leafy caulicles; st. erect, rather stiff, puberulent; lvs. fresh green, the lower with ovate and pectate-parted blades, many-nerved and borne on flat petioles which are longer than the blades, the lateral lobes of which are 3-lobed, the lobules linear, entire and more or less mucronate; the lvs. of the young shoots longer-petioled and with longer, narrower lobes; the cauline lvs. 3-lobed; bracts narrowly linear; infl. subcorymbose, the peduncles much overtopping the lvs., the pedicels and calyx glaucous, pilose; fls. 3–9 on a peduncle, campanulate, white; calyx-lobes erect, lanceolate, acute; petals obovate-oblong, 3-nerved, very shortly clawed, twice longer than the calyx-lobes. June. S. Eu.—Closely allied to *S. geranioides* but distinguished readily by the gradual narrowing of the blades, which are many-nerved into the petiole and also by the linear divisions of the lvs.

22. *Campsis*, Boiss. & Reut. (*S. Wallaca*, McNab. *S. Wallacæna*, Hort.). Fig. 3557. Perennial, loosely cespitose, 3–6 in. high, with slightly shrubby caulicles covered with old reflexed lvs.: fls. seta. erect, reddish, entirely glabrous; lvs. stiff, dark green, shiny, those of the young shoots and the lower ones incise-5-lobed, more than double the length of the strongly broadened, nerved petiole and having decidedly prominent nerves, the lateral lobes of the blade again 2-lobed or dentate with the teeth mucronate, the midlobe usually entire, linear and mucronate; calyces cuneate, attenuate to the petiole, more or less on one petiole; bracts spatulate, acute; infl. terminal, 6–10-fl., more or less congested corymbs or panicles; lvs. large, 3–4 in. across, subcampanulate, white; calyx-lobes oblong, acute; petals rounded-obovate, shortly clawed, 3-nerved. May–July. Spain. B.M. 6640. Gn. 35, p. 387; 75, p. 335. A.F. 4:493. G.M. 43:192; 55:276; 57:620. J.H. III. 70:250.—This species has been intro. into Amer. but never succeeded well owing, it is said, to the hot climate. An attractive little plant on account of its showy fls. which are occasionally used for cut-fls.

23. *canaliculata*, Boiss. & Reut. Lax, cespite, 6–8 in. high, with ascending caulicles which are covered below with old, rather remote lvs., and terminate in rosettes: fls. stam. numerous, erect, very glabrous; lvs. very stiff, quite dark green, strongly viscid below, with transversely broader blade which is 3-parted and is borne on a flat, deeply grooved petiole, midlobe of the blade entire, the lateral ones 2–3-parted, with the lobes bowed and mucronate at their apex; calyces 3-lobed; bracts linear, mucronate; infl. corymbose-paniculate: fls. white; calyx-lobes linear-lanceolate, mucronulate; petals obovate-oblong, attenuate to the claw, 3-nerved, twice as long as the calyx-lobes. July. Spain.—Allied to *S. Campsis* from which it differs in the more spreading divisions of the lvs. and the fact that the petioles are not broadened except at the base.

24. *trifurcata*, Schrad. Perennial, loosely cespite, 4–8 in. high, with slightly shrubby leafy caulicles covered with old reflexed lvs.: fls. stam. erect, glabrous; lvs. dark gray-green, viscid, twice as long as the petiole, palmately 3-parted, nerved, the lateral lobes of the blade sub-3-divided, the midlobe cuneate, 3-toothed, with the teeth mucronate; calyces lvs. few, shortersetated; bracts linear, acute; infl. 3-parted and is borne on a flat, deeply grooved petiole, midlobe of the blade entire, the lateral ones 2–3-parted, with the lobes bowed and mucronate at their apex; calyces lvs. 3-parted; bracts linear, mucronate; infl. corymbose-paniculate: fls. white; calyx-lobes linear-lanceolate, mucronulate; petals obovate-oblong, attenuate to the claw, 3-nerved, twice as long as the calyx-lobes. July. Spain.—Allied to *S. Campsis* from which it differs in the more spreading divisions of the lvs. and the fact that the petioles are not broadened except at the base.

25. *pedemontana*, All. Sparsely glandular-pubescent, cespite, 2–4 in. high, with densely leafy caulicles: lvs. bright green, those of the young shoots and the lower cauline, cuneate or obversely triangular; lower, truncate or oblique-oblong, obtuse to the petiole; lvs. 3-lobed; bracts narrowly linear; infl. subcorymbose, the peduncles much overtopping the lvs., the pedicels and calyx glaucous, pilose; fls. 3–9 on a peduncle, campanulate, white; calyx-lobes erect, lanceolate, acute; petals obovate-oblong, 3-nerved, 2 or 3 times longer than the calyx-lobes. June. S. Eu.—Closely allied to *S. geranioides* and distinguished readily by the gradual narrowing of the blades, which are many-nerved into the petiole and also by the linear divisions of the lvs.

26. *Campsis*, Boiss. & Reut. (*S. Wallaca*, McNab. *S. Wallacæna*, Hort.). Fig. 3557. Perennial, loosely cespite, 3–6 in. high, with slightly shrubby caulicles covered with old reflexed lvs.: fls. stam. erect, reddish, entirely glabrous; lvs. stiff, dark green, shiny, those of the young shoots and the lower ones incise-5-lobed, more than double the length of the strongly broadened, nerved petiole and having decidedly prominent nerves, the lateral lobes of the blade again 2-lobed or dentate with the teeth mucronate, the midlobe usually entire, linear and mucronate; calyces cuneate, attenuate to the petiole, more or less on one petiole; bracts spatulate, acute; infl. terminal, 6–10-fl., more or less congested corymbs or panicles; lvs. large, 3–4 in. across, subcampanulate, white; calyx-lobes oblong, acute; petals rounded-obovate, shortly clawed, 3-nerved. May–July. Spain. B.M. 6640. Gn. 35, p. 382; 75, p. 335. A.F. 4:493. G.M. 43:192; 55:276; 57:620. J.H. III. 70:250.—This species has been intro. into Amer. but never succeeded well owing, it is said, to the hot climate. An attractive little plant on account of its showy fls. which are occasionally used for cut-fls.
26. *conferta*, Coss. & Dur. densely cespitose, 1½-3 in. high, with numerous short, densely imbricate-foliate caulescences: fl.-sts. stiff, ascending, few-lvd., purplish below, densely glandular-pubescent above: lvs. those of the caulescences, subpatent; calyx-funnel spreading; all of them undivided, sessile, oblong- or lanceolate-linear, cuspitate-aristate, leathery, margin short-ciliate: infl. 3-9-fl., corymbose-racemose or paniculate: fls. white; calyx pubescent-glandular, the lobes ovate-triangular, mucronate; petals not known. June, July. Spain.—Rare and seldom cult.

27. *hypnoides*, Linn. (S. *hibernica*, Hort.). Perennial, loosely cespitose, 1½-8 in. high, with herbaceous loosely foliose caulescences which are frequently reddish-tinted: sts. erect, covered with very slender glandular lvs. light green, those of the caulescences rather thick, sparsely covered with slender hairs, when old rather glabrous, the subterminal blade is cut all the way to the base, 3-lobed, and is borne on a rather broad, flat, 1-nerved, cupulate scabrous petiole which is shorter than the blade, lobes of the blade linear-lanceolate, a little dilated at the middle, acute or mucronate, with the lateral lobes divaricate, often 2-lobed; upper lvs. of the young shoots 3-toothed, attenuate to the long petiole, the uppermost linear-lanceolate, oval and like the lvs. of the cauline linear-lanceolate, ciliate and acute or mucronate: infl. 3-7-fl. paniæces: fls. long-pedicelled, white, ½-in. diam.; calyx very densely glandulate, the lobes oblong-trianglar, mucronate; petals obovate, 3-nerved, longer than the calyx-lobes: fr. ovate-globose. May-July. Mountains of Eu., as far north as Great Britain and Ireland. G.C. III. 43:302.—Frequently confused with *S. cespitosa*, Linn., and *S. decipiens*, Ehrh., and this is the distinction of the 3 species is almost hopeless; confused. Botanically speaking very probably Hooper's *S. hypnoides* in his Students' Flora of the British Islands, ed. 3, p. 142, is correct in referring *S. cespitosa* and *S. decipiens* as varieties to this species, but horticulturally at least they are better retained as separate species. Var. *genuinera*, Hort. (S. *Kingii*, Hort., also spelled *Kingiana*), is a close-growing, compact form. Var. *purpurea*, Hort., is offered in the trade. Var. *rosa*, Hort., is offered in the trade. Var. *Whitlavia*, Hort. (S. *Whitlavia*, Hort.) is a form with closely packed foliage said to be suitable for edging. A variation of this is *S. gemmifera* 3090 SAXIFRAGA

28. *spathulata*, Desf., also spelled *spatulata*. Perennial, very densely cespitose, 2½-4 in. high, with short, prostrate, very densely imbricate-foliate caulescences: sts. slender, erect, few-lvd.; lower lvs. spathulate, ciliate, apex obtuse, rarely 3-toothed, 3-nerved; calyx linear: infl. 3-5-fl., corymbose-pedicelled with pedicels longer than the fls. and sparsely glandular as is the calyx: fls. white; calyx-lbs. ovate, very obtuse; petals obovate-oblong, twice as long as the calyx-lbs.: fr. subglobose. June, July. N. Afr.—It is doubtful whether this species is hardy in E. U. S. It forms very thick, close mats which are reddish green or brownish with the silver-gray buds of the axils of the leaves. Not very showy, as the pedicels are few-fld.

29. *globulifera*, Desf. Cespitose, about 3-4 in. high, with densely foliose, short caulescences: sts. prostrate, nearly glabrous or sparsely pilose, few-lvd.: lvs. bearing in their axils buds which are shorter than the lvs.; lvs. all nerved and borne on dilated rather flat petioles; the lowest spathulate-ciliate, 3-nerved; the other lvs. oblong-rounded or, if the lateral lobes are bident, 5-lobed, the midlobe oblong-lanceolate or, if all the lobes are tridentate, with the teeth rather acute; calyx lvs. oblong-linear, obtuse; bracteoles linear: infl. 3-5-fl., corymbose-pedicelled; pedicels twice or more longer than the fls.: fls. white; calyx short-pilose, the lobes ovate-triangular, obtuse; petals obovate, 3-nerved, more than twice the length of the calyx-lbs.: fr. subglobose. May, June. S. Spain and N. Afr.

30. *Maweana*, Baker. Cespitose, about 6 in. high, with copiously branched, slender purple caulescences which are glandular-pubescent: fl.-sts. erect from a decumbent base: lvs. 6-8 to a shoot, loosely disposed, coriaceous, ternate-palmately parted, the lobes with 5-6 oblong, subobtuse teeth; the pedioles spreading, the upper half narrowly winged, often 2-3 times longer than the blade: axillary buds copious and robust: infl. laxly corymbose, 4-9-fl., borne on densely puberulent peduncles: fls. white, large; calyx-lbs. ligulate-lanceolate, subulate, twice as long as the densely puberulent tube; petals obovate-ciliate. May. Morocco. G.C. 1871:1355.

Subsection *Cespitosa*.

31. *decipiens*, Ehrh. (*S. cespitosa*, Hort., not Linn.). Cespitose, about 3 in. high, the caulescences hirta, rarely subglabrous, rather long and leathery: sts. erect, few-lvd., smooth or at first glandular-piloset above: lvs. obovate-ciliate or spatulate, attenuate to the 1-nerved, flat petiole, apex either 3-pointed or 3-lobed, lateral lvs. 2- or 3-lobed even on the midlobe: fr. ovate-oblong; calyx-lobes 3-lobed: infl. loosely pedicelled, few-fl. (usually 3): fls. white; sepal oblong-lanceolate, subacute; petals obovate, 3-veined. May, June. Eu. L.B.C.16:1510. Gn. 78, p. 271.—Approaches *S. cespitosa*, Linn., from which it is most easily distinguished by the aculeate fl. lobes and subacute sepalas; also approaches *S. hypnoides*, from which it is readily told as that species has buds in the axils of the lvs. of the barren shoots, whereas *S. decipiens* has not. Very variable; some of the cult. forms are: Var. *Alba*, Hort., which has strong growth and white fls. Var. *Arkwrightii*, Hort. (S. *Arkwrightii*, Hort.). Rather tall-growing and free-flowering: the buds are suffused with a pale rose tint, but the fls. are pure white, flat, and large, ¾-1 in. across. G.C. III. 45:314. Var. *bathoniensis*, Hort. (S. *bathoniensis*, Hort. *S. muscoides* var. *bathoniensis*, Hort.). A rapid grower, 10-14 in. high, with stout branching sts. bearing large scarlet-crimson fls. Var. *bistolaris*, Hort. (S. *bistolaris*, Hort.) is probably a strain of red-fld. *S. muscoides* var. *muscoides* (S. *muscoides* var. *muscoides*, Hort.). Var. *Brullei*, Hort. (S. *Brullei*, Hort.), with neat cushions of *S. decipiens* var. *Brullei*. Var. *bagnata*, Hort. (S. *bagnata*, Hort.), a rapidly spreading, lax-flowering form, with medium-sized brilliant red or dark carmine-red fls. All of these forms are much prized by fanciers abroad.

Var. *hybrida*, Hort., is probably a strain of red-fl. *S. hybrida*. It is suggested by one author that they are the result of a cross between *S. decipiens* and *S. grandiflora*; one of the trade names of these variants is *S. decipiens* var. *hybrida* (S. *hybrida* grandiflora, Hort. (S. *hybrida* grandiflora, Hort.), with large rich crimson or bright red fls. *S. hybrida* grandiflora *Alba*, with neat cushions of deep green foliage, the flowers and fr. are described as deep clear rose, rich crimson and rich blackish crimson, ½-in. or more diam. G.C. III. 45:301. G. 30:393. Gn. 73, p. 264. J.H. III, 58:431. Var. *bathoniensis*, Hort. (S. *bathoniensis*, Hort. *S. muscoides* var. *bathoniensis*, Hort.). A rapid grower, 10-14 in. high, with stout branching sts. bearing large scarlet-crimson fls. Var. *bristolicrata*, Hort. (S. *bristolicrata*, Hort.) is said to be a remarkably effective variety with rich rose-red fls. Var. *hybrida*, Hort., which is said to be a remarkably effective variety with rich rose-red fls. G.M. 56:151. Var. *hybrida* splendens, Hort., with rosettes of moss-like foliage covered with medium-sized brilliant red or dark carmine-red fls. All of these forms are much prized by fanciers abroad.
Var. lutescens, Hort., is offered in the trade. Var. purpurea grandiflora, Hort., is a trade name for a form which is said to be more vigorous than previous races. It is said to form compact basal tufts, with bright red fls., fading to rose, nearly 1 in. diam. April. Var. sanguinea, Hort. (S. sanguinea superba, Hort., not S. sanguinea, Franch. S. muscoides var. sanguinea superba, Hort.). Habit neat and compact, growth rapid; fls. rich blood-red, well retained when old. Var. Stérbergii, Engl. (S. Stérbergii, Willd. S. hibernica, Haw., not Sternb. S. hirpinoides var. Stérbergii, Hort.). Lvs. ciliate, somewhat pedate; the midlobe entire, the lateral 2-parted, or the midlobe and also the lateral 3-parted; the divisions rather obtuse. Germany, Ireland, Norway, and Greenland. Var. villéa, Engl., is a form which is villous and canescent and has white fls.

32. cespitosa, Linn., more commonly spelled cespitosa (Muscari cespitosa, Haw.). Cespitose, 2–6 in. high, with subwoody columnar caudicles which are densely imbricate with persistent old lvs.; fl-sts. erect, those of the caudicles and shoots cuneate, borne on a large petiole which doubles the length of the blade, 3-parted (rarely 5), the lobes linear and obtuse: inf. terminal, 1–5-fld.; fl-sts. stoutish: fls. white; sepal oblong-deltoïd, obtuse; petals narrowly obovate or oblanceolate, obtuse; pedicels and calyx-lobes, rounded at the apex. June–Aug.

33. exarata, Vill. Fl. 3558. Cespitose, 3–6 in. high, with sublignous and also herbaceous caudicles which are rosulate at their tips: fl-sts. erect, few-flvd., densely glandular above; lvs. of the caudicles deep green, smooth, nearly glabrous, either cuneate, attenuate to the petiole, the ap. 3-toothed, or obvate-cuneate, attenuate to a petiole double the length of the blade, 3-parted (rarely 5), the lobes linear and obtuse: inf. terminal, 1–5-fld.; fl-sts. stoutish: fls. white; sepal oblong-deltoïd, obtuse; petals narrowly obovate or oblanceolate, obtuse, rounded at the apex. June–Aug.

34. obscura, Gren. & Godr. Cespitose, 3–8 in. high, with somewhat shrubby, elongated caudicles covered with old lvs.; fls. erect, slender, nearly naked, pilose: lvs., those of the shoots and the lower, pedate-divided, with lanceolate lobes, linear, longer- petioled, broadened at base. lateral lobes biffid or 2-toothed, teeth lanceolate, the midlobe 3-parted; caly whole lvs. 3–5-parted: inf. 5–15-fld., with pedicels shorter than the fls.: fls. white; calyx-lobes linear, subacute; petals oblong, not at all clawed, double the length of the calyx-lobes. July, Aug. Pyrenees.—A rare, little-known species.

35. mixta, Lapeyr. The whole plant glandular-pilose, densely cespitose, 2–3 in. high, with subwoody columnar caudicles which are densely imbricate with persistent old lvs.; fl-sts. erect: lvs. mostly light green, soft and more or less strongly nerved, those of the caudicles and shoots cuneate, borne on a large petiole which equals the blade in length, 3-lobed, the lobes horizontally spreading, obtuse or at other times the lobes 3-lobed, the lobules linear, obtuse; caly whole lvs. obovate-cuneate, 3-lobed; bracts oblong, obtuse: inf. corymbose-paniculate: fls. milk-white, not uncommonly purple-nerved; calyx-lobes ovate, obtuse; petals round-ovate, 3 times as long as the calyx-lobes. June–Aug. Pyrenees.—said to be an attractive little plant with a good habit, but the species proper appears not to have been cult. Var. hirta, Engl. (S. hirta, F. Schultz). About 2 in. high, differing from the type in the deep green, broadly ovate-cuneate lvs. which are 5–9-divided, the lobes being linear, short, and obtuse; in the few-fld., narrow panicle and also in having the white fls. veined with purple. May–July. Pyrenees.—The variety is more common in cult.

Subsection EXARATE.

36. moschata, Wulf. (S. muscoides, Hort., not All. S. moschoides var. moschata, Hort.). Cespitose, 1–5 in. high, the caudicles herbaceous or subligneous, foliose: lvs. smooth, nerves not prominent, glabrous or glandular-pilose; those of the caudicles linear, entire, obtuse or cuneate, 3–6, rarely 3-parted, lobes linear, obtuse, horizontally spreading; caly whole lvs. few, 3-lobed or entire; bracts linear, obtuse: inf. racemose or paniculate, 1–10-fld., borne on erect, few-flvd., subglabrous or glandular-pilose fl-sts.: fls. commonly yellowish but not uncommonly rose or dark purple, seldom almost white; calyx-lobes ovate, obtuse; petals spreading, oblong, obtuse, 3-nerved, slightly exceeding the calyx-lobes; fr. ovate-globose. May, June. Cent. and S. Eu. Gn. 76, p. 283 (as S. cespitosa).—Linnaeus included this under S. cespitosa and in consequence the two species have been commonly confused. There seems no doubt, however, that Linnaeus intended his cespitosa to apply to the Lapland form. S. moschata is readily separated from the true S. moschoides by the lobed lvs.; those of the latter are unlobed and linear. A very variable species; some of the varieties in cult. arc: var. Alliöni, Engl. (S. Alliöni, Caud., not Bau. S. muscoides var.
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SAXIFRAGA

Alliottii, Hort.). Laxly cephalo-ses, robust, 3-6 in. high:


Section VII. BORAPinLA (SPATHULARIA, MICRANTHES).

Robust habit and larger deeper colored lvs. A form of this more commonly cult., is known as superba Rhei, or with three crenatures. Var. Rhei, Hort., also spelled mossy hillocks covered in April and May with masses the lvs. rather thick, all entire, the apex rounded-obtuse or with three crenatures. Var. Rhei, Hort., also spelled mossy hillocks covered in April and May with masses of rather large rose-colored lvs. Grows about 6 in. high. A form of this, more commonly cult., is known as S. Rhei superba or S. muscosæ Rhei superba, and has a more robust habit and larger deeper colored lvs.

13. bryophora, Gray (SPATHULARIA bryophora, Small). Two to 8 in. high, slender: lvs. 1 in. or less long, basal rather far apart, roseulate at the top of the slender cucullules, oblong-elliptic to oblong-cuneate, obtuse, entire, ciliate: infl. solitary or tufted naked scape, paniculately hispid: lvs. short-pilose on both sides, the lvs. short-pilose on both sides, the apex acute, the teeth equal and acute; lower bracts linear-chalcate, narrowly dentate, upper ones nearly entire: infl. 1 or more scapes arising from the axis of the basal lvs. and branching panicle from the middle, with the branches more or less diffuse; pedicels slender: lvs. white, numerous and star-like; sepals lanceolate; petals unequal, the 3 larger ones with 2 light yellow spots at their coriaceous base, twice as long as the sepals: fr. ovate. June. Mountains of Va. to N. C. and Ga. L.B.C. 16:1698. B.M. 2559. B.B. 2:176; (ed. 2) 2:221 (as Hydastia petulosa).

38. davarica, Pall., also spelled dahirica (MICRANTHES davarica, Small). Three to 8 in. high, rhizome thick: lvs. basal, rather stiff, forming a rosette, sparsely covered with very short hairs, oblong-elliptic, obtuse, narrowly entire or with short teeth rounded at the apex, deeply and evenly dentate, teeth ovate, acute, blades cuneate-attenuate at the base to the petiole which is membranaceous sheathing at the base; bracts oblong-lanceolate, the lowest of the oblong-cuneate: infl. erect, naked scape, which are solitary or several together, and are covered with very slender ciliate, partly glandular hairs, many-fl.d. and corymbose-paniculate-branched from the middle; pedicels filiform: lvs. white, numerous; sepals yellow-green, ovate, rather acute, erect-spread and not reflexed in age: petals obvolute-oblong, scarcely twice as long as the sepals. E. Siberia and the islands of Bering Sea. — Much of the so-called American S. davarica and apparently more or less of the material cult. as S. dahirica is really S. Lyallii from which it differs in having the peduncles hairy instead of glabrous and many—instead of few-fl. smaller lfs. and other characters. Somewhat similar to S. virginiensis.

40. Lyallii, Engl. (S. dahirica, Lyall.). Micranthes Lyallii Small). Four to 15 in. high, rhizome slender: lvs. fresh green, obvolute ("labellate, varying to sub-orbicular or reniform-labellate"), cuneate, attenuate to a basally dilated petiole, equally serrate-dentate above, glabrous, almost nerveless: infl. 6-10-fi.d. loosely paniculate scapes which are naked, slender, erect, almost glabrous, with very slender, erect-spread, later erect pedicels which are purple almost glabrous: lfs. milk-white; calyx purple, the sepals ovate-triangular, reflexed; petals obvolute-rounded, slightly clawed, 1-nerved. Rocky Mt. region, Brit. Col., Alaska, and Bering Sea region. — Has been confused with S. davarica, Pall., which see.

41. micranthidifolia, Steud. (S. erosa, Pursh. Micranthes micranthidifolia, Small). Up to 3 ft. high: lvs. all basal, oblong or oblong-lanceolate, obtuse, attenuate to a flat petiole which is partly clasping at the base, crenate-dentate, sparingly and also very shortly pilose, margin short-ciliate: infl.paniculate, loosely fi.d. and elongated, borne on a tall softly pilose scape; pedicels filiform, densely covered with slender glandular hairs, viscid: lfs. numerous, white; sepals linear-lanceolate, obtuse, finally reflexed; petals ovate, obtuse, with a yellow blotch below the middle, slightly longer than the sepals. June. July. Cold mountain brooks and wet rocks, Pa. to N. C. and Tenn. B.B. 2:174; (ed. 2) 2:219. — Occasionally cult.

42. pennsylvanica, Linn. (MICRANTHES pennsylvanica, Haw.). SWAMP SAXIFRAGE. Tall and stout, up to 3 ft or more high, viscid pubescent: rhizome thick: lvs. ab
basal, sometimes almost 1 ft. long, oblongate or oblong-spatulate, attenuate to a little shorter that the base, obtuse, very shortly and also remotely dentate, margin short-ciliate: infl. 4-8-fld. cyymes in a large panicle at first clustered, borne on a naked erect scape which is few-or few-striate, shortly-pilose, toward the top glandulous-pilose: fls. numerous, small, greenish; calyx-lobes dotted, spreading, in fr. reflex; petals oblong-linear or linear-lanceolate, 1-nerved, a little longer and narrower than the calyx-lobes. June, July. Swamps and low meadows, Maine to Ont. and Minn., south to Mo. B.B. 2:173; (ed. 2) 2:219.—Recommended as a bog-plant.

43. integrifolia, Hook. (Microtheca integrifolia, Small). Whole plant glandular-pilose, viscid, very viscid above, 4–14 in. high: caudex short and somewhat woody, the st. always solitary: basal lvs. dark green, spiny below at the base, obtuse, very shortly and also remotely dentate, margin short-ciliate: infl. 4-8-fld.

44. nivalis, Linn. Two to 6 in. high: rhizome rather thick, short and simple but thick and hard, crowned with a tuft of lvs.: lvs. rather thick and leathery, roundish-ovate, generally abruptly narrowed to the petioles, obtuse, sharply crenate-serrate, upper surface dark green, under surface purple or red and often pubescent; bracts bristly-purple or red: infl. composed of cymules aggregated into one or more terminal conspicuously bracted heads and borne on erect solitary or clustered purple or purple-tinted scapes which are glandular-viscid especially above: fls. white, very short-pedicelled or sessile; sepals ovate or deltoid-ovate, obtuse, ciliate; petals oblong to elliptic, mostly obtuse, narrowed into petals 3-nerved, unequal, 4 smaller, lanceolate, very shortly and also remotely dentate; infl. 4-8-fld., crowded or loose panicle 50. sarmentosa, Linn. Which is borne on the solitary, erect or ascending naked scape: fls. white; not punctate; sepals ovate, obtuse, reflexed; petals oblong, obtuse, double the length of the sepals. Alaska to Alberta, south to Mont. and Calif.—Very similar to Micranthes but readily distinguished by the viscid-ovate lvs.

Section VIII. DIPTERA.

47. Mertensiiina, Bangard (Heterotia Mertensiana, Small). Perennial, 4–15 in. high, subumbellate: lvs. basal, in a rosette, subrounded, base cordate, incise-lobed, the lobes quadrate, 3-toothed with the teeth obtuse or acute; the petals long, slender, pilose and at the base with a long membranaceous sheath: infl. a loosely diffuse panicle with erect-spreadig glandular-pilose branches borne on a slender erect almost naked green scape: fls. white with very long pedicels; sepals ovate, obtuse, reflexed; petals oblong, obtuse, double the length of the sepals. Alaska to Alberta, south to Mont. and Calif.—Very similar to Micranthes but readily distinguished by the incise-ovate lvs.

48. cortusoflora, Sieb. & Zucc., also spelled corusafolía. From 6–12 in. high, not stoloniferous: lvs. basal, rather thick and fleshy, bright green, the lower part reddish, strigo-pilose, margin ciliate, roundish, 7-lobed, milky large, 3-lobed or 3-lobed, acuminate, base cordate; petals 3–4 times as long as the blade and broadened into a sheath ciliate with long rusty brown hairs: infl. laxly paniculate, terminal on an erect, strize, strigo-pilose scape; pedicels long, very slender, erect: fls. white; calyx-lobes lanceolate, acute; petals 3-nerved, unequal, 3 (generally) slightly longer than the calyx-lobes and ovate-lanceolate, the other 2 (sometimes 1–3) 8–10 times longer and quite entire, very long-attenuate to a claw. Oct. Japan. B.M. 6680. Var. média, Maxim. (S. médı́a, Makino). Lvs. thin-membranaceous, deeply lobed, with the lobes 3-lobulate and incise-dentate. Oct. Japan. G.C. III. 46:379.

49. Fortunée, Hook. (Bergenia Fortunée, Steink. Perennial, scoriae (if at all) sarmentose, up to 2 ft. : lvs. dark green, one-colored, basal, thick, strigo-pilose, rounded-reniform, nerves, somewhat 7-lobed, the lobes rounded, strongly and acutely laciniate-serrate; petals longer than the blade, double the length of the sepals; the blades of the calyx-teeth long, doubly ciliate-dentate: infl. loosely paniculate, borne on a stout, erect, strigo-pilose scape; the panicle-branches glandular, spreading, 4–7-fld.; pedicels nodding; fls. white; calyx-lobes ovate, rather obtuse, spreading; petals 1-nerved, unequal, 4 smaller, lanceolate, very entire or subentire, the fifth much longer, 3 or 4 times larger than the others, strongly serrate. June–Oct. Japan. B.M. 5377. G.L. 24:351. G.W. 74, p. 622; 78, p. 964. G.C. III. 46:26. G. 6:445. G.W. 14, p. 398. G.W. 24:759.—A very showy species which is not entirely hardy in England, requiring winter protection. Var. tricolor, Hort., is a form with the lvs. irregularly blotched with rose, white, and yellow. F.S. 21:2227, 2228.

50. sarmentăsa, Linn. (S. japonica, Hort. S. chinensis, Lour.). STRAWBERRY GERANIUM. In England known as MOTHER OF THOUSANDS, a name also applied to Linaria Cymbalaria. OLD MAN'S BEARD. Fig. 3569. Perennial, 9–24 in. high, stoloniferous, the stolons long and filiform: cauline and petal-leaf lvs. sometimes, but rarely, rather thick, strigo-pilose, reniform-rotundate, roundly rounded-ovate, nerved, doubly crenate-dentate with broad acute teeth, upper surface green veined white, lower surface
reddish; petioles twice as long as the blade, semi-terete: infl. loosely paniculate, borne on an erect, strigose-pilose scape, the panicle-branches glandulose, spreading, 4–7-fld.: fls. white, numerous; calyx short-glandu­lose, the lobes ovate, obtuse or acute, spreading; petals 1-­nerved, clawed, unequal, the 3 smaller ovate, acute, of these the two outer have a yellow spot, the middle one 2 scarlet spots, the other two 3–4 times larger and lanceolate-elliptic. May–Aug. Japan. B.M. 62. G.C. III. 7:257 (showing irri­tability of plant to light). Gn. 30, p. 363; 32, p. 37. R.H. 1876, p. 427. G. 25:365. Gn. W. 25:751.—An old-time greenhouse plant, and also one of the commonest window-garden subjects. Of easiest cult. Not quite hardy in England but frequently used in sheltered rock crevices and slightly protected. Var. tricolor, Sieb. (S. tricolor, Hort. & S. tricolor superba, Hort.), has lvs. hand­somely marked with creamy white and red vei­rargations. G.Z. 9:32. Less hardy than the type.

51. cucutaefornis, Lodg. Perennial. 3–6 in. high, stoloniferous, the stolons filiform, often branched and tangled in one another like the sts. of cucuta: lvs. basal, rather thick, plano-convex, both surfaces strigose­pilose, green, white-veined, sub­bilocular or ovate, nerved, coarsely toothed or undulate-acute. Teeth broadly acuminate, becoming obtusely with age; petals longer than or equaling the blade, rather large and thick; infl. laxly seud-paniculate from below the middle of the slender, ascending, strigose­pilose scape; the panicle-branches glandulose, erect-spreading, slender, 2–3-fld.: fls. white; calyx very short-glandul­lar, the lobes ovate, acute, spreading; petals 1-nerved, very short­clawed, lanceolate-elliptic, 3 of them smaller and often pink toward their base and with a yellow spot, the other 2 slightly or twice longer. June, July. Japan. L.B.C. 2:216. An excellent plant for cold damp locations as it is a native bog-grower. Var. grandiflora, Hort., is finer flowering than the type and has golden yellow fls. 1 in. across; more desirable than the type.

Section IX. Hircinus.

a. Petals obovate. ........................... 52. diversifolia

52. diversifolia, Wall. Early to 18 in. high, forming tufts of basal lvs.: sts. hirsute below and glandular (becoming glabrous with age) above, erect and foliose; lvs. polymorphous, the lower petiolated, ovate, obtuse or cordate-based, subacute, undulate, sparingly hirsute or glabrous; calyx mostly sessile, very entire, oblong-glandular; teeth broadly acuminate; infl. corymbose-racemose or paniculate, rarely few-fid.: fls. yellow, obscurely spotted, ½–⅔ in. across; sepals ovate, spreading, at length reflexed; petals obovate, short-clawed, 3-nerved with 4 glands at their base, exceeding the sepals. July–Sept. N. temperate, subarctic and alpine regions. B.B. 2:171; (ed. 2) 2:216. An excellent plant for cold damp locations as it is a native bog-grower. Var. grandiflora, Hort., is finer flowering than the type and has golden yellow fls. 1 in. across; more desirable than the type.

Section X. Trachyphyllum (Leptasea, Chondrosea).

a. Stolons or runners absent: the young shoots leafy and also floriferous.

b. Sts. with a basal rosette of lvs., but few-lvd. above. ........................... 55. chrysantha

c. Axils of the cauline lvs. with buds.

d. Peduncles glabrous: calyx-lobes ovate-triangular. ........................... 60. aspera

dd. Peduncles glandular: calyx-lobes lanceolate.

e. Lvs. linear-lanceolate, gray-green; margin ciliate or spinulose. ........................... 57. bronchialis

f. Lvs. lanceolate; under surface lineolate; margin ciliate, with white hairs. ........................... 58. gemmipara

g. Calyx of calyx lvs. without buds, the lowest, however, have more or less elongated leafy shoots.

h. Pedals oblong, 1-nerved: the cauline lvs. obovate. ........................... 59. aizoides

ii. Pedals oblong, 1-nerved: the cauline lvs. lanceolate. ........................... 60. cinerascens

AA. Stolons or runners present: the young shoots glabrous.

b. Fls. long-pedicelled. ........................... 61. Brunoniana

bb. Fls. almost sessile. ........................... 62. flagellaris

55. chrysantha, Gray (Leptasea chrysantha, Small). Dwarf empetaceous plant, 1–2 in. high, with creeping

3559. Saxifraga sarmentosa (×2). No. 50.
SAXIFRAGA

Saxifraga

SAXIFRAGA

shoots: lvs. mostly basal, in a rosette (a few cauline), imbricated, oblong-ovate, glabrous and fleshy: infl. 1-3-fld., terminal on filiform, glandular-pubescent peduncles: fls. large, yellow; calyx-lobes ovate or oblong-ovate, obtuse; petals oval to broadly obovate, much longer than the calyx-lobes. Mountains of Colo. and New Mex.—Has been offered by dealers in native plants.

56. *aspétra*, DC. More or less cespitose, 4-6 in. high, with prostrate, mostly dark purple caulicles: fls.-stems erect or ascending, remotely lvd.: lvs. pale green, shiny, lanceolate-linear, stipitate and ciliate, those of the caulicles bearing buds in the axis: infl. 1-fld., or few-fld., panicled, on glabrous peduncles: petals oblong, obtuse, abruptly attenuate toward the base: calyx-lobes oblong-triangular, obtuse, spreading: petals orange, 1-nerved, 1½ times as long as the calyx-lobes. June–Aug. Eu., Asia, arctic Amer., south to Gulf of St. Lawrence, mountains of N. Y., W. N. Y., and the Lake Superior region. B.B. 2: 171; (ed. 2) 2: 217. (The Rocky Mt. form has been segregated as *S. Van-Bruntia*, Small.)—Usually found in stony places where there is trickling water. Very easy to grow and may be divided almost any time. Var. *aurantia*, Hort., is a form with the fls. described as of “old-gold pusing off to a kind of coppery red.” Var. *atrubens*, Engl. (S. atrubens, Bt.). Lvs. stiffly spinulose-ciliolate: fls. rich crimson (Emmer says orange-red or cinnamon-colored). Cent. Eu.

57. *brounichias*, Linn. Dwarf, cespitose, 4–8 in. high: sts. ascending, densely foliace at the base; fls.-stems few-fld.: lvs. stiffish, almost leathery, gray-green, shiny, linear-lanceolate, margin ciliate or spinulose: infl. few or many-fld., paniculate, borne on erect-spreading glandulose pedicels: fls. yellowish white with orange-red dots; calyx-lobes oblong-lanceolate, rather obtuse, glabrous; petals oblong, 3-nerved, twice as long as the calyx-lobes. May, Asia and Alaska.—The material from the Cascade Mts. of Wash. to Alberta and southward along the Rocky Mts. to New Mex., which has been passed as *S. bronchialis*, has been separated under the name of *S. austromontana*, Wiegand (*S. bronchialis*, Pursh, not Linn. *Leptdsea austromontana*, Small). It differs from *S. bronchialis* in its more subulate, darker green lvs., more slender often purple sts., calyx-lobes, pedicels, smaller white petals with purple dots above and not clawed at the base. *S. austromontana* is probably not in cult.


58. *gemmipara*, Franch. Sts. erect from a long rhizome, 4–5 in. high, branched, the branches rising from pockets, pilose below; lvs. with buds; lanceolate, long-mucronate, entire, pale, shiny and lineolate on the under surface, both surfaces and the margin striosed with white hairs: infl. paniculate-corymbous, borne on a densely glandular fl.-st. which is naked above; pedicels bracteate at their base: fls. yellow to white; sepals lanceolate, glabrous or glandulose, scarcely or not spreading; petals oblong, obtuse, abruptly attenuate to a long claw, twice as long as the sepals. July–Sept. China.

59. *aizoides*, Linn. (Leptdsea aizoides, Haw.). Loosely cespitose, 2–6 in. high, with decumbent or ascending, foliace, glabrous or sparsely very short pilose caulicles which are branched from the base: lvs. green or reddish, the lower linear or linear-oblong, mucronate, flat below: lvs. above convex, glabrous or more or less glandulose: calyx-lobes oblong-ciliolate; the upper rather remote, smaller, oblong, rather obtuse, rarely ovate: infl. 1-fld., often many-fld., racemose, borne near the top of the st. on axillary peduncles: fls. yellow, more or less spotted with orange;

calyx-lobes oblong-triangular, obtuse, spreading; petals oblong, 1-nerved, 1½ times as long as the calyx-lobes. June–Aug. Eu., Asia, arctic Amer., south to Gulf of St. Lawrence, mountains of N. Y., W. N. Y., and the Lake Superior region. B.B. 2: 171; (ed. 2) 2: 217. (The Rocky Mt. form has been segregated as *S. Van-Bruntia*, Small.)—Usually found in stony places where there is trickling water. Very easy to grow and may be divided almost any time. Var. *aurantia*, Hort., is a form with the fls. described as of “old-gold pusing off to a kind of coppery red.” Var. *atrubens*, Engl. (S. atrubens, Bt.). Lvs. stiffly spinulose-ciliolate: fls. rich crimson (Emmer says orange-red or cinnamon-colored). Cent. Eu.

60. *cinerascens*, Engl. & Irmscher. Densely cespitose, 2–4 in. high, the caulicles prostrate, rosetulate: lvs. of the caulicles rather stiff, linear-lanceolate, margin carinauligous and lax-ciliolate or ciliolate-spinulose, apex tapering to a persistent awn, under surface shining, whitish; the cauline lvs. lanceolate, rather stiff, aristate, margin densely short, black glandular-pilose: infl. 1-fld., or 3-fld., which are often reddish their whole length and black glandular-pilose as are the pedicels: fls. golden yellow; sepals ovate, subacute, not reflexed; petals obvate, narrowed to a stipitate base, 3-nerved, the lateral nerves bifid. Sept. China.

61. *Brunoniana*, Wal. Fig. 3560. Lax, cespitose, 2–8 in. high, very glabrous, stoloniferous; the stolons wiry, filiform and reddish: sts. erect, slender: lvs. stiffish, light green, becoming gray in age, linear-lanceolate, cartilaginous-mucronate, setose-ciliolate; the lowest imbricate, erect and appressed; the upper few and smaller: infl. 1–4-fld. corymbs; the peduncles and pedicels glandulose; the latter 3 or 4 times longer than the fls.: fls. light yellow; calyx-lobes ovate, obtuse; petals oblong, obtuse, 3-nerved, 3–4 times longer than the calyx-lobes. July, Aug. Temperate Himalaya. B.M. 8189.— *Spatularia Brunoniana*, Small, is not this species but a variety of *S. lecanumifolia*. *S. Brunoniana* freely spreads by means of its runners and likes a moist spot. Not commonly in cult. in Amer. Var. *grandiflora*, Hort., is offered in the trade. Var. *mailed*, Eng. & Irmscher (S. majuscula, Hort.). Larger than the type: sts. 3–8 in. high: infl. composite, 3–9-fld.; the branches 1½–4 in. long. Sept., Oct. China.

62. *flagellaris*, Willd. (*Leptdsea flagellaris*, Small). Sts. simple, erect, 1–8 in. high, leafy, densely glandular-pilose: the plant stoloniferous, the stolons bearing a minute bud and roots at their apex: lvs. more or less minute, glandular-pilose, margin glandular-pilose or setose-ciliolate; the basal and lower lvs. close together, ovate-oblong; the upper lanceolate: infl. corymbose 1–10-fld.; the pedicels very short: fls. large, golden yellow; calyx divided beyond the middle or even to the base, the lobes oblong, obtuse, densely glandular-hirsute;
petioles 3-4 times longer than the blade and channelled above: infl. paniculate, the branches 3-6-fl., pedicels slender; fls. white; calyx-lobes oblong, obtuse; petals ovate-oblong, twice as long as the calyx-lobes, with a yellow spot on their base and occasionally with several small purple-red dots. May, June. Pyrenees, Ireland and said to occur in Newfoundland.—A species in common cult. abroad and very variable, by some considered as a variety of S. umbrosa. Var. crenata, Hort., (S. umbrosa var. crenata, Ser.) Lvs. crenate or crinate-dentate: fls. pink, unsuppcted. Pyrenees. Var. crenulfult, Hort., is said to resemble a refined form of S. umbrosa. Var. dentata, Eng!. (S. dentata, Link. S. hiirtuta, Linn. S. umbrosa var. hirtula, Hort. S. umbrosa var. deniata, Hort.). Lvs. rather glabrous or hirsute, orbicular, acute-serrate: fls. white with 1 yellow dot or even several purple dots on each petal (by some said to be unsuppcted).

Section XI. ROBERTSSONIA.

A. Lvs. of the rosette ovate or obovate-oblong, attenuate to a flat petiole.
B. Blades of lvs. very glabrous: panicle-branched 1-3-fl.

63. cuneifolia, Linn., sometimes misspelled cuncifolia. Laxly cepstose, 4-6 in. high, with slender sublignous caulicles: sts. slender, erect, short-glandular and naked: lvs. very glabrous, rather thick, the upper surface dark green and shiny, the lower paler and dull or violet, ovate or subrotund, very obtuse, cuneately attenuate to a long flat ciliate petiole, margin slightly cartilaginously repand-crenate: infl. a loose panicle with 1-3-fl. branches: fls. white; calyx-lobes oblong-triangular, very obtuse; petals oblong, 3-nerved with a yellow spot at the base (occasionally also spotted with purplish red dots). June, July. Mountains of Eu.—There is a form of this species which is grown as S. Buctklandi, Hort., which only differs in having 2 or 3 yellow spots on each petal.

Var. subintegra, Ser. (S. apennina, Bert. S. cuneifolia var. appennina, Koch. S. capillipes, Reichb.). Caulicles long, scantily lvd., forming a rosette at their tip: lvs. smaller, retuse, few-dentate or entire, petiole equaling the blade: sts. few-fl., simple panicle. Switzerland, Tyrol, Apennines, and Maritime Alps.

64. umbrosa, Linn. LONDON PRIDE. ST. PATRICK'S CABBAGE. Loosely cepstose, 6-12 in. high, with sublignous caulicles: sts. erect, naked: lvs. forming a dense rosette 6-12 in. across, rather thick, leathery, grey-green, dull shiny, lower surface tinged reddish or violet, oblong or obovate-oblong, sparsely hirsute, very obtuse, attenuate to the ciliate (rarely glabrous) petiole, margin cartilaginously repand-crenate: infl. a loose panicle with 3-6-fl., shortly glandulouss-hirsute branches: fls. white, varying pink; calyx-lobes oblong, obtuse; petals oblong-ovate, 3-nerved, with several red dots at their base and a yellow spot in the middle. June, July. Eu.—Very neat and attractive plant, frequent in European gardens, but rarely seen here. Var. acanthifolia, Hort., is offered in the trade. Var. bellidifolia, Hort., is offered in the trade. Var. cassinifolia, Hort., is offered in the trade. Var. crassiphylla, Hort., is offered in the trade. Var. erosa, Hort., is offered in the trade. Var. foliis-variegatis, Hort., a form with the lvs. variegated. Var. gracilis, Hort., is offered in the trade. Var. marmorata, Hort., is offered in the trade. Var. primuloides, Hort. (S. primuloides, Hort.), is described as follows: Wl. erect, 4-6 ft. high, but carries entire or partial shade. It forms masses of dark green rosettes of primula-like lvs., whence rise a host of slender sts. about 6 in. high, bearing little lfs. of a kind of rose-pink (lfs. also stated to be bright carmine-rose). Var. rotondifolia, Hort., is offered in the trade. Var. serratifolia, Don. (S. serrata, Sternb. S. serratifolia, Mackay.), is a form with erect, oblong lvs. whose margins are acutely serrate. Ireland. There is a form of this variety known as S. umbrosa serrata minor. Var. variegata, Hort., is a form with the lvs. variegated with white.

65. Géum, Linn. (Mèrinthes Géum, Small). Six to 12 in. high, with sublignous caulicles: sts. nearly naked, erect, glandular-hirsute: lvs. variable, reniform-cordate, margins cartilaginous, crenate, the crenations equal except toward the very top where they are shorter, both surfaces but especially the lower hirsute, petals ob-
12-14 in. diam. and very profusely fl.-sts. panicules which attain a length of 2 ft. and a diam. of 16 in. The fls. are white. G.C. III. 53:390 (as S. longifolia). Gn. 77, p. 298; 79, p. 30.

67. lingulata, Bell. Fig. 3561. One to 2 ft. high with ascending branched caudicles which are covered with appressed vestiges of lvs. and form a cespitose clump; sts. erect or ascending, usually glabrous or sometimes sparsely glandular-pilose, leafy; basal lvs. numerous and rosulate, subulate above, usually linear-spatulate and rather acute, somewhat ciliate, margin erose-crenulate and crustate with lime; cauline lvs. shorter, the margin cartilaginous and less crustate; infl. a thyrsoid panicle from the middle of the scape or above, the branches slender, corymbose-paniculate at their tip, 3-5-fl.d., very often secund: fls. small, white; calyx glabrous, the lobes ovate or oblong, very obtuse; petals obovate or obovate-oblong, attenuate toward the base, 3-nerved, 2-14 in. diam. and very profusely fl.-sts.: fls. white, 1/4-3/4 in. diam.; calyx red-brown, the lobes small, ovate, obtuse; petals obovate, apex rounded. June, July. M. Time Alps. Eu. B.M. 6988. G.C. III. 44:245; 51:174. Gn. 74, p. 326. Var. major, Hort., has much larger rosettes of lvs. and taller sprays of fls. It is suggested that it may be of hybrid origin. Var. minor, Hort. (S. Pilsgni, Correv.), has minute rosettes of silvery lvs. and much shorter sprays of fls. which are white.—Apparently some of the material grown as S. valdenas is referable to this.

70. crustata, Vest (S. inerudita, Vest). About 1-3 in. high with ascending branched caudicles which are covered with appressed vestiges of lvs. and form cespitose clumps up to 4 or 5 in. diam.: sts. ascending, densely glandular-pilose; basal lvs. light gray-green, the lower third pink, subulate, linear, obtuse, minutely crenulate with the crenatures very close together, crustate with lime, ciliate toward the base. Var. rheticus, Engl.; few, linear-lanceolate, serrate, glandular at base; infl. a scape, racemose from the middle or above, the branches 1-fl.-d. or paniculate 3-6-fl.; fls. yellowish white sometimes purple-dotted toward the center; calyx glabrous, the branches oblong-triangular with membranaceous margins; petals obovate, base scarcely attenuate, almost 3 times as long as the calyx-lobes. June. Tyrol.—Easy to grow and adapted to a shady location; scarcely known in Amer.

71. Hösti, Tausch (S. elatior, Mert. & Koch. S. Aizoon var. Hösti, Hort.). Cespitose, 6-18 in. high: sts. erect, rather stout and glandular-pilose; basal lvs. numerous, rosulate, rather erect, lingulate with an obverse apex and ciliate base, margin crenulate, the crenatures truncate; cauline lvs. longer and broader spatulate, more or less at the base but not so at the apex; margin narrowly crustate. Marine Alps. G. C. II. 15:109. Gn. 64, p. 61; 73, p. 55. Minor forms of this variety are cult., as S. lanatiscana eréctâ, having pure white fls., and S. lanatiscana supérba, having arching plumes of creamy white fls. larger than those of the variety proper.

65. catalunicâ, Boiss. & Reut. Densely cespitose, 1-2 ft. high: lvs. of the rosette, which grows to be 3 in. diam., erect-spreading, obovate-ligulate, rather obtuse, margin subentire and white-crustate, glabrous, subcartilaginous, base obtuse; the cauline lvs. few, obovate-oblong: infl. a slender-branched cymose panicle borne on an erect few-lvd. fl.-st. with erect bracteolate slender glandular-viscid pedicels, which are longer than the fls.: fls. white; sepals oblong, obtuse, glabrous, longer than the glabrous tube of the calyx; petals glabrous, glaucous, 3 times as long as the sepals. May, June. Spain. Gn. W. 25:125.—By some considered only a variety of S. lingulata.

69. cochleâris, Reichb. (S. lingulâta var. cochleâris, Engl.). Six to 9 in. high, densely cespitose, with short much-branched caudicles covered below with withered lvs.: lvs. densely rosulate, spreading, 1/4-1 in. long, linear at their base, toward the top spreading into a rounded or spatulate blade, glaucous, coriaceous, margin cartilaginous and crustate with lime; the cauline lvs. small, linear, acute, red-brown: infl. panicleate, erect and oenon, either thyrsoid or subcorymbose, borne on a strong grower and said to produce offsets very freely in this way spread rapidly. Var. rhötica, Engl., equals the type. G. C. III. 54:135. Var. Hostii, Hort. (S. Hostii, Hort.). Cespitose, 6-18 in. high: sts. erect, rather stout and glandular-pilose: basal lvs. numerous, rosulate, rather erect, lingulate with an obverse apex and ciliate base, margin crenulate, the crenatures truncate; cauline lvs. longer and broader spatulate, more or less at the base but not so at the apex; margin narrowly crustate. Maritime Alps. Eu. B.M. 6688. G.C. III. 44:245; 51:174. Gn. 74, p. 326. Var. minor, Hort., has minute rosettes of silvery lvs. and much shorter sprays of fls. which are white.—Apparently some of the material grown as S. valdenas is referable to this.

73. Altissima, Kerner (S. Hösti var. altissima, Hort.). Fig. 3558. Cespitose, 6-2 ft. high: sts. erect, rather stout, glandular-hirsute: lvs. thick, the basal spreading, broad, tongue-shaped, rather acute, base ciliate, margin serrate, serratures cartilaginous; cauline lvs. oblong-linear or oblong, obtuse, glandular-pilose: infl. a scape, paniculate above the branches, elongated, naked and densely glandular-pilose; the pedicels densely short-glandular: fls. white, often with numerous purple dots toward the center; calyx lobes ovate, obtuse, glandular-triangular; petals oblong or oblong-oblong, double the length of the calyx-lobes. May—Aug. Mountains of Cent. Eu.—A strong grower and said to produce offsets very freely and in this way spread rapidly, the branches about 10-fl.-d. and densely glandular-pilose; the pedicels densely short-glandular: fls. white, their base greenish and purple-ciliate toward the center; calyx lobes ovate, obtuse, cartilaginous; petals elliptic, 3-nerved, twice as long as the calyx-lobes. Tyrol.—Very closely allied to S. Hostii, possibly not specifically distinct. Little known in Amer. outside fanciers' collections.

72. Altitissa, Kerner (S. Hösti var. altissima, Hort.). Fig. 3558. Cespitose, 6-2 ft. high: sts. erect, rather stout, glandular-hirsute: lvs. thick, the basal spreading, broad, tongue-shaped, rather acute, base ciliate, margin serrate, serratures cartilaginous; cauline lvs. oblong-linear or oblong, obtuse, glandular-pilose: infl. a scape, paniculate above the branches, elongated, naked and densely glandular-pilose; the pedicels densely short-glandular: fls. white, their base greenish and purple-ciliate toward the center; calyx lobes ovate, obtuse, cartilaginous; petals elliptic, 3-nerved, twice as long as the calyx-lobes. Tyrol.—Very closely allied to S. Hostii, possibly not specifically distinct. Little known in Amer. outside fanciers' collections.
almost twice as long as the calyx-lobes: fr. globose. June, July. Alpine and rock plant of Eu. and As. Amer. from Greenland and Lab. to Sak., locally south to Nova Scotia, New Bruns., mountains of N. Vt., and Lake Superior. J. H. III. 69: 135.—A very variable alpine plant, much tufted and forming small dense rosettes. S. Pört. Stem from ground, golden yellow and is apparently only a minor variation of S. Aizoon. Var. ambigua, Hort., is offered in the trade. Var. atropurpurea, Hort., is said to have slender branching sts. and rose-purple fls. Var. baldensis, Hort., also spelled baldénsis (S. baldénsis, Hort.), is a form with close rosettes of medium size and rather flat white fls. with larger red spots than usual (fls. reported as sometimes pale pink). Balkan Mts. Var. balénsis, L. farrer, with ash-gray lvs., which are short, thick and markedly dentate; their apex rounded: the young shoots glossy, blood-crimson: the fls. white. Var. brevifolia, Hort., with white fls. is offered in the trade. Var. bulgarica, Hort., has rosy spotted fls. Var. callitrichoides (S. callitrichoides, Hort.), with white fls. must not be confused with S. callitrichoides, Greene (Microtheces callitrichoides, Small), a species of Section Boraphila, closely related to S. virginiensis which is probably not in cult. Var. Chuchillii, Hort., with pointed gray lvs. in stiff rosettes. Var. cultrata, Hort., is offered in the trade. Var. dubia, Hort., is offered. Var. erecta, Hort., is offered in the trade. Var. flavescens, Hort., is a free-growing decorative form with clear lemon-yellow fls. produced in good spikes. Not to be confused with S. flavescens, Hort. (S. medica) which is apparently source in cult. Var. intacta, Engl. (S. intacta, Willd.), has beautiful white, unsplotted fls. S. intacta major is the cultural name of a larger form of the species and produces numerous offsets. The above description is taken from Schott's original. Whether the plant offered is the same is undetermined. Probably a variation of S. Aizoon.

75. cartilaginea, Wild. (S. Kolenatiâna, Regel). Six to 9 in. high: st. sparingly glandulose, few-br. lvs.: fls. roseate, oblong or obovate, acute or acuminate; petals oblongelliptic, acute, the tube longer than the calyx-lobes. Asiatic, from Formosa to Ryukyus. G.C. III. 95. —A strong-growing form with prominently toothed lvs. Var. major, Koch, has oblong-linear lvs. which are not much broader at the base, the panicle composite, pyramidal, glandular-pilose all over, the branches paniculate from their middle, 5–15-fl.: fls. white, occasionally tinged rose; calyx-lobes longer than the glandular tube, oblong-acute; petals obovate-elliptic, 3–5-nerved, midnerve mostly obtuse, 2–3 times longer than the calyx-lobes. May–July. Caucasus region and Asia Minor.—S. Kolenatiâna has been kept distinct by some but seems to differ only in the slightly more acuminate fls. of the lvs. In gardens it is more common under this name. A somewhat larger form is known as S. Kolenatiâna major, Hort.

76. Cotyledon, Linn. Tufted, 6–24 in. high: st. erect: lvs. thick and fleshy, basal linguliform or obovate-linguliform, short-cylindrical; the bases softly fimbriate, the apex acute or acuminate, serrate, serratures cartilaginous, at the apex androstely acuminate; caulis lvs. linguliform-lanceolate, the lower part glandular-lanceolate, the upper serrulate; bracts linear, acute and glandular: infl. a scape, paniculate from the middle, 5–15-fl.: fls. white, occasional tinged rose; calyx-lobes longer than the glandular tube, oblong-acute; petals obovate-elliptic, 3–5-nerved, midnerve mostly obtuse, 2–3 times longer than the calyx-lobes. May–July. Mountains of Eu. G. 11: 209; 34: 781; 35: 541. G.W. 12, p. 471.—Easy to prop. as it makes a large number of side shoots which root quickly when potted. Var. pendula, Maxim. (S. pendula, Hort.), has small silver-marbled lvs. and white fls. Var. paradóxa, Hort., is a form with long bluish lvs., their margins with silvery serratures: fr. white. Eng. G. 74, p. 489. See S. paradóxa in suppl. list. var. pectinata, Hort. (S. pectinata, Hort., Nym. & Kotsch.), has narrow lvs. with blunt teeth and conspicuous silvery margins in the narrow rosettes: the fls. are small, of a nice white and spotted with red.

Var. récta, Ser., in part (S. récta, Lapeyr., in part. S. Aizoon) forma grêalis, Engl. S. carinallata, Schott, Nym. & Kotsch), has lvs. which are spatulate-slate shortly dilated toward the apex, narrowly and also deeply serrate: the sts. laxly paniculate from the middle and above; the branches 1–3-fl.: fls. white. Var. rôsea, Hort., is similar to the type, but has bright pink fls. Var. rosulâris, Hort. (S. rosulâris, Schlech.), has finely incurved rosettes and large sprays of white fls. Var. Stabiana, Hort. (S. Stabiana, Ten.), has large rosettes and sprays of creamy white fls. Not very distinct from the type. Var. Sturmiana, Schott, Nym. & Kotschis, is a good-sized form with flattish rosettes, probably referable to the type-form.

77. mutàta, Linn. Six to 12 in. high: rhizome thick, horizontal or oblique: st. ascending, foliose: basal lvs. almost twice as long as the calyx-lobes: fr. globose. June, July. Alpine and rock plant of Eu. and As. Amer. from Greenland and Lab. to Sak., locally south to Nova Scotia, New Bruns., mountains of N. Vt., and Lake Superior. J. H. III. 69: 135.—A very variable alpine plant, much tufted and forming small dense rosettes. S. Pört. Stem from ground, golden yellow and is almost twice as long as the calyx-lobes: fr. globose. June, July. Alpine and rock plant of Eu. and As. Amer. from Greenland and Lab. to Sak., locally south to Nova Scotia, New Bruns., mountains of N. Vt., and Lake Superior. J. H. III. 69: 135.—A very variable alpine plant, much tufted and forming small dense rosettes. S. Pört. Stem from ground, golden yellow and is apparently only a minor variation of S. Aizoon. Var. ambigua, Hort., is offered in the trade. Var. atropurpurea, Hort., is said to have slender branching sts. and rose-purple fls. Var. baldensis, Hort., also spelled baldénsis (S. baldénsis, Hort.), is a form with close rosettes of medium size and rather flat white fls. with larger red spots than usual (fls. reported as sometimes pale pink). Balkan Mts. Var. balénsis, L. farrer, with ash-gray lvs., which are short, thick and markedly dentate; their apex rounded: the young shoots glossy, blood-crimson: the fls. white. Var. brevifolia, Hort., with white fls. is offered in the trade. Var. bulgarica, Hort., has rosy spotted fls. Var. callitrichoides (S. callitrichoides, Hort.), with white fls. must not be confused with S. callitrichoides, Greene (Microtheces callitrichoides, Small), a species of Section Boraphila, closely related to S. virginiensis which is probably not in cult. Var. Chuchillii, Hort., with pointed gray lvs. in stiff rosettes. Var. cultrata, Hort., is offered in the trade. Var. dubia, Hort., is offered. Var. erecta, Hort., is offered in the trade. Var. flavescens, Hort., is a free-growing decorative form with clear lemon-yellow fls. produced in good spikes. Not to be confused with S. flavescens, Hort. (S. medica) which is apparently source in cult. Var. intacta, Engl. (S. intacta, Willd.), has beautiful white, unsplotted fls. S. intacta major is the cultural name of a larger form of the species and produces numerous offsets. The above description is taken from Schott's original. Whether the plant offered is the same is undetermined. Probably a variation of S. Aizoon.

75. cartilaginea, Wild. (S. Kolenatiâna, Regel). Six to 9 in. high: st. sparingly glandulose, few-br. lvs.: fls. roseate, oblong or obovate, acute or acuminate; petals oblong-elliptic, not clawed, obtuse, apex acute or acuminate; petals oblong-elliptic, not clawed, obtuse, apex rounded. Serbia.—Plants under this name are offered in English trade-lists, but the species is not included in any of the recent treatments of Saxifraga. The above description is taken from Schott's original. Whether the plant offered is the same is undetermined. Probably a variation of S. Aizoon.

76. Cotyledon, Linn. Tufted, 6–24 in. high: st. erect: lvs. thick and fleshy, basal linguliform or obovate-linguliform, short-cylindrical; the bases softly fimbriate, the apex acute or acuminate, serrate, serratures cartilaginous, at the apex androstely acuminate; caulis lvs. linguliform-lanceolate, the lower part glandular-lanceolate, the upper serrulate; bracts linear, acute and glandular: infl. a scape, paniculate from the middle, 5–15-fl.: fls. white, occasional tinged rose; calyx-lobes longer than the glandular tube, oblong-acute; petals obovate-elliptic, 3–5-nerved, midnerve mostly obtuse, 2–3 times longer than the calyx-lobes. May–July. Caucasus region and Asia Minor.—S. Kolenatiâna has been kept distinct by some but seems to differ only in the slightly more acuminate fls. of the lvs. In gardens it is more common under this name. A somewhat larger form is known as S. Kolenatiâna major, Hort.

77. mutàta, Linn. Six to 12 in. high: rhizome thick, horizontal or oblique: st. ascending, foliose: basal lvs.
lingulate, rosulate; margin cartilaginous, densely fimbriate below, entire or obliquely serrulate above with many little indistinct pits; cauline lvs. lingulate-spatulate, very obtuse: incl. racemously paniculate from the base or middle of the scape, this and the peduncles glandular-hirsute: fls. yellow, red-orange or copper-colored; calyx-lobes oblong-triangular, sparsely glandular-pilose or glabrous; petals linear-lanceolate, acute, 3-nerved, narrower than and twice the length of the calyx-lobes. July, Aug. Mountains of Cent. Eu. B.M. 351.—Suitable for rather heavy shade. The plant dies after flowering. Said to be biennial.

Section XIII. KARSCHIA.

1. Caudicle lvs. broader or as broad above the middle as below it.
   a. Petals as long as or slightly longer than the calyx-lobes: fls. reddish or purplish, keeled, blotched. (The following four species are very closely related.)
   b. Infl. spreading, branched.
      c. Lower lvs. spatulate-lingulate, the tip somewhat recurved .. 76. media
      d. Lower lvs. oblongo-lanceolate, the tip spreading .. 79. Stribrnyi
      e. Spatulate or nearly so.
         f. Rosette lvs. spatulate-lingulate, their apex rounded mucronate.80. Grisebachii
         g. Rosette lvs. linear-lanceolate, their apex acute or acutish .. 81. Friderici- [Augusti


78. media, Gouan (S. calycijlora, Lapeyr.). Cespitose, 2-3 in. high, with short densely foliate caulicles: fls. erect, leafy, densely glandular-pilose: basal lvs. imbricately, stiff, gray-green, reddish toward their base, the rosettes flattened-depressed, spatulate-lingulate, apex acute or obtuse, margin narrowly cartilaginous, ciliate below, 7-11 pits near the margin when old; cauline lvs. spatulate, cartilaginous, and densely glandular-hirsute on both surfaces except toward the tip which is mucronate and glabrous: incl. cymose-paniculate or racemose; peduncles and calyx purplish and densely glandular: fls. flesh-colored or purplish, at length dark blue; calyx-lobes ovate; petals erect, obvoate, about 3-5-nerved, scarcely longer than the calyx-lobes. June, July, Pyrenees. Gn. 78, p. 108.

79. Stribrnyi, Velen., also spelled Stribrnyi, Stribrnyi, and Stribrnyi (S. porophylia var. Stribrnyi, Velen.). Cespitose, 4-5 in. high, with short, densely foliate caulicles: fls. sts. erect, branched, sparsely leafy, spreading, glandular-pilose: lower lvs. rosalate, spreading, sessile, spatulate-oblancoate, apex submucronate, fleshy, above intramarginally pitted, carinate below, margin narrowly cartilaginous toward the base, sparingly ciliate; cauline lvs. oblongo-spulate, subacute, sometimes reddish toward the apex, margin below glandular-ocillate, both surfaces sparsely glandular-pilose: infl. cymose, branches spreading or slightly recurved up to 1½ in. long; the pedicels up to ½ in. long, spreading, glandular-pilose: fls. nodding, carmine, ½ in. diam.; calyx campanulate, reddish purple and densely glandular-pilose outside, the lobes subequal, oblong-ovate, apex rounded, glandular-pilose outside; petals subrect, broad-spulate, apex obtusely dentate, glabrous, about the same length as the calyx-lobes. Feb.-April. Bulgaria. B.M. 8504. G.C. III. 46:193. Gn. 73, p. 212. G.L. 24:366.—A hardy species with grayish foliage and open infl.

80. Grisebachii, Degen & Doerfl. (S. media var. montenegrina, Hort.). Fig. 3593. Cespitose, 4-6 in. high, with short, densely foliate caulicles: fls. sts. erect, leafy, densely spreading, glandular-pilose: lower lvs. imbricately spreading, sessile, spatulate-lingulate, apex rounded-mucronate, above numerous intramarginal small pits, below carinate, margin cartilaginous, slightly ciliate toward the base; cauline lvs. spreading, oblongo-spulate, reddish, the tip contracted into a green mucron, both surfaces densely glanduloid-pilose except the mucron: incl. racemose or subepicate; pedicels much shorter than the bracts: fls. purple or crimson; calyx reddish purple, densely glandular-pilose, the lobes unequal, oblongo-elliptic, apex rounded; petals erect, elliptico-lanceolate, ciliate below. March. Albania and Macedonia. B.M. 8308. G. 33:513. G.C. III. 33:123. G.M. 46:119. Gn. 83, p. 180; 72, p. 215; 77, p. 120; 79, p. 31. G.W. 12, p. 470. J.H. III. 46:207.—Hardy in England.
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Cespitose, 2–6 in. high with short densely foliate caulicles: sts. erect, densely glandular: basal lvs. forming a flattened rosette, linear-lanceolate, acute or acutish, glabrous, flat, entire, often ciliate at the base, remotely pitted near the margin; cauine lvs. spatulate, glandular: inf. a spike-like rosette, dark purple; pedicels all about equal and shorter than the bracts: fls. violet-purple; petals ovate, acutish, oblate, obtuse; petals cuneate-spatulate, scarcely longer than the calyx-lobes. April. Dalmatia, Serbia, Greece, and N. E. Asia Minor. G. 35:761.—This species has been treated as *S. media* var. *Frederici-Augusti*, Engl., but differs from that species in the narrower lvs. and more spicate raceme. It has also been referred to *S. porophylla*, Bertol., as a synonym: the latter is said to have lingular basal lvs. with obtuse apex, and flesh-colored petals. The distinctions between *S. Frederici-Augusti* and *S. porophylla* seem to be very unsatisfactory. Much of the material cultivated as *S. Frederici-Augusti* is really *S. apiculata*.

82. **aretoides**, Lapey. Cespitose, about 2 in. high, with woody, densely imbricate-foliose caulicles: sts. short and leafy, glandular-hirsute: lower lvs. sulcate, weakly keeled, leathery and stiff; pedicels grey-green but violet at the base of the under surface, linear-lingular, apex rather obtuse, margin narrowly cartilaginous, the lower portion ciliate and near the margin are 7–9 pits noticed with age; cauline lvs. linear-lingular, glandular-hirsute and cartilaginous except the apical portion: inf. terminal, 1–3-fl., rarely cymose, 3–5-fl.; the pedicels and calyx glandular: fls. golden yellow, calyx-lobes ovate and acutish; petals broad-obovate, 5–7-nerved, more than twice as long as the calyx-lobes. April–July. Mountains of Eu. B.M. 5549.—Should be planted on a shady edge where it will obtain plenty of moisture. Little known in Amer. *Var. primulina*, Hort., grows about 1½ in. high; the peduncles are paler green than the type; the fls. are true primrose-yellow and the petals are usually well rounded and fairly well imbricated.

83. **Ferdinandi-Coburgi**, Kell. & Sunderm. Cespitose, about 2 in. high, with columnar foliose branched caulicles: sts. with 9–12 lvs., glandular-hairy as is the calyx and tinted red-brown: lower lvs. somewhat glaucous, up to 3½in. long, long narrow toward the top, margin fine-hairy below, apex thickened and incurred-pointed; cauline lvs. 9–12 in number: inf. close heads of 4–5 (or more) rich yellow fls.; petals ¾in. long, ½in. wide, strongly narrowed toward the base. March. April. Macedonia.

84. **scardica**, Griseb. (*S. scardica*, J. Wood). Cespitose, 3–4 in. high, with woody, densely foliate caulicles: sts. ascending and glandular-pilose: basal lvs. leathery, stiff, light gray-green, pale violet toward the base, oblong acute, spreading, upper surface concave, lower convex-carinate, lower margin indistinctly serrulate or ciliate, upper cartilaginous, entire, when old they are 4–15 pits near the margin; cauline lvs. few, lanceolate, acute, glandular-hirsute except the apical portion, cartilaginous and glandular-hirsute: inf. corymbose. 3–11-fl.: fls. white, ivory-white, or pale rose-red; calyx-lobes ovate, acutish; petals obvate-cuneate, 6-nerved, more than twice the length of the calyx-lobes. June–July. G. 65, p. 593; 69, p. 231. S. E. Eu.—Readily distinguished from *S. Rocheliana* by its keeled and more pointed lvs. The species itself is hard to grow and consequently is very rare in cultivation: the plant is very dwarf, and has the true *S. scardica*, Griseb. G. 34:199. *Var. obtusa*, Spreng., differs from the plant in which subsacute to obtuse lower lvs. with fewer pits, fl.-sts. 1–3-fl. and green, and the calyx-lobes obtuse and less pubescent.

March. Macedonia. B.M. 8058 (as *S. scardica*). G. 32:520.

85. **Rocheliana**, Sternb., also incorrectly spelled *Rochellaniana*. Very densely cespitose-cushioned, forming mats 8–12 in. diam., 2–3 in. high, with more or less elongated, densely imbricated, foliose, often columnar caulicles: lower lvs. stiff, shiny light gray-green above, violet below, densely aggregated, horizontally spreading, spatulate, obtuse, very smooth, flat above, rather convex below the base, ciliate, 7–9 pits near the margin noticeable when old; cauine lvs. few, obvate-spatulate, cartilaginous and glandular-pilose except the apical portion: inf. corymbose-paniculate, 3–9-fl., borne on an erect purple-red glandular-pilose fl.-st.; pedicels erect, these and calyx glandulose and pale green: fls. white; calyx-lobes ovate, obtuse, erect; petals obvate, clawed-attenuate, 7-nerved, thicker than the calyx-lobes. April–July. E. and S. E. Eu.—Flowers freely. *Var. corophylla*, Engl. (*S. corophylla*, Griseb., also spelled *corophyllum*). The lower lvs. smaller, less horizontally spreading, oblong, obtuse, fewer pitted: fls. ivory-white. Bosnia and N. Albania.

86. **marginata**, Sternb. Cespitose, about 3 in. high, with caulicles which are subnaked below or short-columnar, woolly and leafy: lower lvs. obvate-cuneate, obtuse, the base ciliate, the upper margin cartilaginous; cauline lvs. cartilaginous and glandular-pilose except the apical portion: inf. corymbose, 5–7-fl., borne on erect fl.-sts., these as well as the pedicels and calyx being black-glandular-pilose: fls. white; calyx-lobes oval-oblong, obtuse; petals obvate, attenuate at the base, 5–7-nerved, 3 times the length of the calyx-lobes. March–June. S. Italy. B.M. 6702. Gn. 77, p. 206; 79, p. 294. G.L. 18:117.—Suitable for sunny ledges and rocky crevices, but requires lime and good drainage. Some of the material cult. under this name may be *S. Borgii*.

87. **Boryi**, Boiss. & Heldr. (*S. marginata*, Bor. & Ch., not Sternb.). Cespitose-cushioned, about 1½ in. high, with densely imbricate-foliose caulicles which are elongated and columnar: lower lvs. obvate-spatulate, obtuse, glabrous, erect-spreadingsubcoriaceous, flat above and subcoriaceous below, margins ciliate at base or others entire, remotely pitted near the margin; cauine lvs. few, minute and glandulose: inf. corymbose, 3–5-fl., borne on glandular-fl.-sts.: fls. ivory-white; petals elliptic-spatulate, twice the length of the calyx-lobes. April–July. S. E. Eu.—Thrives in a sunny location. Closely allied to *S. marginata* but differs in having smaller lvs., acute calyx-lobes and shorter and narrower petals.

88. **lilacina**, Duthie. Cespitose, ⅓–1 in. high, with numerous very densely foliate, columnar caulicles: lvs. rosetulate, oblong, obtuse, recurved and thickened toward the apex, sparsely ciliate at the base, margin cartilaginous and incurved, 3–5-pitted toward the apex; cauine lvs. 1–2, alternate, erect, linear-oblong or spatulate, obtuse, glandular, half-clasping at base: inf. 1-fl., borne on glandular-pubescent fl.-st., which are linear: fls. about ⅓in. diam., pale or grayish line with a purple center; calyx ⅓in. long, glandular-pubescent, the lobes ovate-oblong, obtuse; petals ⅓in. long, obvate-rotund, ciliate on the base, the margins undulate. March, April. W. Himalayas. G.C. III. 35:250. Gn. 65, p. 290.—The plant is very dwarf, and is grayish green in color, though the fl-tips are dark green.

89. **squarrosa**, Sieber. Very densely cespitose, about 3 in. high, with wooly, subcylindrical caulicles which are very densely imbricate-leafy: lvs. of the caulicles on stiff, shining green stems, linear-lanceolate, erect, sitting at the apex, linear-lanceolate, obtuse, submurculate, very narrowly cartilaginous, at the base fimbriate, the back convex and obtusely carinate above, marked with 7 pits, erustate with line when young.
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95. sancta, Griseb. Cespitose, about 2 in. high, with short, woody, imbricate-foliate caudicles: stts. erect, glandular: lower lvs. densely congested, gray-green, light violet on the under side, erect, recurved from the middle, spathulate-linear, obtuse, dorsally convex and obtusely carinate, 9-pitted near the margin, crustate with lime, fimbriate from the base to the middle; cauline lvs. spathulate, 5-pitted, glandular, 3-in. long, finely corymbose, 6-10-fl., borne on dark purple fl.-stts.: fls. white; calyx-lobes ovate, very obtuse, glandular; petals obvate, 3-5-pitted, almost 3 times as long as the calyx-lobes. June-Aug. Mountains of Eu. L.B.C. 5:426. Var. major, Don, has the sts. more robust, taller, and strongly villous: the rosettes somewhat noticeable when old; cauline lvs. linear-lanceolate with mucronulate, near the margin very slightly cartilaginous at their tips; petals obovate, 3-5-nerved, lateral nerves bowed or straight, almost 3 times as long as the calyx-lobes. June-Aug. Mountains of Cent. Eu. G. 1:198; 36:289. Var. elegans, Hort., is mentioned in connection with S. G. 36:289. Var. minor, Hort., is said to have diminutive white fls. Var. minima, Hort., is offered in the trade as a form with fine yellow scapes bearing solitary fls. which are larger than that of var. major. April, May. G. 47:164. Var. N. 54:213. Var. grandiflora, Hort., grows about 1½ in. diam. with crimped white petals. Feb. Austrian Alps. G. 1:211: 11: 21:23. G. 63, p. 75. Var. minima, Hort., is said to have diminutive white fls. Var. minor, Hort., is mentioned in connection with S. Paulina as one of the parents of that hybrid. Var. rosea, Hort., equals S. irvingii. Var. speciosa, Hort., has bright red scapes bearing solitary fls. which are rich red and later than the type; the petals are pure white, broad and almost round. Var. tridentata, Jenkins (var. tridentata, Hort.), is more tufted than var. major; the fl.-stts. more richly scarlet and the fls. less notched at the margins, the petals reflexed, white. Jan., Feb. Dolomites. G. 37:379.

96. Juniperifolia, Adams (S. juniperifolia, Bieb.). Cespiteose, about 2 in. high, the caudicles densely leafy: lvs. rigid, prickly, dark green, the lower imbricate, spreading, lanceolate, acuminate, stiffly mucronate, the entire margin ciliate-denticate, cartilaginous, 3-5 minute pitted when old) near the cartilaginous margin; cauline lvs. large, lanceolate, acuminate: inf. corymbose-paniculate, 1-3-fl., borne on erect sts., these as well as the peduncles and calyx densely slender glandular-pilose: fls. white; calyx-lobes oblong-triangular; petals broadly obvate, strongly cuneate-attenuate toward the base, many-nerved, 3 or 4 times as long as the calyx-lobes. April. S. Tyrol and N. Italy.

93. Vandelii, Steinh. About 2 in. high, the caudicles very closely imbricate-follose and also strongly congested: lvs. of the caudicles leathery, very stiff, light green, erect, lanceolate, acute, stiffly mucronate, 3-cornered, 5-7-pitted (noticeable when old) near the cartilaginous margin, fimbriate at the base, when young crustate with lime; cauline lvs. linear-lanceolate, glandular-pilose except the long-mucronate apex: inf. corymbose-paniculate, 3-7-20-fl., borne at the top of erect fl.-stts. and calyx covered with spreading, glandular hairs: fls. white with reddish veins; calyx-lobes ovate-lanceolate, acute; petals erect, ovate, strongly cuneate-attenuate toward the base, many-nerved, 3-4 times as long as the calyx-lobes. April-Aug. Tyrol. G. C. III. 44:71; 57:238. G. N. W. 25:458. - Best suited to rock-fissures as it has deep woody tap-roots; also requires lime.

92. Tombeanensis, Boiss. (S. diapensioides var. tombenensis, Hort.). One to 2 in. high, with numerous very densely foliose, columnar, erect, or ascending caudicles: lvs. of the caudicles imbricate, erect, recurved at their tip, ovate-lanceolate, subulate, 3-cornered, apex mucronate, 3-7-pitted (noticeable when old) near the cartilaginous margin, very thinly subulate, 5 minute pitted are noticeable when old; cauline lvs. linear-lanceolate with the exception of the apical part, narrowly cartilaginous-marginate, acute, glandular-pilose: inf. cymose-racemose, 1-3-fl., borne on erect sts., these as well as the peduncles and calyx densely slender glandular-pilose: fls. white; calyx-lobes oblong-triangular; petals broadly obvate, strongly cuneate-attenuate toward the base, many-nerved, 3 or 4 times as long as the calyx-lobes. April. S. Tyrol and N. Italy.
Austrian Alps. Var. speciosa, Farrer, has a stouter plant, about 2 in. high; lvs. opposite, rather remote, thick, fleshy, green or purple, lower obovate-rotund, upper obovate-spulate, apex rather obtuse, rarely acute, 1-pitted, sparsely piliate and also ciliate, dorsally subcarinate: fls. frequently in pairs, dark violet, deep purplish crimson or blackish blue; calyx broad-ovate, glandular-hirsute, lobes obvue obtuse, ciliate; petals lanceolate, 3-nerved, one-half longer than the calyx-lobes and narrower than them. April–July. Mountains of Eu.–Found wild in rocky debris watered by the melting snows. Seldom seen in cult.

99. retusa, Gouan. Cauliaces prostrate, much branched, the branches densely cespitose, only about 1½ in. high; fls. erect, 1-4-fid., glandular-hirsute or obtuse; lvs. opposite, stiff, dark green, gray-tipped, the infi. racemose or capitate, few-fid.; fls. small, yellow; calyx lanceolate, 3-nerved, lvae. rather obtuse, about 2½ in. high; lvs. opposite, rather remote, thick, fleshy, green or purple, lower obovate-rotund, upper obovate-spulate, apex rather obtuse, rarely acute, 1-pitted, sparsely piliate and also ciliate, dorsally subcarinate: fls. frequently in pairs, dark violet, deep purplish crimson or blackish blue; calyx broad-ovate, glandular-hirsute, lobes obvue obtuse, ciliate; petals lanceolate, 3-nerved, one-half longer than the calyx-lobes and narrower than them. April–July. Mountains of Eu.–Found wild in rocky debris watered by the melting snows. Seldom seen in cult.
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**AA. BETWEEN SPECIES OF SECTION II.**

103. Vetteriana, Beauverd (S. hederaea × S. Hueteriana). Lvs. intermediate between the two parents: fls. sulfur-yellow or whitish, the shape of those of *S. Hederaea* and twice as large as those of *S. Hederaea*; the petals more elongated than those of the last-mentioned species. June. Switzerland.—A spontaneous hybrid which appeared in the alpine garden of the Hortus Boissierianus.

**AAA. BETWEEN SPECIES OF SECTIONS XI AND XII.**


105. Engleri, Huter (*S. Aizoon × S. cuneifolia*). Lvs. elongate, obovate-oval, the narrowed lower portion ciliate, margin indistinctly crenate and obscurely pitted: fl.-sts. about 4 in. high, glandular-hairy: infl. lady's 2–3-fld.: fls. very small. A garden hybrid.—Quite probably all of the material grown as *S. Engleri* is not the same as another form, "with beautiful, long, silvery lvs. in handsome rosettes bearing upward of 20 handsome plumes of white fls. to a height, some of them, of more than 1 ft."

106. Dr. Ramsey, Hort. (*S. longifolia × S. cochlearis*). Resembling the latter parent more, but both the spoon-shaped lvs., which take on a brilliant red tint in the fall, and the infl. of white fls. are larger than in *S. cochlearis*. The fls. are sprinkled with pink dots. A garden hybrid.

107. Splendens, Hort. (*S. longifolia × S. Cotyledon*). A showy plant about 1½ ft. high, with silvery rosettes more like the former parent and the looser infl. of the latter: fls. white. A garden hybrid.

108. Burnatii, Sundern. (*S. cochlearis × S. Aizoon*). Rather intermediate in character, but more nearly approaching the former parent in its fl.-rosettes and the infl. of large white fls. A natural hybrid found in the Maritime Alps.

109. Grandfieldii, Hort. Said to have been raised from *S. Aizoon* var. regulars, by some said to be more probably raised from *S. Aizoon* var. lutea. The lvs. are ligulate, about 1 in. long and ⅜ in. broad, encrustated and form a basal rosette: fls. pure white, unsotted and loosely arranged in stalks 15 in. high in spreading sprays. A garden hybrid of English origin. G. 30:673.

110. Gaudentii, Bruegg. (*S. Aizoon × S. Cotyledon*). Also spelled Gaudaudiana. Rosettes small and silver-gray; the fls. white. Supposed to be a spontaneous hybrid. Eu.

111. Macababina, Hort. (*S. Cotyledon × S. Hostii*, S. Hostii var. Macababina, Hort.). The rosettes of lvs. are intermediate in character, but the lvs. are much smaller than in *S. Cotyledon* and the plant is seldom more than 1 ft. high, more or less branched above: fls. numerous, white, heavily speckled with pink to purple dots, the spots largest in June. A garden hybrid. G. III. 20:968. J. H. III. 57:61.

**AAA. BETWEEN SPECIES OF SECTION XIII.**

112. ambigua, DC. (*S. media × S. aretioides*). About 2½ ft. high with redish or purplish glandular fl.-sts.: fls. linear, nearly obtuse and a little reflexed: fls. purple, red or coppery, with the petals a little longer than the calyx-lobes. Pyrenees. G. III. 54:183.—One of three native hybrids resulting from this cross. *S. ambigua* comes nearest to *S. media*, with red sepals and yellow petals; while *S. Lapereoisai*, Don, resembles *S. aretioides* more closely; its sepals are green and its petals yellow.

113. susanitaca, Hort. (*S. media × S. aretioides*). More nearly resembling *S. aretioides* but the rosettes are larger: fls. yellow. Very similar to *S. luteo-purpurea*, Laperey.

114. internedia, Hort. (*S. Griesebachii × S. Stibniyi*, *S. Griesebachii* var. internedia, Hort.). Nearer in character in all respects to the former, but more nearly approaching the latter: fls. tinged red and bearing a head of 2–3 fl.-sts. 5 in. high, glandular-hairy and terminated by a cluster of erect pink-tinted fls.; the shade deeper toward the base, fls. cylindrical in form with the petals never reflexed. Feb., March. A garden hybrid.

115. Eudoxiana, Kellerer (*S. Friderici-Augusti × S. perophylla*). Nearer the former parent in habit, about 3 in. high, the rosettes of lvs. 1½ in. diam.; lvs. long, narrow, and pointed, with the chalk-pits very evident: infl. nodding fracture borne on a red stem. With red leafy bracts which are tipped with green: fls. red, on short pedicles. A garden hybrid.—Does well in a crevice or on a ledge, but requires lime.

116. Kellerei, Sundern. (*S. Friderici-Augusti × probably a form of S. Bursarinae*). Inclined in habit to the former, with well-developed rosettes which are nearly 2 in. diam., but the lvs. are longer and narrower and are acutely pointed and pitted with white dots: fl.-sts. 5 in. high, glandular-hairy and terminated by a cluster of erect pink-tinted fls.; the shade deeper toward the base, fls. cylindrical in form with the petals never reflexed. Feb., March. A garden hybrid.

117. Eudoxiana, Kellerer (*S. Friderici-Augusti × S. sanceta*). An intermediate in character, growing like *S. sanceta*. The lvs. have the silvery appearance of the former parent and the length and pointedness of the latter: sts. tinged red and bearing a head of 2–3 deep orange-yellow fls. which are rather small. A garden hybrid raised at Sofia, Bulgaria.

118. apiculata, Engl. (*S. Rocheliana × S. sancta*, S. Friderici-Augusti, Hort., not Bias* S. luteo-purpurea Hort.*, not Laperey). Cespitose, forming a large dark green mat, with subligneous, very densely lvd. caulicules. fl.-sts. 2–3½ in. high, glandular-pilosus: basal lvs. linear-oblong, acutely cuspitate, slightly carinate, thick, with pitted margins; cauline lvs. subspatulate: infl. 5–9-fld., the latter: fls. tinged red and bearing a head of 2–3 deep orange-yellow fls. which are rather small. A garden hybrid raised at Sofia, Bulgaria.
later opening than the type. Var. pallida, Hort., a form said to have pale yellow lvs., is offered in the trade.

119. pingens, Sündern. (S. Rocheliana × S. juniperifolia). It is similar to the latter parent, with rather smaller rosettes of dark green, sharp-pointed lvs., but with the more compact habit of S. Rocheliana. Fls. fl.-sts. are about 1-2 in. high, glandular, to 3 in. in diameter, bearing several deep golden yellow lvs. which are larger and paler than those of S. juniperifolia. A garden hybrid.

120. Börstlin, Kellerer (S. marginata × S. Ferndinandi-Coburgi). It more closely resembles the latter parent. About 2-3 in. high with large rosettes of silvery lvs.; bracteate, glandular sts. each bearing 4 or 5 large yellow lvs. which are paler than S. Ferndinandi-Coburgi. A garden hybrid raised in Sofia, Bulgaria.—S. Kyriillii is another product of the same cross.

121. Kyriillii, Kellerer (S. marginata × S. Ferndinandi-Coburgi). Another product of the same cross as S. Börstlin but more closely resembling the former parent. The lvs. show the chalk-pits more distinctly; the petals are white, more the substance of S. marginata. March. A garden hybrid. Gn.W. 22:291.

122. Sündermannii, Hort. (S. marginata × S. Burseriana). A smaller plant than S. Obstini (a result of the reciprocal cross) and resembling the latter parent more closely. About 2-3 in. high, habit tufted and free-growing, the rosettes larger than in S. Obstini, 3/4 in. diam.: lvs. long, broadest at the base and tapering to a point as in S. Burseriana, upper surface channelled or concave and covered with a chalky deposit on the margins and apex: inf. 1- or 2-fl., borne on glands, the inff. and stronger growth that of the former but the infl. and stronger growth that of the latter parent: rosettes usually 1/2 in. diam.; lvs. awl-shaped, 3-cornered with cartilaginous margins and decidedly glaucous: fls. 1 1/2-2 in. high, tinged red, pubescent and covered with lvs.; fl-buds suffused with pink, but lvs. white, more the substance of S. Rocheliana and born 3-4 to a rosette. Feb., March. A garden hybrid. G. C. III. 49:229.—It is very like an enlarged S. Burseriana in general appearance though the foliage is intermediate and the lvs. resemble S. marginata. Another distinct form resulting from this cross is S. Sündermannii.


124. kestoniensis, Hort. Supposed to be a seedling of S. Burseriana, though by some said to resemble S. scarica var. obtusa more closely. It has very white lvs. which come very early and are starry. The fl.-sts. are bright red and about 3 in. high. Jan.—March. A garden hybrid.


Var. albâ, Hort. (S. Burseriana var. Böydii, Hort.). A plant which very little resembles S. Böydii and by some is taken as a hybrid (S. Rocheliana var. coriophyllâ × S. Burseriana). Lvs. subulate, arranged in small rosettes which form dense cushions: lvs. white, borne on scapes about 2 in. high, bearing a cyme of 3-4 fls. G. 71, p. 175; 72, p. 177. It resembles S. Burseriana in many respects but differs in having larger lvs. and more fls. to a scape. Var. késtoni, Hort., is offered in the trade, possibly the same as S. kestoniensis.

126. Faldonside, Boyd (S. Burseriana × S. aeticala. S. Leucodendron). Lvs. silvery: st. suffused with pink: fls. lemon-yellow, borne in 2's or 3's. A plant of beautiful form with full overlapping petals which are crimped at the edges; the small orange-colored glandular disk in the center of the fl. adds to its attractiveness. Feb., March. A garden hybrid. Gn.W. 22:291. The same cross as S. Böydii but freer growing and with larger fls. of a better form.

127. Salomónii, Sündern. (S. Burseriana × S. Rocheliana. S. salomónica, Hort.). The habit is more that of the former but the infl. and stronger growth that of the latter parent: rosettes usually 3/4 in. diam.: lvs. awl-shaped, 3-cornered with cartilaginous margins and deciduous glaucous: fls. 1 1/2-2 in. high, tinged red, pubescent and covered with lvs.; fl-buds suffused with pink, but lvs. white, more the substance of S. Rocheliana and born 3-4 to a rosette. Feb., March. A garden hybrid. Gn.W. 22:291.

128. Obristii, Sündern. (S. Burseriana × S. marginala). A robust plant, about 3-4 in. high, with rosettes about 3/4 in. diam.: sts. glandular and tinged red-brown: lvs. strap-shaped, acute, with 4 or 5 chalk-pits on their margins: fls. 2-4 to a rosette, large, almost 1 in. across; ivory-white; petals broad, rounded and overlapped as in S. marginala. March. A garden hybrid. G. C. III. 49:229.—It is very like an enlarged S. Burseriana in general appearance though the foliage is intermediate and the lvs. resemble S. marginala. Another distinct form resulting from this cross is S. Sündermannii.


130. Irwingii, Hort. (S. Burseriana var. macrantha × S. Frederici-Augusti, S. Burseriana var. elegans, Hort. S. Burseriana var. roseea, Hort.). This partakes more of the character of the former, with similar tufts of foliage and single lvs. The latter parent shows in the color of the fls. which are bluish-pink, deeper at the center. The fl-sts. are about 1 in. so high and the plant is very free-blooming. March. A spontaneous hybrid at Kew. G. C. III. 57:158. G. 73, p. 193; 79, p. 152. G. M. 58:149.—S. kevenis is another product of the same cross but more allied to S. Frederici-Augusti.

131. kevenis, Hort. (S. Burseriana var. macrantha × S. Frederici-Augusti). About 2-3 in. high with the lvs. of the latter parent but the cushioned habit of the former: sts. pale glandular-hairy; bracts red tipped with green; lvs. intermediate in shape; sepal red and glandular, while the petals are rose, much deeper colored toward their base. March. A garden hybrid. G. C. III. 51:247.


133. Paulina, Sündern. (S. Burseriana var. minor × S. Ferndinandi-Coburgi). Habit compact, nearer like that of the latter parent, about 2 in. high, with larger rosettes of glaucous foliage: sts. tinged with red and fls. pale yellow, about 3/4 in. diam. March. A garden hybrid.—Somewhat resembles S. Burseriana but the foliage is more glaucous and the rosettes are smaller. Var. compáctica, Hort., is said to have compact cushions
of dark green foliage and stout sprays of clear yellow
fls. resembling S. Bogdai.

134. Halgei, Sundern. (S. sacta x S. Ferdinandiana)
Curiously resembles the latter parent.
Its habit is very compact, its foliage is similar and glauc-
ous: fl-sts. 2-3 in. high, bracted, tinged red-brown
and glandular-hairy: fls. golden yellow, 4-5 to a st.,
clustered in heads. March, April. A garden hybrid.
Hort. 78, 1: 170.

135. Godseffiana, Hort., also known as S. Godseff
and S. L. S. Godseff (S. sacta x S. Elisabetha)
Habit of growth intermediate, foliage spiny and in close tufts:
fl-sts. 3-4 in. high, reddish and having reddish green-
tipped lvs. fls. an improvement on S. Elisabetha, being
deeper crimson and having better for fruit. A garden hybrid.

S. atrosaevia, Hort., is offered in the trade as a form growing 6 in.
high, with white fls. Probably belongs in Section Dactylodes.—S. Bogdai,
Bogdai, is offered in the trade and said to have white fls.—S. crassula, Hort.,
forms a hybrid in the trade as one of the easiest to grow, fls. white. Perhaps a misspelling of cori-
opus, the same plant as S. roburica. S. coriopus, is said to have
very slantly balsated foliage and pretty little panicles of white
fls. borne on sts. 4 in. high. It belongs to Section Eucosmica.—S. crassula
Hort., is offered in the trade as a form growing 6 in. high,
with white fls. Probably a form of S. Aizoon near var. para-
doxa, S. truncata. S. crassula Hort.,—S. elaeagni, Hort.,—S. elaeagni var.
major, S. gracilis, Hort., is offered in the trade as growing 6 in.
high, with white fls.—S. gracilis, Hort., forms cushions of rather pale
green, about 6 in. high, the growth being packed and somewhat
related at base of the stem more white and numerous. Probably belongs
in Section Dactylodes.—S. Hæferti, Hort., is offered in the trade.—S.
Hæfra Hort., not others.—S. Hæfra, Haw.,—S. hæfra, Haw.,—S. hæfra, Hort.,
not Don, is listed as belonging to the encrusted section and as having white fls.—S. incrustata, Don.
is a form of the plant Oettingen, seems to be the same as
S. incrustata, Hort.,—S. latifolia, Wimm.—S. Aizoon var. major.—S.

Var. pilifera, Hort.,—S. Eucosmica.—S. E. 38: 839.

S. mendax. Tr. 15: 113.

S. mendax var. gracilis, Hort.,—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. minor, Hort.—S. Eucosmica.—S. E. 38: 839.

S. mendax var. major, Hort.—S. Eucosmica.—S. E. 38: 839.
3. *stellata*, Linn. An annual plant, hairy, simple or somewhat branched, 6-18 in. high: lvs. cut or somewhat lyrate, the terminal lobe large, obovate, dentate, the upper ones often pinnately parted; fls. blue, in long-peduncled heads; corolla 5-cleft, the lobes radiate. June and later. S. Eu.

4. *brachiatä*, Sibth. & Smith. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately cut, lyrate; the lower lobes deciduous, the terminal large, obovate, oblong: fls. light blue, purple, and later. Eu., Asia. Recent authors have kept this distinct as the type of the genus Calistemma where it becomes *C. brachiatum*, Boiss.

5. *ucranica*, Linn. (S. Wulfenii, Roem. & Schult.) Biennial or perennial: sts. erect, branched: lvs. pilose-pubescent with appressed white hairs; the lower pin-nately parted, segms. oblong or oblong-linear, entire or dentate; the upper often undivided: calyx-limb short-stipitate; corolla white or yellowish white, rarely rose or blue, lobes nearly entire or crenate; fruiting head spherical. Eu., Asia Minor, and Persia.

6. *Reuteriana*, Boiss. Annual: st. erect, branched: lower lvs. oblong-oblongate, entire; the other lvs. lyrate, lateral segms. on each side 1-2, short, lanceolate, terminal segm. much larger: involucre hirsute, involucre bracts in 2 rows, very unequal, shorter than the fls.: nana or Tom Thumb. This is the group listed in the trade as Tom Thumb. The forms of *S. atropurpurea* are among the most popular of flower-garden annuals. Seeds sown in the open ground in spring should give bloom in early summer and continue till frost. The composite-like heads are produced on long stalks, good for cutting.

S. *pumila*, Hort., also known horticulturally as *grandiflora minor*, is a smaller-growing group of plants, very much branched, of which the following forms are named in the trade: *S. minor aurea* flore-pleno, also known as *S. minor aurea* flore-pleno, which has bright yellow double fls.; *S. minor jolite-aurea* with yellow foliage, and *nana pumila*. Var. *pumila*, Hort., also known horticulturally as *grandiflora pumila*, is a dwarf group occurring in various colors; there is also a double form horticulturally known as *pumila flore-pleno*. This is the group listed in the trade as *S. atropurpurea*....
SCÁNDIX (Greek, to sting, in reference to the roughness of the fr.). UMBELLIFERÁ. Glabrous or pubescent annual herbs, one of them grown for foliage and bloom: lvs. pinnately decompound, the segms. small and narrow; umbels compound, few-rayed, or now and then simple (1-rayed); involucre none or 1-bracted; fls. white, polygamous; calyx-teeth minute or wanting; petals often unequal, oblong, cuneate or obovate: fr. oblong-linear, laterally compressed, long-beaked, primary ridges prominent, broad obtuse or filiform.—About 12 species natives of temperate or subtropical regions of the northern hemisphere.

Pécten-Venéris, Linn. Fig. 3565. A hardy garden annual 6-12 in. high, with finely cut lvs. and small white fls. in simple umbels. Et. —Little grown.

S. cerefoliúm, Linn. See Chervil.

SCAPHOSÉPALUM (Greek, boat and sepal, alluding to the form of the lower sepal). Orchidáceas. A genus separated from Masdevallia on the character of the lateral sepals, which are united into a boat-shaped organ. In habit the plants resemble masdevallias, except that the parts of the rhizome are longer, thus making the tufts less compact, and the racemes assume climbing habits, becoming very long and bearing fls. for months in succession. The dorsal sepal is free or partly connate with the petals and rather spreading, lateral broader than the dorsal; petals similar to the sepals; labellum articulate or continuous with the foot of the column, not divided or obscurely lobed; column rather long, 2-auredicated at the apex; pollinia 4.—About 15 species. Mex. to Brazil.

álba, Rolfe. Sts. fascicled, narrowly spine-shaped, 1½-2 in. long, 2-lvd.: lvs. linear, 1½-2½ in. long, minutely biobed at apex; fls. small, white, in fascicles of 3 or 4; sepals oblong; rather connivent; petals somewhat narrower; lip cuneate-oblong, nearly entire. Hab. (?).

S. Cogniauxiana, Wildem. A small species with narrow lvs. 2-4 in. long; fls. greenish yellow; sepals acute, petals subacute. Brazil.—S. sedólo, Lock. differs from S. volácea in having larger fls., with more spreading segms. and lateral lobes of the lip as large as the middle one. Guinea.—S. volácea, Lindl. Sts. terete, articulated, 2-3½ in. long, linear or linear-lanceolate; fls. violet, minute; lateral sepals twice as broad as the dorsal; lip white, filiform, cuneate. Guinea. B.M. 4071. B.H. 1903.

F. TRACY HUBBARD.

SCHLENÓSTOMA: Charántoma.

SCHAUÈRÍA (after J. C. Schauer, professor at Greifswald, 1818-1848). Acanthácceas. Erect half-shrubby herbs, of greenhouse cult., with entire lvs.; fls. yellow or red, in a terminal thyrse or spike; calyx 5-parted, segms. linear or setaceous; corolla-tube long, gradually broadened upward; limb 2-lipped, the upper lip interior narrow, entire or emarginate, erect, lower lip cut into 3 subequal, recurved segms.; stamens 2 each, with 2 parallel anthers, about as long as the upper lip; aborted stamens wanting; style filiform; ovary seated on a disk, 2-loculed, with 2 seeds in each locule.—About 8 species from Brazil. Closely related to Jacobinia, from which it differs by the equal parallel anther-cells. It is distinguished from Anisacanthus by its setaceous calyx-lobes, and from Fittonia by its habit.

flavicoma, N. E. Br. (Justicia flavicoma, Lindl. Justicia flava, Hort., not Kurz.). Fig. 3566. Half-shrubby plant, with erect, branched sts. up to 4 ft. high: lvs. opposite, petiolate, ovate to ovate-lanceolate, shining green, undulate; fls. light yellow, 1½ in. long, borne in erect, feathery panicles; calyx-
lobes long, subulate, glandular-haired, or glabrous, scattered, or several along the main leaf axis. The leaves may be simple, palmately compound, or digitately compound. The flowers are usually showed in the axils, stalked, the corolla 2-3 in. long, the tube inclined or drooping. A glabrous vine 6-18 ft. high:

**Schina**


**Schima** (said to be an Arabian name). *Ternstroemia*. Evergreen trees or shrubs, suitable for the greenhouse or hardy in the far South. Leaves various, mostly digitately compound, rarely simple and then usually mixed with compound lvs., very seldom double digitately compound: fls. in umbels, heads, or racemes, these mostly arranged racemously, seldom in whorls; calyx- limb weakly developed, obscurely and shortly toothed or almost lacking; petals 5 or more (15), mostly 5-6. Stamens as many as the petals: fr. globose to ovate or elongated, sulcate or angular. About 150 species in the tropical regions of the world. Para-
tropia Sieberiana, Bar.-Rodr., belongs to this genus. See under Para-
tropia. A glabrous vine 6-18 ft. high:

**Schinus** (Greek name for the mastic-tree, Pistacia Lentiscus; applied to this genus on account of the resino-
vous mastic-like juice of some species). *Asafoetida*. Resinous dioecious trees, one much planted in California.
Leaves alternate, pinnate; lfts. sessile, axillary: panicles terminal, bracteate: fls. small, white, with short, 5-lobed calyx, 5 "umbellated" petals, broad annular disk, and 10 stamens: fr. a globose drupe. —About 17 species, all S. American except one in the Hawaiian Isles, one in Jamaica, and one in St. Helena. Only two are cult.: they are semi-tropical and grown in the warm-house at the E. and in N. Eu., in the open at the S. and in Calif., as far north as the San Francisco Bay region. Schinus molle, the old generic name, is from Mulli, the Peruvian name of S. molle, and not, as sometimes supposed, Latin molle, soft, which would not be applicable in this case.

**Schinus Molle** is everywhere present in southern California, where it attains a height of 50 feet and soars itself. It was a great thing for this region in years past before the water systems had reached their present efficiency. Now the pepper-tree is under a ban, and justly so. Next to olive, the pepper-tree is most subject to black scale. Hence the pepper-trees, being large and numerous, have been indirectly a serious menace to the orchards of citrus fruits. Thousands of old trees, 2 to 3 feet in diameter, have been cut because of their proximity to orange orchards. Los Angeles boasts some magnificent avenues of them. *S. tomentosifolius* is but little known in this region, the tallest tree being only 15 feet as yet, but it is likely to be extensively planted in the near future. (Ernest Braunton.)

**Molle, Lind.** **PERUVIAN MASTIC-TREE, CALIFORNIA PERUVIAN-MASTIC-TREE.** Figs. 3567, 3568. Evergreen tree, 20 ft. and more, with rounded outline and graceful, pendulous branchlets when not trimmed: lvs. 9 in. or more long, glabrous, of many alternate, linear-lanceolate lfts. 1½–2 in. long; fls. in conical panicles, yellowish white; ripe berries black. W. S. Amer. B.M.7406.

**Schinus molle,** Linn., is now considered a subgenus of *Schinus.*
white, the total mass of green being less than the varie-
gation; petiole 3—4 1/2 in. long: blade 4-5 x 1 1/2-2 1/2 in.
nae was offered in 1853 by John Soal, Wash-

ngton, D. C.

Upper surface of blade ashy-striped.

Longispâtha, Bull. Lvs. ovate, base slightly cordate, apex acuminate, upper surface green with minute white dots, lower pale black-dotted; petiole about as long as blade. Borneo. Var. albo-maculata, Engler (S. cri-
spinata, Hook.).--S. rubriflora, Hook. & Thoms.

cc. The petiole about equaling the blade and verrucose.

asperâta, Engler. Caudex short: lvs. ovate or ovo-
vate, base cordate or only emarginate, apex acuminate, upper surface green with minute white dots, lower pale black-dotted; petiole about as long as blade. Borneo. Var. albo-maculata, Engler (S. cri-
spinata, Hook.).--S. rubriflora, Hook. & Thoms.

BBB. Blade ovate-oblong or its outline more or less triangu-
lar and cordate or rarely cordate-ovate, sometimes variegated in the same specimen.

c. Adult s-blades oblong-ovate, base distinctly cordate; blade ashy-maculata.

neoguineennis, N. E. Br. (S. neoguineennis, Engler.

S. variegtata, Hort., not Hook.). Lvs. ovate-cordate, bright green, irregularly blotched with pale yellowish green, the total mass of green being greater than the varie-
gation; blade 8—9 x 6—7 in. long, New Guinea. I.H. 27:380 (as Colocasia neoguineennis, the variegation being a bright cream-colored white).--S. variegtata, Hort.

cc. Adult s-blades t'fin, broadly ovate-cordate, white or palely ashy-maculata.

Picta, Schott. Lvs. ovate-cordate, the basal lobes short, but the sinus deep, dark green above, marked with lacertoid glaucous spots at the middle, on each side of the midrib, and between the nerves; petiole 8—10 in. long: blade 6—7 in. long. Java.

BBBB. Blade broadly ovate-cordate, slightly longer than broad, posterior lobes semi-ovate.

latifolia, Miq. (S. rugprtsis, Zoll. & Mor.). Caudex thick; above ground: lvs. ovate, acute, deeply cordate, 6—18 x 6—12 in., upper surface dull green, lower paler, posterior lobes semi-ovate, sinus acute; petiole usually longer than the blade. Java, Celebes, and the Philippine.

S. oblongoflora var. Catttii, Hort., is offered in the trade but is apparently not known botanically. (S. Roebelw, Fischer & Mand. 1895, p. 138. "Lvs. beautifully marked with silvery white in a broad leafy variegation. Only the center and edge of the lvs. are plain light green. The plant is compact, tree-growing, with falcate lvs. as enduring as those of a rubber tree. A fine house plant." This plant is imperfectly known. It is figured in Pitcher & Manda's catalogue for 1895:141 as S. picta and in V. 23:71 (1899) as S. crispata. The plant so pictured is distinct from any species described above. There is more white than green in the lvs., the entire blade and midrib portion being green. Some growers think it to be a sport of S. aspera var. albo-maculata.—S. Seemann, Hort. Bull. was addressed by his botanical name. (S. Niesy, var. Picta, P. Tracy Hubbard.)

SCHISMSUS (Greek, schisma, a cleft, referring to the 2-lobed lemma). Gramineae. Low annuals with short dense panicles of pale shining spikelets. Species 4, Medit. region and Afr. S. calcigenus, Coss., has recently been intro., but is of no horticultural importance.

A. S. Hitchcock.

SCHIZDRA (Greek, to split). Schizandra is a group of small ferns with twisted grass-like lvs. and sedge-like sporophylls formed of a cluster of closely com-
pacted pinnae, each with 2 rows of sporangia, which in common with the family are pear-shaped, with an apical ring, opening by a vertical fissure.

S. pulsiflora, Pursh. Our only native species, growing in sand at the edges of bogs, mainly in N. J. Lvs. 1 in. long, grass-like, twisted sporophylls 2-3 in. long, with the apex expanded and consisting of 6-8 closely com-
pacted divisions. Known locally as club-grass. The prothallus resembles the protomma of a moss, being filamentous rather than thalloid as in ordinary ferns.

L. M. Underwood.

SCHIZANDRA (Greek, schizhen, to cleave, and aner, andros, man, stamen, referring to the cleft or separate anther-cells). Including Sphenaneris and Magnolioduce. Ornamental vines grow chiefly for their handsome bright green foliage and the scarlet or orange-red berry-like fruits.

Deciduous twining shrubs: lvs. alternate, long-petioled, entire. Propagation is by seeds, by greenwood cuttings, in cuttings under glass, root-cuttings or layers, and also by suckers.

coccinea, Michx. High-climbing shrub: lvs. slender-petioled, ovate or oval, acuminate, entire or obscurely dentate, glabrous, 2-3 in. long: flowers white or red, berries scarlet or red, rarely black, berry-like fruits forming drooping racemes.

S. chinensis is hardy North, while the other Chinese species are somewhat tender; the native S. coccinea can be grown only South. They may be used for covering rocks, tress, shrubs, or fences, and seem to thrive most in partly shaded and somewhat moist places in a porous, sandy loam. To enjoy the very showy fruit which ripens at the end of August or in September, both sexes must be planted together, as most species are dioecious.

S. suiswai, F. L. H. Ev,., a cleft, referring to the cleft or separate anther-cells. Includes Sphenaneris and Magnolioduce. Ornamental vines grow chiefly for their handsome bright green foliage and the scarlet or orange-red berry-like fruits.

Deciduous twining shrubs: lvs. alternate, long-petioled, entire. Propagation is by seeds, by greenwood cuttings, in cuttings under glass, root-cuttings or layers, and also by suckers.

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A monotypic genus, the species being S. elegans, Meissn. (S. Grahamii).Fig. 3569. The most variable of the species, with many horticultural forms distinguished by height of st. and color-markings of the fls. Typically 2 ft. high; lvs. 1–2-pinnatisect; the segms. entire, dentate or incised pinnatifid; fls. varying in depth of color, the lower lip usually violet or lilac; the upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B.M. 2404; 2521. B.R. 725; 1902 (as var. pubescens, var. pubescens, G. W. 12:613. G.W. 3, p. 497.—The plant known horticulturally and in trade as S. grandiflorus, Hort., and variations, undoubtedly belongs to

Var. albus, Hort. (S. grandiflorus albus, Hort.), has fls. slightly larger than the type, offered in several forms in the trade. Var. niveus, Hort., has pure white fls. Var. compactus, Hort., is a compact form similar to var. niveus, and offered in several forms in the trade. Var. lilacinus, Hort., has lilac fls. Var. nana, Hort., is dwarfer than the type, offered in several colors in the trade. Var. papilionaceus, Hort. (S. grandiflorus papilionaceus, Hort.), has a purplish black blotch surrounded with yellow at the base of the middle segm. of the upper lip or with the typical yellow portion dotted with small dark purple spots. H.F. 1862:451. H.F. II. 2:294. Var. papilionaceus, Hort., has a central coloroglyph, what as var. oculatus, with the general color of the fl. marbled in various shades. Var. roseus, Hort., has rose-colored fls. Var. tigrinolus, Hort., is also cult.

F. TRACY HUBBARD.
purple, nearly 1 in. broad; fr. very hairy, producing seed freely by which the plant is readily prop. (or by cutting). Vera Cruz, Mex. G.C. III. 42:293. Gt. 62, p. 275. This species, although first described in 1839, has not been in cult. until since its rediscovery in 1901 at Jalapa by J. N. Rose. It is a very dainty plant, well worthy of ornamental cult. It is grown to some extent in Mexican gardens at an elevation of about 3,000 ft., where it does unusually well, growing apparently as well in shade as in the bright sunlight. The plant has been grown for a number of years in the N. Y. Botanical Garden, and when in full flower makes a most striking display. It forms a dense mat and is well suited for close carpet-bedding.

J. N. Rose.

**SCHIZOCÔDON** (Greek cut and bell, referring to the fringed corolla). *Diapensiae*. Glabrous herbs, with the caudex perennial and scale-bearing between lvs., suitable for outdoor planting; lvs. all radical, long-petioled, ovate-rotund, base cordate, crenulate-undulate, leathery and bestent; fls. few at the top of the stolons, racemose, subsecund, nodding, 1–2-bracted; calyx 5-parted, the segms. linear-oblone, striate-nerved; corolla funneliform, 5-lobe, the lobes truncate, fimbriate, and imbricate; stamens 5; ovary ovoid-globose, 3-angled.—Perhaps 4 species. Japan. S. **soldanelloides** is a pretty alpine plant or boreal with rosy fls. fringed like the well-known soldanellas of the Alps. It may be readily distinguished from Soldanella (which is a member of the primrose family) by the lvs. being toothed, and the stamens 4 instead of 5. The name “fringed soldanella” has been proposed for schizocodon, but all soldanellas are fringed. “Fringed galax” would be better, as galax is the nearest relative, schizocodon being, in fact, the Japanese representative of the American galax. The lvs. of schizocodon are sometimes more or less bronzy, like those of *galax*, but *soldanelloides*, obtuse; corolla deep rose in center passing into bluish or white at the edges; staminodes linear. Japan. B.M. 7316. Gn. 44:418. G.C. III. 13:415; 51:348. G.M. 36:206. J.H. III. 34:523; 44:347. V. 20:119.—This is probably the only species in the genus, as *S. vulgatus* Shortia and *S. uliginolus* is thought to be a variety of *S. soldanelloides*, with more variable lvs. and fls. ranging from red to white. Offered by many European dealers, and by one or two Americans; little known here.

F. TRACY HUBBARD.

**SCHIZÔLÖBIUM** (Greek, to cleave and pod, alluding to the manner of dehiscence). *Leguminossae*. Tall trees adapted to the warmhouse and planted outdoors in the extreme South: lvs. large, bipinnate; lfts. numerous, small; fls. in axillary racemes or in panicles at the ends of the branches; calyx-tube disk-bearing, oblique, turbinate, the segms. slightly unequal, reflexed; petals 5, clawed, ovate or rotundate, slightly unequal; stamens 10, free, ovary scarcely stipitate: legume compressed, obovate, 2-valved, 1-seeded.—One, possibly 2, species. Brazil and Panama.

**SCHIZÔPÉTALON** (Greek, cut and petals, alluding to the cut petals). *Cruciferae*. Half-hardy erect annual herbs used in border planting; lvs. alternate, sinuate, dentate or pinnatifid; fls. purple or white, in terminal, leafy-bracted racemes; sepals erect; petals clawed, pinnate-lobed, involute; silique narrowly linear, knotty; seeds many.—About 10 species. S. Amer. S. Walkeri, Sill. S. weak, assurgent: lower lvs. 4–5 in. long, sinuate-pinnatifid, elongate-oblong in outline, long-attenuate at base, secrably on both surfaces, distant; peduncles solitary, axillary, but collected at the top into a raceme; fls. white; calyx cylindrical; petals spreading, ovate, incise-pinnatifid. Chile. B.M. 2379. G. 24:240.

**SCHIZÔPHRAGMA** (Greek, schizein, to cleave, and phragma, wall; the inner layer of the wall of the valves is dehiscent by fleshy fibers). *Saxifragaceae*. Ornamental vines grown for their handsome bright green foliage and the showy clusters of white flowers. Shrubs climbing by aerial rootlets: lvs. opposite, long-petioled, dentate or entire; fls. in loose cymes; sepals and petals 4–5; stamens 10; free; ovary 4–5-loculed; marginal sterile fls. consist only of 1 large white sepal, terminating the branchlets of the inflo.: fr. a small, 10-ribbed caps.—One species in Japan and another in China, allied to Hydrangea and Decumaria. These are handsome woody vines with rather large bright green foliage and loose terminal cymes of small white flowers with large and showy sterile ones at the margin. They are well adapted for covering walls and trunks of trees and cling firmly by means of aerial rootlets. The Japanese species is hardy as far north as New York City, while the Chinese one is tenderer. They thrive best in rich, moderately moist soil and partial shade, but also do well in full sun if the soil is not too dry. Propagation is by seeds or hardwood cuttings under glass; also by layers.

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Burma, to Java and Timor. Intro. into timber is good, the bark is astringent and when mixed
subsequently: racemes axillary: fls. yellowish or green: flowers oblong, obtuse or short-acuminate, entire, sessile or corymbose.-Two species, Asia. S. trijuga, Willd. A large tree: lvs. paripinnate, 8-16 in. long; lfts. simple, lanceolate, complicate: fl.-heads in the spathe; bracts narrower than the spathe, green or somewhat scarious, 2-keeled; petals showy, red, the tube slender, the lobes equal, oblong or ovate; ovary 3-celled: capsules obvoid or oblong, the top truncate, 3-grooved, membranaceous.—Two species, S. Afr.

coccinea, Backh. & Harv. Crimson Flag. A winter-blooming tender plant: st. 1-2 ft. high, bearing 2-3 lvs.: basal lvs. 2-3, about 1½ ft. long; fls. bright red, about 2 in. across. B.M. 5422. F.S. 16:1637. G.L. 24:208. J.H. III. 48:589.—The following cultural notes are taken from Garden and Forest 9:156. The species blooms from Oct. to early Dec. and is useful (or cut-flowers at this season. It is perfectly hardy in England but of little use here except for indoor use. The roots should be planted out in rich soil in spring about 8 in. apart, and encouraged to make a strong growth. The plants may be placed in a cool greenhouse, where they will flower. After flowering they may be stored in a frame until the following spring, when the fleshy roots will need to be separated about 8 in. apart, and encouraged to make a strong growth. In the fall the plants may be lifted, potted and placed in a cool greenhouse, where they will flower.

SCHIZOSTYLOS (Greek, to cut, and style, alluding to the silifom segments of the style). fridacea. Greenhouse or half-hardy plants: stts. fascicled on the rachis. Leaves linear or slightly bullate-thickened at the base. Lvs. linear or narrow-ensiform: stamens 5-8; ovary 3-4-celled: flowers dry. (Schlumbergera.) Schizostylis for J. C. Schleicher, a Swiss botanist.

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SCHOMBOLIELIA (compound from Schomburgka and Lelia). Orchidaceae. A generic name to designate the hybrids between Schomburgkia and Lelia. S. tibicinis = S. tibicinis x L. tenebrosa.

SCHOMBOLEIOCATLEYA (compound from the names Schomburgkia and Leiolcattleya). Orchidaceae. A name to comprise the hybrids between Schomburgkia and Leiolcattleya. S. schombromium = S. rosea x L. Lucya.

SCHOMBURGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). Orchidaceae. Orchids with the habit of cattleyas or lalias, except that they are less compact.

Pseudobulbs long, fusiform, bearing several brown scales and 2-3 leathery lvs. at the summit; ft.-sts. from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls.: fls. like those of Lelia except that the sepals and petals are narrow and undulate and the labellum does not completely envelop the column; labellum always evidently 3-lobed. About 15 species, in Trop. Amer.

3571. Schomburgkia tibicinis. (X1/2)

Give schomburgkias plenty of heat and a light place near the glass, which should be slightly shaded during the hot summer months. Provide freely of water in the growing season. Rest them in a temperature of 55°. S. tibicinis and S. Lycens are to be classed amongst the showy easily grown orchids resembling lalias. (Wm. Mathews.)

tibicinis, Batem. (Epipendrum tibicinis, Batem.). Fig. 3571. Pseudobulbs 1-1 1/2 ft. long, tapering upward: lvs. 2-3, oblong, leathery: raceme 4-8 ft. high, bearing numerous fls. each 3 1/2 in. across; sepals and petals oblong, undulate, crisp; lateral lobes of the labellum large, cucullate, middle lobe small, emarginate; fis. deep pink, speckled with white on the outside, rich chocolate-red within; labellum white within, deep rose-color at the sides, with a short chocolate-red middle lobe. Summer. Honduras, Cuba G.C. III. 4:212; 7:651. Var. grandiflora, Lindl. Fls. larger and paler, with more yellow in the lip. B.R. 31:30. B.M. 4476.

F.S. 1:54.—S. tibicinis requires less compost than the other species.

Lyonsii, Lindl. Pseudobulbs about 1 ft. high, with 2-3 linear-oblong lvs., at the top: racemes erect, 9 in. long, bearing 12-25 fls., each subtended by a reflexed bract about 3 in. long; fls. 2 in. across; sepals and petals ovate to ovate-lanceolate, undulate, white with several rows of purple spots; labellum larger, recurved, acute, white, with a yellowish brown crisp margin; anther 2-horned. Aug. Jamaica. B.M. 5172. F.S. 20:2130. G.C. III. 26:203.

S. rosea, Lindl. Related to S. undulata. Bracts, peduncles and labellum light rose: sepals and petals oblong, undulate, narrower than the labellum; labellum with rotund lateral lobes and a smaller subrotund middle lobe, margin crisp. Colombia.


S. Lueddemannii, Prill. Fls. brown, with the lip and column purple, and the crest and anther yellow: sepals and petals linear-oblong, obdurate, manifestly undulate. 1 1/2-1 3/4 in. long, lip 3-lobed, 3 in. long, the middle lobe ovate-ovaricular, apicate, about 1 1/2 in. long, the edges incurved near apex. Venezuela. B.M. 8427.—X. Sanderae, Rolfe. Fls. rose-earmine; sepals lanceolate-oblong, 1 1/4 in. long; petals oblanceolate-oblong; lip obscurely 3-lobed, 1 1/2 in. long, the front lobe broadly rounded obtuse, crisped-undulate. Origin unknown. J. H. III. 51:383.—S. Thomtomaea, Reichb. f. Sepals and petals linear-oblong, 1 1/4 in. long, crescent-white passing to yellow at apex, the sepals undulate, the petals crisped; lip 3-lobed, the middle lobe obtuse, emarginate, much crisped, deep purple, with a yellow disk. Cayman IIs. B.M. 7815.—X. Willisi, Reichb. f. Resembling S. Lueddemannii. Lip with broad obdurate side lobes, and very acute front lobe, all brown at apex.

GEORGE V. NASH, †

SCHOMBURGKIOCATTLEYA (compound from Schomburgkia and Cattleya). Orchidaceae. A genus established to contain the hybrids between Schomburgkia and Cattleya. S. spiralis = S. tibicinis x C. Mossiae.

SCHOTIA (named for Richard Schot, companion of Jacquin during his travels in America, 1754-1759). Leguminosae. Small trees or unarmed shrubs, suitable for greenhouse-growing.

Leaves odd-pinnate; lfts. leathery, or small; stipules short; fls. red, showy, clustered in short panicles; bracts and bracteoles ovate or oblong, caduceous; calyx-tube disk-bearing, turbinate; short or long; the base long-attenuate, segms. 4, strongly imbricated; petals 5, slightly unequal, sub sessile, imbricated, either ovate or oblong or minute scale-like; stamens 10, free, or shortly con nate at the base; ovary stipitate; legume oblong or broad-linear. About 6 species. Subtrop. and S. Afr.

a. Fls. on rather long pedicels.

b. Petals longer than the calyx

speciosa, Jacq. A tree or shrub, about 10 ft. high; lvs. variable in form, which fact has led to much separa tion of this species into varieties and species; lfts. 8-32, linear, oblong, or ovobovate: fls. crimson, in terminal panicles. S. Afr. B.M. 1153 (as S. tamarnindifolia).—Intro. in S. Calif.

bb. Petals shorter than the calyx.

brachypetala, Sonn. A large shrub or small tree: lfts. 8-10, larger than in S. speciosa, ovobovate or obovate: panicles many-fl., axillary and terminal; calyx-tube conical, crimson; petals very small, linear, hidden by the calyx. S. Afr.—Cult. in S. Fla. and S. Calif.
SCHOTIA

AA. Fls. nearly sessile.

latifolia, Jacq. Becoming a tree 20-30 ft. high: lfts. 4-8, ovate-oblong or obovate, usually 1½-2¼ in. long, ½-1 in. wide; fls. rosy or flesh-colored, in much-branched panches; petals longer than the calyx. S. Afr.—Advertised in S. Calif. F. W. Barclay.

F. TRACY HUBBARD.†

SCHRANKIA (named after F. B. Schrank, a Bavarian botanist); also spelled Schranciea. Leguminosae. Perennial herbs or subshrubs, often prostrate, armed with recurved prickles. The species in common cult. is

an outdoor plant. Lvs. bipinnate, often sensitive, petiole without glands, frequently bristly between the pinnae; the lfts. small; stipules bristle-like; fls. in globose heads or cylindrical spikes, peduncles solitary or fascicled at the axils, rose or purplish, 5-4-merous, sessile, perfect or polygamous; calyx very minute; petals longer than the calyx. S. Calif. F. W. BARCLAY.

SCHUBERTIA grandiflora. (X3)

SCHUBERTIA (named after Gotthilf Heinrich von Schubert). Asclepiadaceae. Twining shrubs, occasionally grown in the greenhouse: lvs. large: fls. large, white, borne in loose umbels; sepals ovate, generally acute, alternating with single glands; corolla funneliform or salver-shaped, with a broad tube; crown upright, included: follicles thick and hairy.—About 6 species from S. Amer. S. grandiflora, Mart. & Zucco. Fig. 3572. Branches twining, straw-colored, covered with long red-brown hairs; lvs. coriaceous, obtuse, with long surfaces densely brown-pubescent; umbels few-fl.; pedicels long-hairy: fls. white; sepals ovate-acute; corolla large, tube gourd-shaped, glabrous inside, the lobes oval-longish, obtuse, erect, sparsely pale yellow pubescent. Brazil. G. 36:503; 37:351. Gt. 50:1492. G. F. 3:369 (adapted in Fig. 3572). G. 2:256. S. graveolens, Lindl. (Ardisia graveolens, Mast.), is a Brazilian climber, likely to be found in collections of greenhouse plants, smaller-fl. than the above. See also Physianthus. There may be confusion in the use of the names S. graveolens, S. grandiflora, and Physianthus auricomus.

SCIADOCALYX: Isoloma. The following species was not treated under Isoloma, see Vol. III, p. 1705.

Isoloma Warszewiczii, Hort. (Sciadocalyx Warszewiczii, Regel. Kôtleria Warszewiczii, Honst.). Perennial herb, 3-4 ft. high, with catkin-like stolons: st., petioles, lvs., and calyx villous-hirsute: lvs. opposite, long-petioled, oval or cordate, crenate: fls. in axillary umbels of 3-6 fls., bright yellow or yellowish green, red or brown-dotted; calyx adnate to ovary, 5-lobed, lobes almost horizontally spreading; corolla almost oblique at base, tube slightly inflected, limb 5-lobed, lobes rounded; ovary hirsute, surrounded by a glandular, 5-lobed ring. Columbia. B. M. 4843. Gt. 2:256.

SCIADOPHYLLUM (shade leaf, because of the umbrageous foliage). Araliaceae. As understood by Benthum & Hooker in Genera Plantarum, it is a genus of the American tropics, at that time with about 22 known species, differing from Schefflera, among other things, in the calyptrate or coherent rather than free petals and sometimes 4-merous fls. Harms, in Engler & Prantl’s Pflanzenfamilien, refers it to Schefflera, and under this name (p. 3108) are here described any species probably now in the trade.

SCIADOPITYS (Greek, skiás, skiaiados, umbrellas, and pitis, spruce, alluding to the position of the leaves). Pinaceae. Umbrella Pine. Ornamental tree grown for its handsome foliage and regular pyramidal habit.

Evergreen resinous tree; lvs. of two kinds; small and scale-like lvs. scattered on the shoot, but crowded at its end and bearing in their axils a whorl of 20-30 long linear flat lvs. furrowed on each side, more deeply beneath; these lvs. really consist each of 2 connate lvs. borne on undeveloped spurs like those of Pinus; they have been sometimes called cladodes, but are not true cladodes: fls. monocious; the staminate oval, consisting of spirally disposed 2-celled anthers and appearing in dense clusters at the ends of the shoots; the pistillate are solitary at the ends of the shoots and consist of numerous spirally arranged scales subtended by a small bract and bearing 7-9 ovals: cone oblong-ovate, woody, the bracts connate, with the broadly orbicular thick scales spreading at the margin; seeds oval, compressed, with narrow wing, marginate at the apex.—One species in Japan, with very strong and straight-grained, nearly white wood.

The umbrella pine is a very handsome tree of narrow
pyramidal habit, with linear, rather large, needle-like dark green and lustrous leaves in whorls and oval ovaries 3 to 4 inches long. It is hardy as far north as Portland, Maine, and is of rather slow growth. It thrives well in a moderately and constantly moist, loamy, and also in clayey soil; in dry soil or in soil which periodically becomes dry, it grows poorly. Propagation is by seeds and layers, and sparingly by cuttings of half-ripened wood in summer; but seedlings are to be preferred, as they grow more symmetrically and more vigorously.


**SCILLA** (the old Greek name used by Hippocrates: *I injure*, according to Miller, alluding to the poisonous bulb). **Lilium**. Scilla. *Witches'-Bluebell*. Perennial bulbous plants remarkable for easy culture, quick growth, and beautiful blue, rose, or white flowers, blooming early in the spring (some in the wild-garden, and although typically they have blue or blue-purple flowers, most, if not all, of the species in cultivation have white and red-purple forms. *S. sibirica* and *S. bifolia* are the earliest to flower, and of these forms the Taurian kinds are in advance. The form of *S. sibirica* known as *multiflora* is nearly past before the usual type begins to expand. There is also sometimes cultivated in the garden a beautiful white scilla, with hyacinth-like flowers, known to the trade as *S. amena*. But these white forms are mostly oddities; the effective ones are the blue-flowering kinds. Occasional hybrids between scillas and chionodoxas are met with (see page 749). *Chionooscilla Alleni* is the accepted name for a natural hybrid between *Chionodoxa Luciliae* and *Scilla bifolia*, first obtained by Mr. Allen, of England, in 1891.

None of the hardy squills requires special culture, and if planted where they can remain undisturbed for a score of years, they will be expected. If the soil is occasionally enriched by top-dressings of manure, the writer has grown them distributed in the grass of the lawn for a number of years with considerable success. The bulbs should be planted as early as possible in autumn. The varieties may be increased if taken after the foliage has matured. For the cool greenhouse or conservatory, many of the scillas are ideal subjects. For this culture, five or six bulbs may be put in a 5-inch pot and the vessel afterward transferred to a coldframe and covered until growth commences. Up to this period very little water will be required, but as the flower-cluster appears the quantity should be increased and the pots transferred to the greenhouse, giving them a position near the glass. The foliage matured, the bulbs may be shaken out of the soil and stored. More attention should be paid to the propagation of the scillas by commercial dealers, for these bulbs should become one of the features of the wild-garden in early spring.

The *Urginea Scilla*, sometimes called *Scilla maritima*, needs to be mentioned in this connection on account of its yielding a medicine for many centuries held in esteem. Almost everyone is familiar with sirup of squills, and has obtained relief from its use in severe colds. The scales of the bulb contain mucilage, sinistrin, sugar, and crystals of calcium oxalate (stated by botanists to ward off snails); the active principles are scilloperin, scillitoxin, and scillin (the latter producing numbness, vomiting, and the like). Scilla bulbs or roots should never be used unless under proper direction, as in their fresh state they are extremely acrid, and might prove dangerous.

The trade names are considerably confused. Many of the so-called horticultural species and races may be united as mere varieties of species that have been defined botanically. The following names are thought to include all those in the American trade, but other species are known to fanciers.

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SCILLA

KEY TO THE SPECIES.

A. Shape of fls. campanulate: color blue, blue-lilac, rose-purple, white.
B. Pedicels short: bracts linear, in pairs: raceme many-fld.; fls. broadly campanulate; produced from April to June. 1. nongrata

2. puschkinioiides

3. hispanica

BBB. Pedicels long (1–1½ in.); scape equilateral, compact; fls. cylindric-campanulate; perianth usually blue but often becoming rose-purple; or white; pedicels 1–1½ in. long. May, Spain and Portugal. B.M. 1102. Gm. 78, p. 456; 79, p. 255.—Durly. Several varieties of it are in the trade under the specific name campanulata, viz., alba, white; albo-majus, large white; cárnea, flesh-colored; hyacinthoides, hyacinth-like; rósea, rose-colored. This species is worthy of wider acquaintance. The bulbs are cheap and easily obtained in autumn, and if planted then they are sure to bloom the following spring.

4. numida, Poir. (S. pareflora, Desf.). Bulb ovoid, 1–2 in. thick; lvs. 4–6, fleshy, herbaceous, linear, 6–8 in. long, 1½–3 lines broad, suberect or paired, ½–1 ft. high; racemes dense, 30–60-fld.; pedicels short, ascending, 3–5 lines long; bracts minute, linear, evanescent; perianth rose-purple, 1½ lines long; single ovule in each of the ovarian cells: caps. small, globose, drooping. Flowering in winter in its native home, Algeria.

5. chinensis, Benth. (Dormidria scilloides, Lindl.). CHINESE SQUILL. Lvs. 2 or 3, equaling or exceeding the scape, rather hard, acute, channeled; bulb small, ovate; scape erect, slender, or wand-like; raceme spicate, dense, elongated; pedicels short; bracts minute, linear, evanescent; perianth rose-purple, 1½ lines long; single ovule in each of the ovarian cells: caps. small, globose, drooping. Flowering in winter in its native home, Algeria.

6. autumnalis, Linn. AUTUMN SQUILL. STARRY HYACINTH. Lvs. 5 or 6, glabrous, ascending, lanceolate, ½–1 in. broad, subobtuse, convex at back: scape long: raceme equilateral, compact: fls. cylindric-campanulate; perianth usually blue but often becoming rose-purple; white; pedicels 1–1½ in. long. May, Spain and Portugal. B.M. 1102. Gm. 78, p. 456; 79, p. 255.—Durly. Several varieties of it are in the trade under the specific name campanulata, viz., alba, white; albo-majus, large white; cárnea, flesh-colored; hyacinthoides, hyacinth-like; rósea, rose-colored. This species is worthy of wider acquaintance. The bulbs are cheap and easily obtained in autumn, and if planted then they are sure to bloom the following spring.

7. peruviana, Linn. (S. cluisii, Hort. S. Clusii, Parl.). CURAN LILY, PERUVIAN JACINTH. HYACINTH OF PERU (once thought to be a Peruvian plant). Fig. 3375. Bulb large, ovate, tunicate: lvs. many, broad-linear, 6–12 in. long; margins ciliate with minute white

3375. Scilla peruviana in full bloom.—Also known as Scilla cluisii. (X34)
bristles, channeled; scape robust, terminated by a many-fld. conic broad and compact raceme of purple, lilac, reddish, or whitish fls.; fls. rotate; corolla persistent; anthers short. May, June. Region of Medit., not Peruv. B.M. 749. Gn. 27, p. 288. R.H. 1882, p. 508. — The hyacinth of Peru is not hardy in Mass. It propagates freely by offsets. It flowers all through May and June and forms a most attractive object in the herbaceous border or bed. S. peruviana, however, has one fault that may tell against it in the opinion of many cultivators — it never flowers two years in succession; it seems to need a whole year's rest after the effort of producing its large spike of fls.

8. monopólia, Link (S. monopólia, Plan. S. pú­nita, Broit.). Dwarf Squill. Lf. solitary, inclosing the base of the scape, 2 in. long, 1/2 in. broad, involute, ovate-acuminate, with a callous apex, glabrous; scape erect, slender, usually 5-20-fld.: pedicels long, ascending, springing from a small sheathing bract; perianth bright lilac, 1/2 in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May. Spain, Portugal. B.M. 3023.—Hardy.

9. bifólia, Linn. Fig. 3376. Bulb tufted, oblong-oval; lvs. 2, seldom 3, curculate, 4-8 in. long, 1/2-1/2 in. broad; scape 2-5-fld., erbracteate; fls. stellately rotate; perianth blue, sometimes reddish or whitish; anthers blue, versatile. March. Eu. Asia Minor. B.M. 746.—Hardy. Several varieties of this exquisite little plant are in the trade: alba, white-fl.; rósea, pink-fl.; rubér-red-fl.; splendens, intense cobalt-blue fls. Cultivators would do well to obtain all the varieties possible; also as many bulbs of this beautiful species as they can afford. It is one of the most charming of hardy, early spring-flowering plants.

10. natalénsis, Planch. Bulb thick, large, ovoid, sub-globose; lvs. broadly lanceolate, glabrous, 9-12 in. long, 3-4 in. broad, ascending; scape erect, teetee, 1-11/2 ft. long; raceme dense, simple, elongated, open, many-fld. (50-100): bracts solitary, subulate; fls. pale blue, stel­late, rotate; pedicels long, pale blue. Natal. B.M. 3379. F.S. 10:1043.—Suitable for greenhouse cult. It is a graceful and elegant species, suitable for cult. in pots.

11. hyacinthoides, Linn. (S. pufúfora, Salisb.). HYACINTH SQUILL. Lvs. 10-12, spreading, 1-11/2 ft. long, 1/2-11/4 in. broad, narrowed at both ends, minute-eruaceous-denticulate on the margins; scape straight, long; racemes many-fl.; broad, open; pedicels long, 1-11/2 in.; bracts whitish, minute, persistent; perianth bluish lilac, open, campanulate. Aug. Medit. region. B.M. 1140.—Hardy. This species is noted for its extreme slyness in flowering. The bulbs are sometimes 2 in. diam., and produce a profusion of offsets. In Fish's Bulb Culture several varieties are mentioned:

12. sibírica, Andr. (S. aména var. præcoz, Don.). Siberian Squill. Fig. 3577. Lvs. 2-4, ascending, narrow, 4-6 in. long; scapes 1-6, 3-8 in. long; racemes 1-3-fld.; fls. rotate, horizontal or drooping, with short pedi­cels; perianth blue deep. March. Russia, Asia Minor. B.M. 1025. Gn. 11, p. 168. P.M. 14:100. L.B.C. 2:151.—Hardy. This plant ought always to have a little shelter. It forms attractive tufts and has a desirable habit for rock-gardens. Several trade forms exist, viz., alba, multifóra, pallidá; amnubla, dwarfer with brighter blue fls.

13. aména, Linn. SPAR HYACINTH. Fig. 3578. Lvs. 4-7, flaccid, ascending, glabrous, 6-9 in. long, 1/4-3/4 in. broad; scapes several, equaling the lvs.; racemes several-fld., 4-8, open; fls. distant, 1/2-3/4 in. diam., blue; pedicels ascending or spreading. March. Austria, Germany. B.M. 341. G. 37:293.—Hardy. It grows luxuriantly, several flowering sts. being found on the same plant.

14. itálica, Linn. ITALIAN SQUILL. Bulbs ovate, clustered together; lvs. radical, several, flaccid, spreading, lanceolate, acute, 4-8 in. long, 1/4-1/2 in. broad; scape solitary, slender, longer than the lvs.; raceme dense, many-fld.; pedicels filiform, spreading; bracts in pairs: fls. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segments, puberulous at apex; filaments white; anthers sagittate, dark blue. March-May. B.M. 663. L.B.C. 15:1483.—Hardy. This plant has less brilliant fls. than either S. sibírica or S. bifólia, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.

15. japónica, Baker (Ornithogalum japonicum, Thunb. Barnardia japónica, Schult. l.). JAPANESE JACINTH. Bulb ovoid, 9-12 lines thick; lvs. 2-3, fleshy, herbaceous, 6-12 in. long, 4-16 lines broad, acute; scapes 1-3, strict, erect; raceome 20-60-fld.: pedicels ascending: bracts minute, linear, white; perianth 1 1/2 lines long, rose-purple; caps. turbinate, trisulcate, 3/2-3 lines long; ovules solitary in each ovarian locule. Japan. The dwarf sibírica or S. peruviana, it is also noted for its extreme slyness in flowering. The bulbs are sometimes 2 in. diam., and produce a profusion of offsets. In Fish's Bulb Culture several varieties are mentioned:
Use in aquatic gardens. The nomenclature of those in

ennials (except perhaps the last), suited for shallow

ft. Racemes at the base, 2-3-cleft; fr. an achene with bristles attached.

- Rhapludophora pertusa. Jared G. Smith.

is sometimes kept separately as Cubcuaria marantifolia. Not known in broad: raceme many-flowered: perianth-segments white outside with

spikelets which are solitary, clustered or umbellate; scales spirally arranged; perianth of bristles or none, only a few species are in cult., and these are all perennials (except perhaps the last), suited for shallow water or damp places. The larger are important for

plants inhabiting the whole globe. Flowers perfect, in

clusters, tall and stout, 2-4 ft. high, bluntly triangular: lvs. long, coarse and firm,

3-6 lines wide, spreading: involucere foliaceous: umbel sparingly compound; rays stiff, very unequal; spiklets ovoid-oblong, acutish, dark greenish brown, in dense heads of 5-25; scales oblong, cuspidate; perianth-bristles 6, downwardly barbed above; styles 3. E. U. S. in mud or damp soil.

Holoeschénus, Linn. Stiff and rush-like, from stout rootstocks: sts. clustered, slender, cylindrical, 1-3 ft. high: lvs. 1-2, basal, stiff, erect and narrow, furrowed: bracts several, the larger one appearing as a continuation of the st.; spiklets very numerous and small, closely packed in 1 to several globular, light brown heads, 3-5 lines in diam.; scales ovate, mucronate, ciliate; perianth-bristles none; styles 2-3-cleft. Eu., Asia.—The form in cult is var. variegatus, Hort., with sts. alternately banded with green and yellowish white. Damp or dry soil.

AA. Sts. with very short basal lvs. or none.

b. Rootstocks very stout, creeping: sts. scattered, 3-9 ft. high.

lacinistis, Vahl. Great Bulrush. Sts. terete, smooth, tall, stout, and flexible, 3-9 ft. high: lvs. reduced to a few basal sheaths: bracts very short, erect: umbel compound, flexuous: spikes in heads of 1-5, oblong-conical, pale brown, 2½-8 lines long; scales ovate-oblong, obtuse, rarely mucronate; perianth-bristles 4-6, downwardly barbed throughout; styles 2-3. In shallow quiet water, N. Amer., Eu., Asia.—A composite species probably consisting in Eu. and Amer. of several distinct forms, each of specific rank. Typical S. lacinistis is a 3-style form common in Eu., not found in Amer. S. Tuberosomontanus, Gmel., is a European 2-style form. The horticultural variety of the latter species, with alternate bands of green and yellowish white, is var. zebra, Hort. (Juncus zebra, Hort.). S. collistis, Vahl, and S. occidentalis, Chase, are 2-styled American species. S. heterochéfetus, Chase, is a 3-styled American form. The bulrush is very effective as a border plant in aquatic gardens.

SCILLA (Latin for squill). SQUILL. CYPERACEAE. A large group of rush-like or grass-like plants inhabiting the whole globe. Flowers perfect, in spikes which are solitary, clustered or umbellate; scales spirally arranged; perianth of bristles or none, not enlarged in fr., smooth or barbed, persistent; ovary 1-loculed, with 1 anatropous ovule; style not thickened at the base, 2-3-cleft: fr. an achene with bristles attached. Only a few species are in cult., and these are all perennials (except perhaps the last), suited for shallow water or damp places. The larger are important for use in aquatic gardens. The nomenclature of those in the trade has been very much confused.

a. Sts. leafy.

atróvirens, Muhl. Sts. clustered, tall and stout, 2-4 ft. high, bluntly triangular: lvs. long, coarse and firm,
**SCIRPUS**

*SCIRPUS,* Vahl (S. gracilis, Koch. *Isolépis gracilis*, Hort.). Fig. 3579. Sts. very slender or filiform, cernuous, erect or more often drooping; basal sheaths leafless or with a very short filiform blade; involucral bract subulate, about equaling the spikelet, the latter usually solitary, oblange-lanceolate, 1–3 lines long; scales oblong-ovate, obsolete, pale brown or whitish; bristles none; style 5. Achenes in greenhouse plants rarely maturing. Widely distributed, common in Texas and Mex., G: 21:614; 25:111.—Grows well in damp pots, the drooping stts. producing a very graceful effect. This plant is now considered under *Scirpus* by practically all authors. *S. cernua* is an older name than *S. gracilis.*

**SCLOCÁRAPUS** (Greek, *hard and fruit,* the achenes are inclosed in a hardened pales). Syn., *Gynómpsis,* in part. *Compositae.* Annual or perennial strigosse-pubescent herbs, suitable for outdoor planting in the *S.* sts. branching; lvs. alternate or the lower rarely all opposite, dentate or subartic: heads small or medium, at the ends of the branches, pedunculate, many-fl.: fls. yellow; the ray-fls. few to several, fertile; pappus wanting: achenes more or less 4-sided with a broad flat suture.—About 15 species. N. Amer., region of Texas and Mex., Trop. Afr., and Trop. Asia. *S. wiesneri,* Bentham & Hook. f. (Gynómpsis wiesneri,* Hook. *Gynómolda wiesneri,* Hort.). Annual, 1–2 ft. high, loosely branched; lvs. alternately, slender-petioled, deltoid- or rhombic-ovate, or the uppermost lanceolate, ears dentate, the strigose pubescence of the lower surface canescent; corollas orange. Texas and Mex. R.H. 1853:261. G.C. III. 28:165.

**SCRODOSMA**

*SCRODOSMA.* (Greek, *hard and nut or kernel,* the name of a centipede, the resemblance being found in the lines of linear sori on the backs of the lvs.). *Polyopodiaceae.* The name most common in the trade for the hart’s-tongue ferns (known as *Scolopendrium vulgaris*) and its varieties. See *Phyllitis.*

**SCOLÓMUS** (old Greek name used by Hesiod). *Compositae.* Three or four herbs, all natives of the Mediterranean region. *S. grandiflorus,* a perennial species, is rarely cultivated abroad for its flowers and *S. maculatus,* an annual species, for its variegated foliage.

*Scólymus hispanicus* (Fig. 3580) is the vegetable known as golden thistle or Spanish oyster plant. It makes a root very like salsify, except that it is much lighter colored and considerably longer. Its flavor is less pronounced than that of salsify, but when carefully cooked, it possesses a very agreeable quality which is somewhat intermediate between that of salsify and pursnip. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish oyster plant, aside from affording a variety in the kitchen-garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and to sow than those of salsify. They are sown in March or April. The seeds, or rather achenes, are flat and yellowish, surrounded by a white scarious margin. The roots may be dug either in, fall or spring. The greatest fault of the Spanish oyster plant lies in the prickly character of the leaves, which makes the plant uncomfortable to handle. The roots are often 10 to 12 inches long and 1 inch thick. It is said that the leaves and stalks are eaten like cardoons by the people of Salamanca; also that the flowers are used to adulterate saffron. The *S. hispanicus,* Linn., is a biennial plant, native to S. Eu. The radical lvs. are very spiny, oblong, pinnatifid, dark green, marked with pale green spots. The plant grows 2–2½ ft. high, is much branched and bears bright yellow fl.-heads which are sessile and contain only 2 or 3 fls., all of which are ligulate. The heads are sessile, terminal, and axillary.

**SCOPOLIA** (nominated in honor of Joh. Ant. Scopolii, 1725–1788). *Solandraceae.* Erect slightly branched glabrous hardy perennial herbs for outdoor planting: lvs. membranous, entire: fls. lurid purple or greenish, veined, nodding, borne on solitary, glabrous pedicels; calyx broad-campanulate, membranaceous truncate or broadly 5-lobed; corolla campanulate, the limb folded, 5-angled or shortly and broadly 5-lobed; stamens 5; ovary conical, 2-celled almost to the apex: caps. included in the calyx.—About 5 species, of Texas, 1 in Himalaya, and the others in Japan and China. *S. carniolica,* Jacq. (Hyoscymus Scopolii, Linn.). About 1 ft. or more high: lvs. entire, petiolate, about 3 in. long, ovate or obovate-oblong, subcupulate: fls. solitary, axillary, umbellate: corolla lurid red, yellow, or green inside. Russia. B.M. 1126.—Somewhat used in medicine.

**SCORODÓSMA** (*Ferula*; supplementary list.)
**SCORPIUS** (Greek, scorpion and tall, alluding to the twisted form of the legume). *Leguminosae.* Nearly hardy stemless or decumbent herbs, adapted to the open border: lvs. simple, very entire, elongate, twisted and folded; stipules adnate to the petiole: fls. yellow, often few, solitary or umbelliferous, on axillary peduncles, nodding; calyx with the 2 upper lobes connate above; petals long-clawed, the standard suborbiculate, the wings oblique-obovate or oblong, the keel incurved, bearded-acuminat; stamens 4, perfect, didynamous: ovary sessile, many-ovuled: legume subterete, circinate-involute, sulcate-costate, the ribs often tuberculate or muricate, indehiscent.—About 6 species, S. Eu., N. Afr. to the Canary Isls., and W. Asia. Prop. by seed-sown in the open border in the spring. *S. vermiculata,* Linn. A trailing annual: lvs. tapering into the petioles: fls. solitary on the peduncles, the standard streaked with red: pod thick, glabrous, with the inner ribs almost obsolete, but the 10 outer ones bear crowded stipitate tubercles which are obtusely dilated at the apex. Medic. region. See the article *Worms.*

**SCORZONERA** (old French scorzon, serpent; *S. hispanicus* was used against snake-bites). *Compositae.* The vegetable known as scorzonera or black salsify is a plant with a long fleshy tap-root like that of salsify, but differing in having a black skin. The flesh, however, is cultivated and cooked like salsify, but being somewhat more difficult to raise it is rarer than that vegetable, although considered by many to be superior to it in flavor. The leaves may be used for salads. Scorzonera is a perennial plant, but it is treated in cultivation as an annual or biennial crop. Perennial herbs, or rarely annual, floccose, lanate or hisrate: lvs. sometimes entire and grass-like, or wider, sometimes more or less pinnately lobed or dissected: heads long-peduncled, yellow, the fls. all radiate: achenes glabrous or villous.—About 100 species, all natives of the Old World. Cult. same as salsify.

Botanically, also, Scorzonera is closely allied to salsify. The two vegetables are easily distinguished in root, leaf, flower, and seed. The leaves of Scorzonera are broader, the flowers are yellow (those of salsify being violet), and the seeds are white. Also, the involucral bracts of Scorzonera are in many series; of salsify, in one series.

**Scrophulariaceae.** Herbs or subshrubs, glabrous or hirsute, often fetid, sparingly grown in the hardy stemless or decumbent herbs, adapted to the twisted form of the legume. Section

**SCROPHULARIA** (Greek, scrophularia, A reputed remedy for scrofula). *Scrophulariaceae.* Figwort. Herbs or subshrubs, glabrous or hisrate, often fetid, sparingly grown in the herbaceous border.

Leaves opposite or the upper alternate, entire, incised, or dissected: cymes lax, in a terminal simple or somewhat branched thyrsus: fls. small, rarely rather large, greenish purple, purple, lurid or yellow: calyx deeply 4- or 5-cleft or 5-parted; corolla 4- or 5-lobed, short, 4 cleft, the apex one spreading; stamens 4, perfect, didynamous: caps. ovoid or subglobose.—About 150 species, Medit. region, Orient and N. Amer.

**SCUTELLARIA** (Latin, dish: referring to the form of the persistent calyx). *Labiatae.* Skullcap. Annual or perennial herbs, or decumbent or diffuse rarely tall and erect subshrubs or very rarely shrubs, suitable for outdoor planting.

Leaves opposite, frequently dentate, sometimes pinnatifid or entire; the floral lvs. similar or changed into bracts: fls. in opposite 2-fld. floral whorls or in some species a few at the top, sometimes disposed in all or the lower axis, sometimes in terminal racemes or spikes, blue, violet, scarlet, or yellow; calyx campanulate, 2-lipped; corolla-tube long-exserted, limb 2-lipped; stamens 4, ascending, all fertile, the anterior pair longer: nutlets subglobose or depressed.—About 140 species scattered over the world, mostly in the temperate regions and the mountains, a few in Trop. Afr., not known from S. Afr.

**SCUTELLARIA** (Greek, scutellum, shield). *Scutellaria.* Annual or perennial herbs, or decumbent or diffuse rarely tall and erect subshrubs or very rarely shrubs, suitable for outdoor planting.

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SCUTELLARIA


Section II. HETERANTHESIA.

All American species.


Section III. STACHYMACRIS.

A. **S. subsecisile or short-petioled, sub-sect., lanceolate or linear** .... 11. *bicalensis*

AA. **S. petioloed, crenate or serrate, ovate to suborbiculate**.

B. Base of the lvs. narrowed, blades usually ovate-oblong or oblong-lanceolate .... 5. *violeta*

CC. **Margins serrate** .... 9. *montana*

BB. **Base of at least some of the lvs. truncate or cordate** .... 6. *albida*

CC. **Margins entire** .... 10. *brevifolia*

DD. **Floral lvs. sessile or shorter than the calyx** .... 4. *indica*

EE. **Surface of the lvs. villous above and below** .... 5. *violacea*

FF. **Margins of the lvs. entire** .... 7. *pergernina*

DD. **Sts. erect, more than 1 ft. high** .... 6. *albida*

EE. **Surface of the lvs. hispidulous above, lvs. ovate** .... 5. *violacea*

FF. **Margins of the lvs. entire** .... 7. *pergernina*

GG. **Floral lvs. petiolate, equaling or exceeding the calyx** .... 8. *albida*


5. *violacea*, Heyne. Herb, 6-12 in. high: st. erect or ascending, pubescent: lvs. petioloed, crenate-ovate, 1-3 in. long, serrate, pubescent or glabrous beneath: racemes 4-5 in. long, lvs. subsimple: fls. opposite, secund; calyx pubescent; corolla bluish, white or violet. India and Ceylon. B.M. 8260. G.W. 14, p. 620.

6. **albida**, Linn. St. erect, branched: lvs. petioloed, ovate or ovate-lanceolate, crenate, base broad-cordate, scarcely rugose: racemes elongated, somewhat branched, villous: fls. opposite, secund; calyx villos; corolla creamy white. 4 times as long as the calyx. S. E. Eu. and Caucasus.

7. *pergernina*, Linn. Sts. procumbent: branches elongated, glabrous or pubescent near the ends: lvs. petioloed, ovate, obtuse, crenate, base rotund-truncate, pubescent:

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Section IV. GALERICULARIA.

A. **Fls. red, bright in axillary and terminal racemes** .... 13. *mociniana*

AA. **Fls. yellow** .... 12. *angustifolia*

BB. **Infl. composed of axillary racemes** .... 10. *brevifolia*

CC. **Margins of the lvs. entire** .... 11. *bicalensis*

DD. **Margins of the lvs. entire** .... 12. *angustifolia*

EE. **Margins of the lvs. entire** .... 11. *bicalensis*

FF. **Margins of the lvs. entire** .... 12. *angustifolia*

GG. **Margins of the lvs. entire** .... 13. *galericulata*

8. *brevifolia*, Gray. A half-hardy, compact perennial, ½-1 ft. high: lvs. ovate or oblong-ovate, coarsely and sharply serrate, lowest subcordate, upper acute at both ends, petioloed: raceme simple, few-fld.: fls. opposite; corolla large, 1½-1½ in. long, blue. Mountains of Ga.

9. *brevifolia*, Gray. A half-hardy, compact perennial, ½-1 ft. high: lvs. ovate or oblong-ovate, coarsely and sharply serrate, lowest subcordate, upper acute at both ends, petioloed: raceme simple, few-fld.: fls. opposite; corolla large, 1½-1½ in. long, blue. Blooming season long; summer. Dry limestone banks, Texas.

Subsection ANGIUSTIFOLIA.


Section V. GALERICULARIA.

A. **Fls. red, irregularly arranged in axillary and terminal racemes** .... 18. *mociniana*

AA. **Fls. yellow** .... 17. *brevifolia*

BB. **Infl. composed of terminal or axillary fls.** .... 16. *angustifolia*

CC. **Margins of the lvs. entire** .... 15. *bicalensis*

DD. **Margins of the lvs. entire** .... 14. *brevifolia*

EE. **Margins of the lvs. entire** .... 13. *galericulata*

FF. **Margins of the lvs. entire** .... 12. *angustifolia*

GG. **Margins of the lvs. entire** .... 11. *bicalensis*

12. *angustifolia*, Pursh. A hardy perennial, about 6 in. high, with lvs. ½-1 in. long, narrowed at the base, and violet-blue fls. ½-1 in. long, with the corolla-tube slender. Moist ground, N. W. U. S.


15. *brittonii*, Porter. C glandular- or viscid-pubescent, branching from the base, 4-8 in. high: lvs. oblong or oval, sessile and entire or the lowest short-petioled and slightly crenulate: fls. solitary in the axis; corolla blue
SCUTELLARIA

(pale blue and white according to some). Wyo. and Colo., and probably W. Neb. B.B. (ed. 2) 3:108.—Allied to S. resupinata.

16. antirrhinoideae, Bentham. Resembles the larger-leaved forms of S. angustifolia, but has longer petals and the flowers oblong at base and also shorter and broader fls. 7-10 lines long. Shady ground, N. W. U. S.

Subsection Lasiophloae.

17. lateriflora, Linn. A hardy perennial, increasing by slender stolons, 1-2 ft. high; lvs. ovate to lanceolate, 1-3 in. long; racemes axillary or terminal, narrow, leafy bracted; fls. blue to nearly white. Moist soil throughout the U. S. B.B. (ed. 2) 3:100.

Subsection Pteridioideae.


G.W. 11, p. 127. G.Z. 13:2.—According to Gn. 10, p. 606, the plants are of easy cult. with warm greenhouse treatment and may be grown as bush specimens or in hanging pots with a single st., when they will flower at about 1 ft. in height. Cuttings are easily rooted.

S. nuwantiaca, Hort., is offered in the trade.—S. pulchella, Hort., not Bunge, belongs to Section III and is closely related to S. nuwantiaca var. japonica, but the plant has more slender twigs, somewhat smaller lvs. which are short sub-hairy on the upper surface and a lower raceme with somewhat darker blue fls. Hab. (?). Qt. 6:296.—S. splendens, Link, Klotzsch & Otto, belongs to Section II and has broader, obtuse or scarcely acuminate, create lvs., with the base cordate and both surfaces hirsute; raceme elongate; fls. sparse; corolla scarlet. Mex. B.M. 4290 (as S. cordifolia).

F. TRACY HUBBARD

SCUTICÂRIA (Latin, scutico, lash or whip). Orchidaceae. Orchids remarkable for their long whip-like leaves, which are channeled on one side.

No evident pseudobulbs formed, but each shoot terminating in a long, pendulous fl.: lvs. rather crowded on the short rhizome: fls. solitary or several, on short peduncles, in structure fls. resembling Maxillaria, but the plants are easily distinguished by the terete lvs.; sepals and petals similar, the lateral ones forming a mentum; labellum movable, 3-lobed, with large, erect, lateral lobes; pollinia on a transversely elongated stipe.—Two species from S. Amer.

These plants require a temperature similar to cattleya and laelia, but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. S. Steélii does best on a block, as the plant grows downward in an inverted position. The compost should be kept moist, particularly while the plants are in action. They are propagated by division. (R. M. Grey.)

Steélii, Lindl. Fig. 3581. Lvs. attain a length of 4 ft. as thick as a goose-quill; fls. on short scape; sepals and petals oblong, connivent, pale yellow, with chocolate blotches; labellum large, cream-colored, striped with brownish purple, at all seasons. British Guiana. B.M. 3573. B.R. 1886 (both as Maxillaria Steélii).

3581. Scuticaria Steélii.

Hádwenii, Flanch. Lvs. 1 1/2 ft. long; fls. with spreading sepals and petals oblong, sharply acuminate, yellowish green, blotched with brown; labellum obovate-ovulate, white with flesh-colored spots. Brazil. B.B. 4629. F.S. 7:731 (both as Bifrenaria Hadwesi). G.M. 41:558.

HEINRICH HASSELBERG.

SCYPHÁNTHUS (Greek, beaker and flower, alluding to the shape of the flower). Sympodium, Lobeliaceae. Climbing plants, half-hardy annual herbs for outdoor border planting: lvs. opposite, 2-3-pinnatisect: fls. axillary, sessile, yellow, calyx-tube linear-elongate, lobes 5, spreading, linear-spatulate; petals 5, acute, alternate, which are hooded, 3-lobed at the base have 2 cali; stamina very many, in 5 fascicles opposite the petals, staminodia 10, in pairs opposite the scales; ovary elongated, 1-celled: caps. linear, upright, longitudinally 3-valved.—One or 2 species, Chile.

elegans, Don (Grammaticopus volubilis, Freyn). Sta. herbaceous, climbing and twining, frequently branched; lvs. opposite, rough with minute deflexed hairs, the lower ones bipinnatisect, the upper ones smaller and only pinnatifid, all the segms. oblong, 1-2-nerved; petiole short, channeled; fls. really sessile but appearing peduncled from the elongated inferior ovary, terminal or axillary, yellow, calyx-tube very long and incorporated with the ovary, limb of 5 spreading, spathulate, leafy segms.; petals 5, forming a cup, obtuso-ovate, deeply succate below the middle. B.M. 5028. J.H. III. 44:272.

F. TRACY HUBBARD

SEAFORTHIA (Francis Lord Seaforth, patron of botany). Palmaceae. A genus of palms, founded by Robert Brown on an Australian species, usually considered as synonymous with Ptychosperma. The Seaforthia elegans of cultivation, however, is said to be Archontophoenix, mostly A. Cunninghamii and perhaps some of it A. Alexandri; the original species described by Brown as S. elegans becomes Ptychosperma elegans, Blume.

According to Dammer (G.C. III. 31, pp. 18-20) the true Ptychosperma elegans of Blume is met with but rarely in European gardens. What is cultivated under this name in most cases is either Archontophoenix Cunninghamii or A. Alexandri. These archontophoenixes "are decorative hardy palms, forming on the Riviera very fine high-stemmed specimens. In youth they form bold leaves, the blade almost leafy. After having made some four to six such leaves, each larger than the foregoing, there appears a fully pinnate leaf, much differing in mode of growth from Phoenix and all other pinnatisect-ovate palms." S. elegans, Hort., and Ptychosperma elegans, Hort., are apparently sometimes Archontophoenix Cunninghamii and sometimes A. Alexandri. The last is very like A. Cunninghamii, but, according to Dammer, differs in its segments, which are green only above while underneath they are ashy-glaucous or white; it is well figured in G.C. III. 31:19; also in B.M. 4961 as Seaforthia elegans, Blume (Seaforthia elegans, R. Br., not Hort.), with pinnules erosive rather than acuminate at apex, is figured in G.C. III. 31:21.

In a recent study, O. F. Cook separates the plant grown in California under the name of Seaforthia elegans into a new genus, Lorosaria, making the species L. amethystina; probably from Australia. He also retains the genus Seaforthia for S. elegans, R. Br.

SEA-KALE (Crambe maritima, Linn.) is a large-leaved, strong cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home-garden, for it supplies an esculent of good quality.
at a season when vegetables are scarce. Sea-kale demands a deep rich and rather moist soil, in order to give the best results and to maintain its vigor for a series of years. The plants are grown about as much as rhubarb; that is, they should stand from 3 to 4 feet apart each way. The culture and general requirements are much the same as for rhubarb. The young shoots are blanched as they grow, in early spring. The blanching is accomplished by heaping fine loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower-pot so that the light is excluded from the growing shoots. These shoots are eaten before the leaves have begun to expand to any extent, whilst crisp and tender. The vegetable is prepared as is asparagus.

Sea-kale is propagated by root-cuttings, and also by seeds. Quicker results are secured from cuttings. If strong cuttings, 4 or 5 inches long, are taken in early spring and grown in good and rather moist soil, the plants may be strong enough for cutting the following spring; but it is usually better not to cut them until two years from starting. The cuttings may be placed where the plants are to stand permanently, or they may be grown in drills in a seed-bed. The latter plan is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year. The seeds are really fruits or pods, and each fruit may produce two or three plants. Usually the fruits are sown without shelling. The seedlings are raised in the seed-bed and transplanted when one year old to permanent quarters. On good soil, plants of sea-kale should maintain their vigor for five to eight years after they have come to cutting age. As soon as they begin to show signs of decline, new plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Plants may be forced in hotbeds or under the greenhouse benches, as recommended for rhubarb. Sea-kale has large glaucous cabbage-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. For botanical description, see Vol. II, p. 873. L. H. B.

3582. Fruit of Secchiun edulis. (X 5/9)

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SEA-LAVENDER: Statices. S.-aion. Urpinia marinaria; also applied to Ornithogalom camusum and Setha serna. S. pink: Armeria.

SEBASTIANIA (from Antonio Sebastiani, a writer on Roman plants 100 years ago). Euphorbiaceae. Tropical shrubs scarcely in cult.: juice milky: lvs. alternate, small, usually entire: inf. usually terminal: lvs. of 2-3 sepals free or connate at the base, imbricate; stamens 1-5; ovules in each cell of the ovary; seed carunculate. About 75 very variable species, all tropical except S. hpiastrih, Muell. Arg. in swamps from the northern United States until the plants are cut down by frost. Plants should be 8 to 10 feet apart, and trained on an arbor or trellis. In

SECHIUM (probably from the Greek seko, "to fatten in a fold," because it was fed to hogs). Cucurbitaceae. A climbing sparsely hairy herb, with perennial tuberous roots, grown in tropical and subtropical regions for its large fruits, which somewhat resemble the summer squash in use and character.

Leaves membranaceous, 3-angled or oblong, cordate at the base; tendrils 2-5-branched, opposite the lvs.: fls. small, monoeious, axillary, the pistillate solitary, the staminate in small clusters; calyx-tube saucer-shaped, the limb 5-lobed; corolla rotate, deeply 5-parted, the segms. ovate-lanceolate; filaments and styles connate into a central column, of which the anthers appear as lobes, while the stigmas are closely set together, forming a small head; fr. pear-shaped or globose, fleshy, 1-seeded.—One species, indigenous in Mex. and Cent. Amer. and widely planted.

edible, Swartz (Chayota edulis, Jacq.). CHAYOTE. CHAYOTLI. CHOCHOTTES. CHOCHO, CHUCHE, or CHUCO. CHOKRO. CHAIOTA. CHUKI, CHUX. CUCURBITACEAE. PITTENILLA. Fig. 3582. Sta. herbaceous, annual, sometimes making a growth of 50 ft. in one season, if the

plant is grown on rich well-drained ground: large tuberous roots are formed the second season: lvs. 4-6 in. long, resembling those of the cucumber, deep green, somewhat rough, scarcely hairy; corolla greenish or cream-colored: fr. 3-8 in. long; seed single, flat, 1-2 in. long, attached at the upper end of the cavity. G.C. 1865: 61; III. 24:476; 28:450. The chayote is grown successfully in southern California and about New Orleans, where it is fairly common. In Florida it is not yet common, but its culture is being extended rapidly. It can probably be grown successfully in those parts of the South where the ground does not freeze in winter. The fruit is round to pear-shaped, smooth or corrugated, the surface sometimes covered with small soft spines. The color varies from nearly white to dark green, the flesh being firm, crisp, and more delicately flavored than the squash. The cooked fruit can be creamed, baked, or made into fritters, sauces, tarts, puddings, salads, or used like potatoes with other meats and vegetables. The young spring shoots, tender branches, and tuberous roots form palatable dishes, while the woody stems furnish a fine fiber, known in French by the name as "paille de chouchou." The fruits, vines, and tubers are excellent fodder for stock.

The entire fruit is planted in early spring, and the vine should come into fruit after the rainy season, remaining in fruit (in the southern United States) until the plant is cut down by frost. Plants should be 8 to 10 feet apart, and trained on an arbor or trellis. In
Florida and the Carolinas, a vine may yield fifty to one hundred or more fruits in a season. The fruit can be easily collected and stored for four to two months at moderate temperatures. In tropical and subtropical regions there are numerous varieties, differing somewhat in flavor and value.

Nathan Menderson.

Securinée (Latin, secund, hatchet, and negare, to refuse, alluding to the hard wood). Euphorbiaceae. Shrubs sometimes grown for the bright green foliage.

Deciduous: lvs. alternate, short-petioled, entire, stipulate: fls. dioecious or monoeccious, apetalous, axillary, the pistilate solitary or few, the staminate in fascicles; sepals 5; stamens usually 5, with a 5-lobed disk at the base; pistillate fls. with entire disk; ovary 3-lobed, or 3-2 lobed styles: fr. a 3-lobed dehiscent capsule, 3-6-seeded.—About 10 species in temperate and sub-tropical regions of S. and C. Amer., Asia, Alt., and S. Eu.

The species in cultivation are bushy round shrubs with slender wand-like branches, rather small bright green foliage, inconspicuous greenish white flowers in axillary clusters or solitary and with small subglobose greenish capsules. They have proved fairly hardy at the Arnold Arboretum, usually only the tips of the young branches being winter-killed, and do not seem particular as to the soil. Propagation is by seeds which are usually freely produced when the two sexes are present, and by greenwood cuttings under glass. Seeds can be shipped, and stored for two to four months at moderate temperatures but at least 50 to 100 seeds are required. This genus is a favorite for window-sills, balconies, and house-tops, especially in crowded cities.

Sedums are also general favorites in all forms of rock-gardening. They are much used for carpet-bedding, especially the kinds with mealy or glaucous foliage, and those with various metallic shades of purple. In the hardy border, these greenwood cuttings, like S. maximum and S. spectabile, are preferred, though many of the lower-growing kinds are suitable for edgings and any of the evergreen kinds are welcome in winter when the hardy border shows other brown or dead signs of life. As a rule, sedums like the sun, but a few of the species may help to solve the difficult problem of carpeting the ground underneath the trees where the soil is dry and shaded. Sedums are also favorites for baskets and vases, especially the kinds with mealy or glaucous foliage and minute leaves. For greenhouse decoration, S. spectabile is the favorite, as it is perhaps the showiest of the genus. It may be had in flower at any season of the year and, as a horticultural point of view, by M. T. Masters in Gardener's Chronicle for 1878. Masters' descriptions and treatment have been partially followed in the present revision. The variability of the fls. is very noticeable both in thickness and breadth, some being thick and terete, others flat and thin, though all of them tending toward fleshy. Some are quite linear and from that they range to nearly 1½ in. broad. The margin is also variable from entire to deeply dentate. The synonymy of the species is very uncertain; and in some groups, especially the Telephium group, the specific delimitation is very uncertain; in fact the whole genus needs monographic study. The present key is an attempt to differentiate the more prominent forms as they occur in horticulture and is based in part on horticultural and in part on herbarium specimens. It is unfortunately not altogether satisfactory but may prove of some value in separating the species.

Sedums are of the family Crassulaceae. As a rule, they prefer sandy soil, and are very averse to a wet position in winter. Some are useful plants for carpeting poor and sandy waste places where few other things will grow. The little-yellow-flowered plant with pulpy foliage that spreads in nearly every cemetery is Sedum acre. Sedums are also general favorites in all forms of rock-gardening. They are much used for carpet-bedding, especially the kinds with mealy or glaucous foliage, and those with various metallic shades of purple. In the hardy border, these greenwood cuttings, like S. maximum and S. spectabile, are preferred, though many of the lower-growing kinds are suitable for edgings and any of the evergreen kinds are welcome in winter when the hardy border shows other brown or dead signs of life. As a rule, sedums like the sun, but a few of the species may help to solve the difficult problem of carpeting the ground underneath the trees where the soil is dry and shaded. Sedums are also favorites for baskets and vases, especially the kinds with mealy or glaucous foliage and minute leaves. For greenhouse decoration, S. spectabile is the favorite, as it is perhaps the showiest of the genus. It may be had in flower at any season of the year and, as a horticultural point of view, by M. T. Masters in Gardener's Chronicle for 1878. Masters' descriptions and treatment have been partially followed in the present revision. The variability of the fls. is very noticeable both in thickness and breadth, some being thick and terete, others flat and thin, though all of them tending toward fleshy. Some are quite linear and from that they range to nearly 1½ in. broad. The margin is also variable from entire to deeply dentate. The synonymy of the species is very uncertain; and in some groups, especially the Telephium group, the specific delimitation is very uncertain; in fact the whole genus needs monographic study. The present key is an attempt to differentiate the more prominent forms as they occur in horticulture and is based in part on horticultural and in part on herbarium specimens. It is unfortunately not altogether satisfactory but may prove of some value in separating the species.

Sedum is a genus of succulent herbs, rarely shrubby, mostly hardy and perennial, useful for rockeries and one species, S. spectabile, a frequent showy border plant. See Succulentia, Vol. V, page 2072. Plants glabrous or glandular-pubescent, fleshy, erect or decumbent, sometimes cespitose or moss-like: lvs. very variable, opposite, alternate or whorled, entire or serrate: fls. cynone in a few axils and solitary, white, yellow, or rose, rarely rose. Herbs from a basal rosette of lvs. and dying to base after flowering: st.-lvs. alternate, mostly broad, fleshy: fls. dimcious or monccious, apetalous, axillary, solitary: petals 4-5-carpelled: fr. a 5-lobed dehiscent capsule, 5-6-seeded.—About 250 species, mostly natives of the temperate and cold regions of the northern hemisphere. The hardy sedums are monographed, from a horticultural point of view, by M. T. Masters in Gardener's Chronicle for 1878. Masters' descriptions and treatment have been partially followed in the present revision. The variability of the fls. is very noticeable both in thickness and breadth, some being thick and terete, others flat and thin, though all of them tending toward fleshy. Some are quite linear and from that they range to nearly 1½ in. broad. The margin is also variable from entire to deeply dentate. The synonymy of the species is very uncertain; and in some groups, especially the Telephium group, the specific delimitation is very uncertain; in fact the whole genus needs monographic study. The present key is an attempt to differentiate the more prominent forms as they occur in horticulture and is based in part on horticultural and in part on herbarium specimens. It is unfortunately not altogether satisfactory but may prove of some value in separating the species.

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KEY TO THE SPECIES.

A. Lvs. terete or subterete (that is, relatively thick as compared to breadth).
B. Fls. yellow (except a white-flowered variety of No. 1).

C. Lf.-blades broad as compared to length.

D. Petals without a dorsal awn.
E. Petals lanceolate.
F. Lvs. flat (that is, relatively thin as compared to breadth).

CC. Lf.-blades narrow as compared to length (usually linear).

D. Apex of lvs. blunt.
E. The lvs. papillose-pilose.
F. The lvs. pubescent or puberulent.

DD. Apex of lvs. acute or acuminate.
EE. Base of lvs. membranaceous and dilated, abruptly tapered to a much narrower upper part.
EE. Base of lvs. not distinctly dilated, not abruptly tapered to a much narrower upper part.

FF. Petals acute or acuminate.
GG. Sepals subulate.
HH. Lfs. round or reniform.

GG. Sepals obovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals obovate.
HH. Lfs. round or reniform.

GG. Sepals ovate.
HH. Lfs. round or reniform.

GG. Sepals linear to lanceolate.
HH. Lfs. round or reniform.

GG. Sepals obtuse.
HH. Lfs. round or reniform.

GG. Sepals acuminate.
HH. Lfs. round or reniform.

GG. Sepals subulate.
HH. Lfs. round or reniform.

GG. Sepals linear.
HH. Lfs. round or reniform.

GG. Sepals subulate.
HH. Lfs. round or reniform.

GG. Sepals ovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals obovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals linear.
HH. Lfs. round or reniform.

GG. Sepals subulate.
HH. Lfs. round or reniform.

GG. Sepals ovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals obovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals linear.
HH. Lfs. round or reniform.

GG. Sepals subulate.
HH. Lfs. round or reniform.

GG. Sepals ovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals obovate-lanceolate.
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GG. Sepals obovate-lanceolate.
HH. Lfs. round or reniform.

GG. Sepals linear.
HH. Lfs. round or reniform.
SEDUM

1. acre, Linn. (S. neglectum, Ten.). Stonecrop. Wall Pepper. Love Ectangle. Fig. 3583. Perennial, glabrous, cespitose: branches creeping, branched, about 2 in. long; fl.-sts. 2–3 in. high; Ivs. minute, about \( \frac{1}{2} \) in. long, fleshy, ovate, crowded, glistening at base, sessile; fls. yellow, about \( \frac{1}{2} \) in. across, in 1-sided cymes, which have 2–5 forks; sepal\. lvs.-like; petals lanceolate. Eu., N. Afr., E. Asia, and naturalized in N. Amer. Gn. 27, p. 316 —This is the commonest native species in England and one of the commonest in cult. Thrives best in poor soil and is a good ledge-plant and is frequently used for covering rather arid spots which would otherwise be bare. The lvs. have an acrid taste. Var. album, Hort., is a white-fld. form. Var. aureum, Mast., has the lvs. and shoot-tips bright golden yellow in spring. The yellow tint is lost later in the summer, but the variety is never so robust as the green form. Excellent for spring bedding, to give a bit of color. Var. elegans, Mast., has the tips and young lvs. pale silvery. More delicate than var. aureum and not so effective. Var. hawaiiunum, Hort., is offered in the trade. Var. maurus, Mast., is larger and more robust than the type: lvs. in 7 rows, deltoid-ovoid, scarcely auricled at base: fls. \( \frac{3}{4} \) in. across, in a 2-parted cyme, with a central sessile fl; sepal\. linear-oblong. Morocco. Var. Maivehana, Hort., is said by the trade to be the same as var. hawaiiunum. Var. sexangulare, Hort., is offered in the trade; it probably is S. sexangulare.

2. Stbhillii, Solms. Perennial, trailing, much branched, puberulent: sts. green or pinkish; fl.-sts. 4–6 in. high: lvs. opposite or nearly so, sessile, nearly round in cross-section, ovoid or ellipsoid, \( \frac{1}{2} \)–\( \frac{3}{4} \) in. long; fls. yellow, 7–9 lines across, in few-branched terminal cymes, the branches of which are recurved; sepal\. puberulent, linear-oblong; petals lanceolate, with a short dorsal awn just below the apex. Mex.

3. multitipes, Coss. & Dur. Perennial, about 2–6 in. high, base subshubby, much branched: barren shoots flexuous or erect, bearing dense rosettes of lvs. at their tips; fl.-sts. usually taller, erect: lvs. \( \frac{3}{4} \)–\( \frac{4}{5} \) in. long, glaucous or pruinose, pinkish and papillos. linear or oblongate, subterete: fls. pale yellow, about \( \frac{3}{4} \) in. across, 5-merous, in many-branched, 2–6-fld., scorpion cymes; sepal\. linear-oblong; petals oblong-lanceolate; others pale yellow. Algeria. G.C. II. 10:717.

4. sexangulare, Linn. (S. acre var. sexangulare, Godr. S. boloniimse, Lois. S. forsteriunum, Reichb., not Smith. S. pulchellum, Hort., not Michx.). Perennial, glabrous: barren shoots ascending 2–3 in., branched; fl.-sts. 2–3 in. high, very slender: lvs. densely crowded in 6–7 rows, about 2 lines long, linear-cylindrical, slightly gibbous at base: fls. yellow, \( \frac{3}{5} \) in. across, in a 3–5-branched umbellate cyme, 1–3 in. diam.; sepal\. linear-oblong; petals lanceolate. Eu. The Linnean material properly differs very little from this, else the horticultural material (especially the European) may be distinct.

5. tenuifolium, Strobl. (S. amplexicaule, DC. Spermervum tenuifolium, Sibth. & Smith). Perennial, glabrous, evergreen: barren branches 2–4 in. long, slender, wing, ascending; fl.-sts. decumbent, ascending, about 6–9 in. high: lvs. of the barren shoots dilated and membranous at base, gradually tapering to a long awl-like point; of the fl.-sts. alternate, sessile, \( \frac{3}{4} \) in. long, terete, with a membranous auricle at base: fls. numerous, golden yellow, secund in 2-forked cymes, with a sessile fl. in the fork; sepal\. ovate, oblong, acute, united below into a cup-shaped tube; petals oblong-lanceolate, \( \frac{3}{4} \) in. long, keeled; filaments greenish, anthers yellow. Mediterr. region.—There are often 6–10 petals in this species.

6. stenopetalum, Pursh. Perennial, tufted, glabrous: sts. 3–6 in. high, erect from a decumbent base: lvs. crowded on the barren shoots, sessile, linear or lanceolate, \( \frac{3}{4} \) in. long, terete: fls. bright yellow, in much-branched scorpion cymes; sepal\. subulate; petals linear-lanceolate, acuminate. Alberta to S. D., Neb., New Mex., and Calif.

7. sarmentosum, Bunge. Perennial, glabrous: shoots slender and prostrate: lvs. crowded, opposite or whorled, \( \frac{3}{4} \)–\( \frac{3}{5} \) in. linear, terete or slightly flattened: fls. bright yellow, \( \frac{3}{4} \) in. across, numerous, in a flat-topped, umbellate, 3–5-forked cyme, with a solitary fl. in the forks: branches recurved, the fls. on the upper surface only,
Sedum

**3583. Stonescrop, or wall pepper. — Sedum acre.**

but it has been referred to *S. rupestre* and also to *S. graminatum*, a species which does not seem to be in cult. and it has also been treated as a variety of both these species. Var. _glanduliferum_, Hort., is offered in the trade.

9. _rupéstre_, Linn. Perennial, glaucous, reddening with age and drought: barren shoots numerous, creeping, 1–3 in. long; fl.-sts. ascending or erect, 6–12 in. high: lvs. ½ in. long, in numerous rows, linear, subulate, incurved, flattened above, forming dense conical rosettes which are ¾–1 in. diam., at the ends of the sterile shoots: fls. numerous, yellow, barely ½ in. across, 5–7-merous, in umbellate, 3–5-forked, ultimate hollow-topped cymes; sepals ovate, oblong; petals ovate, oblong; anthers yellow. W. Eu. Closely allied to and confused with _S. reflexum_. Var. _spirale_, Hort., is offered in the trade.

10. _reflexum_, Linn. (S. collinum, Willd.). Perennial, glabrous; fls. trailing; fl.-sts. erect, 8–10 in. high: lvs. in 6 or 7 rows, crowded on the barren shoots into a conical mass, but not forming so marked a rosette as in typical _S. rupestre_, ½–3 in. long, linear-subulate, reflexed, terete, gibbous at base: fls. 4–8-merous, yellow, ½ in. across, in a decurved, many-fld. umbellate cyme which is many-branched, with a fl. in each fork; sepals oblong-lanceolate; petals linear; anthers yellow. Eu. Also escaped in N. E. N. Amer. Var. _albescens_, Mast. (S. albescens, Haw. _S. glaucum_, Smith), is glaucous: lvs. rarely in rosettes: fls. ½ in. across, 6-merous. Eu. and N. Afr. Var. _crisatulum_, Mast. (S. montanum, Hort. _S. robustum_, Hort.), has the sts. fasciated so as to form a crest like a cock’s comb. Var. _viridescens_, Mast. (S. viridescens, Willd.), is similar to var. _albescens_, but has pale sulfur-yellow fls.—This species and its varieties are treated by some authorities as a part of _S. rupestre._

11. _anglicum_, Huds. Perennial, about 3 in. high, glabrous, evergreen: barren shoots trailing or erect, forming dense masses; fl.-sts. about 2 in. high: lvs. crowded, alternate, on the fl.-sts. somewhat opposite and less crowded, ½–¾ in. long, ovate or ovate-lanceolate, green, becoming red-tinted: fls. white or rosy tinted, about ½ in. across, in few-fld. dichotomous cymes; sepals ovate; petals lanceolate; anthers red, becoming black. W. Eu. _Gn. 79_, p. 366.—A good plant for the rockery, though rather difficult to grow.

12. _carnéum_, Linn.; also spelled _carréum_ (S. carnérne, Desf.). Fig. 3584. Annual, glabrous, or pilose in the inf.: flts. 2–3 in. high, branched from the base: lvs. tufted, ½ in. long, oblong, obtuse, pale green, spotted with red: fls. pale blue to rose-lilac, ¼ in. across, 5–7-merous, in a lax, many-fld. cyme, which is 1 in. diam.; sepal oblong; petals oblong; anthers reddish brown. Medit. region. B.M. 2224. B.R. 520. _Gn. 27_, p. 315.—Said to thrive in a sandy soil, and to be adapted to carpet-bedding.

13. _brevifíllum_, DC. Perennial, said to grow about 4 in. high, glaucous, tufted lvs. crowded in 4–6 rows, deciduous, ½ x ¼ in., oblong, very obtuse: fls. white or flesh-color, nearly sessile, ½ in. across, crowded in a 2–3-parted cyme, 5–7-merous; calyx-tube very short, segments linear-oblong, pink-tipped; petals lanceolate, acute, keeled; anthers purplish brown. Madeira.—Masters says that most of the material under this name is really _S. album._

14. _farinosum_, Lowe. Perennial, glaucously pruinose, glabrous: sts. tufted, creeping, much branched: lvs. crowded in 4–6 rows, deciduous, ½ × ¼ in., oblong, very obtuse: fls. white or flesh-color, nearly sessile, ½ in. across, in a decurved, many-fld. cyme, which is about 1 in. diam.; sepal oblong-lanceolate, white, with a pink midrib; petals oblong, with a pink midrib; anthers purple. France and Medit. region. —Closely related to _S. dasyphyllum_ of which some authorities have made it a variety. Rather tender and sensitive to root-moisture. _Var. album_, Hort., is said to have bronzy lvs. and to grow 6 in. high. _Var. Pottsiï_, Hort., is offered in the trade as a form with tiny round lvs., covered with white meal.

15. _dasyphyllum_, Linn. (S. glaucum, Lam.), 4. Perennial, about 2–4 in. high, glabrous: sts. tufted, slender, branching: lvs. crowded, sessile, spreading, oblong-acute or suborbicular, thick, studded with crystalline pimpls: fls. white to pinkish, about ½ in. across, in lax, few-fld., corymbose cymes; sepals oblong; petals lanceolate; anthers yellow. Eu. and N. Afr. —The material cult. under the name of _S. glaucum_ probably belongs here; see also _S. rupestre_ and _S. hispanicum_. Var. _glanduliferum_, Mars (S. cönicum, Duby), has minute gray-green lvs. which are more or less densely glandular-pubescent: fls. white. Corseca and N. Afr. B.M. 6027. There is a form of this offered in the trade under the name of _S. cönicum_ var. _grandiflorum_, Hort.

16. _potosinum_, Rose. Sts. low and weak, at first erect, but soon prostrate or at most ascending; fl.-sts. 2–4 in. high, slender: lvs. crowded, rhomboid-subspHERICAL, nearly terete, ½–½ in. long, obtuse, pale green, glabrous, papillose (?), slightly glaucous: fls. white or tinged pink, terminal and few; sepals linear; petals lanceolate, acuminate, widely spreading. Mex.—A rare species.
17. *pilosum*, Bieb. (S. *Reptili*, Hort., not Kuntze). Fig. 3385. Biennial, 2-3 in. high, glabrous-pubescent: st. leafy; lvs. \( \frac{3}{4} \)-\( \frac{3}{4} \) in. long, oblong or oblanceolate-oblong; radical densely rosulate; cauline alternate, rather close together: fls. rose-pink, clustered in a corymbose cyme, \( \frac{3}{4} \)-\( \frac{1}{2} \) in. diam.; calyx-sepals oblong; petals elliptic-lanceolate, narrowed to a broad claw; anthers reddish. Asia Minor. G. 37:25.—A good plant for rockeries. Some of the material grown in gardens as *S. pulchellum* and *A. anglicum* are really this species. Var. *album*, Hort., was offered in the trade. Var. *roseum*, Hort., is offered in the trade as a glaucous-lvd. form.

25. *albunum*, Linn. Perennial, about 4-6 in. high, glabrous, cespitose: barren sts. erect or creeping, rooting, olive-brown; fls.-sts. erect, pinkish: lvs. alternate, spreading, linear-oblong, about \( \frac{1}{2} \) in. long, obtuse: fls. pink, about \( \frac{1}{4} \) in. across, in corimbos-segments, broadly ovate to subrotund, obtuse; petals lanceolate; anthers reddish. Eu., Temp. Asia, and N. Afr. Gn. 27, p. 315. G. 57:469.—Some of the plants grown as *S. neglectum* probably belong to this species.

26. *Kirilowii*, Regel. Perennial, rhizome destitute of shoots of preceding years, green, glabrous: sts. up to \( \frac{1}{2} \) ft. high, slender: lvs. spreading, elongate-linear, 2-3 in. long, attenuate, more or less congested toward the base: fls. rose-pink, yellow, 5-merous, rather small, in a dense, many-fld., corymbose cyme, which is commonly leafy; sepalae and petals linear. Soongaria, China, and Turkestan.—Allied to *S. roseum*.

27. *roseum*, Scop. (*Rhodolola rosea*, Linn. *S. Rhodolola*, D. C.). Perennial, 4-8 in. high: rootstock thick, fleshy, exhaling a perfume. 3585. Sedum pilosum. (X\( \frac{1}{2} \))

29. *Woodwardii*, N. E. Br. Perennial, glabrous: st-s. erect, pinkish: lvs. alternate, lax, obovate or spatulate, sessile, \( \frac{3}{4} \)-\( \frac{1}{2} \) in. long, attenuate, more or less serrate toward the tip: fls. oblong, sessile or slightly peduncled, pinkish brown beneath; anthers pinkish. N. Italy and Corsica. L.B.C. 3:461.

33. *Sedum*, Linn. and Linn. (S. *glaucum*, Linn. and *S. Aizoon*, Brit.). Perennial, glabrous, 2 in. high, much branched, smooth: lvs. flat, fleshy, obovate or oblong, obscurely 1-crenated, slightly toothed at apex: fls. dioecious, greenish or reddish purple, in a terminal flat-topped, subglobose cyme, about \( \frac{1}{2} \) in. diam.; sepals 4, lanceolate or oblanceolate; petals 4, linear-oblong; stamens 4 in the male, lacking in the female fls. Eu., N. Amer. and Himalaya. Gn. 12:103 (as var. *lanatum*). B.B. (ed. 2) 2:207.—A neotrop.-growing species well adapted to the rockery. Var. *linifolium*, Hort., is offered in the trade.

37. *dendroideum*, Moq. & Sessé. Shrub, 4-12 in. high, much branched, smooth; lvs. flat, fleshy, obovate or spatulate, sessile, \( \frac{3}{4} \)-\( \frac{1}{2} \) in. long; fls. sessile or nearly so, bright yellow, in a panicle cyme, numerous; calyx-lobes ovate; petals lanceolate. Mex.

39. *Woodwardii*, N. E. Br. Perennial, glabrous: sts. simple, about \( \frac{1}{2} \) ft. high, green: lvs. alternate, lax, \( \frac{1}{2} \)-\( \frac{1}{2} \) in. long; oblong or lanceolate, irregularly and obtusely dentate above, green, flat; fls. yellow, sessile, about \( \frac{1}{2} \) in. across, in dichotomously branched, 2-5-parted, rather flat, rather lax cymes, which are \( \frac{1}{2} \)-\( \frac{1}{2} \) in. diam.; sepals linear-subulate; petals lanceolate. China.—*S. oregunum* Nutt. (Germánia oregéná, Brit.). Perennial, glabrous: fls.-sts. erect, simple, 3-6 in. high: lower lvs. about \( \frac{1}{2} \) in. long, all spicate-oenate, irregularly and obtusely dentate above, green, flat; fls. yellow, sessile, about \( \frac{1}{2} \) in. across, in dichotomously branched, 2-5-parted, rather flat, rather lax cymes, which are \( \frac{1}{2} \)-\( \frac{1}{2} \) in. diam.; sepals linear-subulate; petals lanceolate. Alaska to N. Calif.

31. *sphatulifolium*, Hook. Fig. 3386. Perennial with slender rootstocks, glaucous, ultimately reddish: barren shoots creeping or ascending, 3-4 in. long; fls.-sts.
SEDUM

3585. Sedum spathulifolium. (X½)

36. Sempervivum, Linn. Perennial, 1½-4 in. high, with rosettes of leaves. Leaves oblong, erect, ciliate, approximately 1½ in. long, ½ in. wide, slightly fleshy. Flowers in terminal or near-terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls. 

37. Sedum album, Linn. Perennial, 1½-2 ft. high, with rosettes of leaves. Leaves lanceolate, with a white margin, ½-1 in. long, ½-1 in. wide, and slightly fleshy. Flowers in terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls. 

38. Middendorffianum, Maxim.; also spelled Middendorffii. Perennial, 1½-4 ft. high, with rosettes of leaves. Leaves oblong, erect, ciliate, approximately 1½ in. long, ½ in. wide, slightly fleshy. Flowers in terminal or near-terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls. 

41. Maximoviczii, Regel. Perennial, 1½-4 ft. high, with rosettes of leaves. Leaves oblong, erect, ciliate, approximately 1½ in. long, ½ in. wide, slightly fleshy. Flowers in terminal or near-terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls. 

42. kamtschaticum, Fisch. & Mey. Perennial, 1½-4 ft. high, with rosettes of leaves. Leaves oblong, erect, ciliate, approximately 1½ in. long, ½ in. wide, slightly fleshy. Flowers in terminal or near-terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls. 

43. Albidon, Linn. Perennial, 1½-4 ft. high, with rosettes of leaves. Leaves oblong, erect, ciliate, approximately 1½ in. long, ½ in. wide, slightly fleshy. Flowers in terminal or near-terminal panicles, usually 3-5 per panicle. Bracts oblong, ciliate, with 3-5 supernumerary bracts. Corolla yellow, with 4 petals, 6 stamens, and 2 carpels. fruit a capsule, containing many seeds. Seeds small, black, and flat. Propagation by offsets from the base. Hardy in most climates, suitable for rock gardens and dry walls.
variegatum, for rockeries and borders. Var. variegatum, Hort., occurs in many forms. A fine border plant, Turcz.

44. sempervivoides, Fisch. (S. Sempervivum, Ledeb.). Biennial, pubescent, 2–8 in. high: basal lvs. in a rosette of 40–50, oblong-cordate, pubescent and ciliate, about 1 x 8 in., cauline clasping, greenish red, oblong, acute;

45. oppositifolium, Sims. Perennial, trailing pubescent: fl-stems, erect, 6 in. high: lvs. opposite, deciduous, 1/2 x 3/4 in., obvate-spatulate, dentate-lobulate or crenate, slightly puberulent: fls. white, 1/2–3/4 in. across, in a terminal dichotomous cyme; sepals lanceolate; petals oblong-lanceolate; anthers orange according to Masters. Caspian and B.M. 1809 (authors shown as yellow).—Closely allied to S. stoloniferum, but the lvs. are brighter green and more regularly decussate.

46. populinum, Pall. Subshrub, with fibrous roots, glabrous: lvs. 6–10 in. high, greenish or purplish, slender, branched: lvs. alternate, distant, 1 1/2 x 1 in., petiolate, ovate, acute, base cordate, coarsely and irregularly toothed; petiole 1/4 in. long: fls. numerous, nearly 1/2 in. across, white or pinkish, in terminal, much-branched, corymbose cymes; sepals lanceolate; petals lanceolate; anthers pinkish, 1-nerved; carpels rose pink. Japan. B.M. 1809.—Very useful for rockeries and borders. Var. variegatum, Hort., not Wats. Var. variegatum, Hort., has white variegated lvs. LH.

47. Sieboldi, Sweet. Fig. 558. Subshrubby, 6–8 in. high, glaucous: branches terete, slender, purplish, erect, afterwad decurred: lvs. in whorls of 5, sessile or nearly so, suborbicular, sinuate, about 3/4 in. diameter, bluish green, margins pinkish, base cuneate: fls. pink, 1/2 in. across, numerous, in much-branched umbellate cymes; sepals ovate-acute; petals lanceolate; anthers pinkish. Japan. B.M. 5588. G. 31:831.—Very useful for rockeries and borders. Var. variegatum, Hort., not Hort. ex W. Mill.), has sts. erect, 2 to 3 x 1 in., oblong-obovate, denate; lower wedge-shaped at base; upper somewhat rounded: fls. numerous, pink, red-spotted or sometimes pure white, in dense terminal and lateral, pedunculate cymes; sepals lanceolate; petals lanceolate, 2–2 1/2 in. long, somewhat recurved. Cent. Eu. to Siberia and N. W. Asia. Gn. 27, p. 316.—Var. haematodes, Mast. (S. atropurpureum, Hort., not Turez. S. maximum var. atropurpureum, Hort. S. macrophyllum var. atropurpureum, Hort.), has sts. erect, glabrous, 1 1/2–2 1/2 ft. high; lvs. opposite, oblong-ovate, glaucous or dark purple; petals whitish, rose-pink. G.C. II. 10:337. Var. purpureum, Hort. (S. macrophyllum var. purpureum, Hort.), is a purple-lvd. form questionably different from the preceding variety. Var. variegatum, Hort., has been offered in the trade as a form with green-and-gold foliage. Var. versicolor, Van Houtte (S. Rodigasi, Hort.), is a form with pink lvs. and lvs. heavily variegated with white, their margins pink. F.S. 16:1669.

49. spectabile, Bor. (S. Faberla, Hort., not Koch). SHOWY SEDUM. Fig. 3588. Perennial, robust and glaucous: sts. 18–24 in.: lvs. opposite, deciduous or in whors of 3, 3 x 2 in., flat, scarcely petiolated, ovate or spatulate, entire or obscurely sinuate-dentate: fls. numerous, 1/2 in. across, pink, in large flat-topped, inversely pyramidal, leafy and umbellate cymes; sepals whitish, linear-lanceolate; petals slightly concave; anthers orange. Japan(?). Gn. 27, p. 315. I.H. 8:271. Gt. 21:709.—The fls. are said to vary from rose to purple and perhaps to white. This is the showiest of the sedums and is an excellent border and garden plant. It is said to thrive best in stony clay and not to do so well in lighter soils. Var. album, Hort., a white-flld. form is offered in the trade. Var. atropurpureum, Hort., is a form with rosy crim: fls. Var. purpureum, Hort., is offered in the trade. Var. roseum, Hort., is offered in the trade. Var. rubrum, Hort., is a form with crimson fls. There is also a form with variegated lvs.

50. alboroseum, Baker (S. erythrostictum, Mast., not Mor. S. japonicum, Hort., not Siebold. S. macrophyllum, Hort., not Hort. Vilm.). Perennial, glaucous: sts. several, ascending, about 1 1/2 ft. high, glabrous: lvs. up to 2 1/2 x 1 1/4 in., alternate in 4 ranks, slightly convex below, oblong-spatulate, upper margin incurved: fls. greenish white, in a dense corymbose cyme, 3–4 in. diam.; sepals deltoid; petals lanceolate; anthers pinkish: carpels rose pink. Japan. Gt. 21:709.—A fine plant for the border or rockery. Var. variegatum, Hubb. (S. erythrostictum var. variegatum, Mast. S. japonicum var. variegatum, Hort. ex W. Mill.), has the lvs. irregularly blotched yellow in the center. Gt. 21:709.

51. telephioides, Michx. Perennial, glabrous: lvs. 6–10 in. high: lvs. scattered, 2 x 1 in., oblong or obovate, nearly entire or sparingly toothed, base cuneate: fls. numerous, flesh-colored, in small, dense, compound cymes, 1 1/4 in. diam.; sepals lanceolate, petals lanceolate, falcate, hooded at the tip. S. Pa. to W. N. Y., to S. Ind., N. C., and Ga.—Not common in cult.

52. Telephium, Linun. ORNINE. LIVE-FOREVER. Fig. 5588. Perennial: sts. erect, 12–18 in. high: lvs. scattered, rarely opposite, 2–3 x 1–1 1/4 in., oblong-obovate, denate; lower wedge-shaped at base; upper somewhat rounded: fls. numerous, pink, red-spotted or sometimes pure white, in dense terminal and lateral, pedunculate cymes; sepals lanceolate; petals lanceolate, 2 1/2 in. long, somewhat recurved. Cent. Eu. to Siberia and naturalized in N. America. The American material may be another species which it is almost impossible to distinguish horticulturally, namely S. purpureum, Tausch., and which is referred to S. Telephium by many authors.) Var. Bördei, Mill. (Anacampseros Bördei, Jord. & Fourn. S. Bördei, Hort. S. Anacampseros var. Bördei, Hort.), has reddish sts.: lvs. distinctly petiolated, oblong, tapering at base: fls. pink, in

3527. Sedum Sieboldii.

3537. Showy sedum.—Sedum specia-
3589. Live-forever.—Sedum Telephium. (X5)

55. ternatum, Michx. Fig. 3590. Perennial by root-stocks, glabrous, tufted: barren shoots 6-8 in. long, prostrate and creeping; fl.-sts. erect: lvs. ½in. long, in whorls of 3, flat, oblong, to suborbicular spatulate, crowded in rosettes at end of the barren shoots; those of the fl.-sts. clustered, oblong, acute; fls. white, ½in. across, 4-merous, in 1-sided, leafy, terminal, 5-6-parted cymes; sepals oblong; petals oblong, acutė; anthers red. N. Y. and N. J. to Ga., Ind., Mich., and Tenn. B.M. 1977. B.R. 142. G.M. 57:340.

56. primuloides, Franch. Rhizome thick; branches of st. short and fastigiatēly clustered; lvs. clustered in a terminal rosette, densely papillose, more or less long-petiolate, broad-spatulate, 5-10 lines including the petiole, entire: peduncles 1-fl., short: sepals narrowly lanceolate; petals white, broadly ovate, about ½in. long. China. G.M. 57:212.—Apparently rare in cult.

57. cyaneum, Rudolph. Perennial, 2-3 in. high, glaucous, lilac above; st. solitary or congested: lvs. opposite, few, entire, glabrous; radical oblong or oblong-oblong, somewhat rosulate; caune line oblong or oblong-linear: fls. purplish pink, about ¼in. across, in a simple or compound corymbose cyme; sepals lanceolate; petals ovate-oblong. Siberia. Gt. 27:972.

58. stoloniferum, Gmel. (S. ibérieum, Stev. S. spuriuh, Bieb.). Perennial: barley shoots trailing, glabrous, rooting at the nodes; fl.-sts. ascending, 6 in. high; reddish; lvs. opposite, ¼–½ in. long, spatulate or obvate-cuneate, coarsely toothed above, short-petioled: fls. numerous, ½–¾ in. across, pink or white, in terminal umbellate cymes, 2 in. diam.; sepals linear-oblong; petals lanceolate; anthers reddish, speckled. Asia Minor and Persia, also escaped in N. Maine and Newfoundland. B.M. 2370. Gn. 27, p. 315. R.H. 1891, p. 523.—S. spurium, Bieb., is maintained as a species by some authorities, but there seem to be no good characters by which to distinguish it. A showy species, common in European gardens and well adapted to rockeries. Var. cocineum, Hort. (S. spuriu var. coccineum, Hort.), is offered, in the trade.—The following trade names also appear: S. spuriu var. albus, Hort., S. spuriu var. roseum, Hort., S. spuriu var. rubrum, Hort., and S. spuriu var. splendens, Hort.

59. Névi, Gray. Perennial, cepitose, tufted, glabrous: barren shoots prostrate; fl.-sts. erect, 2-5 in. high; lvs. of barren shoots crowded in terminal rosettes, ½ x ¾ in., alternate, obvate-spataulate, tapering to a short petiole, auricled at the base, sprinkled with pink dots; those of the fl.-sts. scattered, alternate, similar, but appressed: fls. numerous, white, nearly ½ in. across, in forked cymes whose branches are 1-1½ in. long and recurved; sepals greenish, oblong; petals lanceolate; anthers brownish purple. Mountains of Va. to Ala. and Ill., but hardy as far north as Mass. B.B. (ed. 2) 2:210.

60. reithum, Hemsl. Shrubby, glabrous: branches thick and fleshy; lvs. alternate, small, about ½ in. long, oblong-oval or obvate-spataulate, sessile, flat, fleshy, usually rebose: lvs. white, subsessile, in a few-fl. cyme; sepals linear-oblong; petals oblong, acute, keeled on the back. Mex.

61. Cepaea, Linn.; also spelled cepaie. Annual, 10-12 in. high, glabrous: st. tufted, simple or loosely branched: lvs. alternate, ½–½ x ¾ in., oblong-spataulate, narrowed to the petiole; caune line opposite, whorled or scattered, narrower: fls. white, ½–¾ in. across, in a loose many-fl. paniculate cyme which has purple-spotted, spreading branches; calyx-tube very short, sepals lanceolate; petals lanceolate, with pink mid­nerves and often a few pinkish spots; anthers purplish. W. and S. Eu.—Cult. specimens are sometimes said to be pink-fld.

62. Anacampseros, Linn. (S. ronundilórum, Lam.). Perennial, glaucous, evergreen: branches terete, rooting at the nodes; fl.-sts. erect, reddish, about 6-8 in. high; lvs. alternate, orbicular or obvate-obturate, cor­date, auricled, margins redish; fls. numerous, pale
SEEDS AND SEEDAGE. A seed is a ripened embryo, and its integuments and storage tissues resulting from fertilization in the flower. Seedage is a term used to include all knowledge respecting the propagation of plants by means of seeds or spores. The word was first used, so far as the writer is aware, in 1887. It is equivalent to the French semis, and is comparable with the words graftage, layerage, and cutage. See Spores.

In general literature and common speech, a seed is that part of the plant which is the outcome of flower-fertilization and which is used for propagating the species. In the technical or botanical sense, however, the seed is the ripened ovule. The seed contains an embryo, which is a minia
ture plant. The embryo has one or more leaves (cotyledons), a bud or growing-point (plumule) and a short descending axis (caulicle). From the caulicle or stemlet, the radicle or root develops. This embryo is a minute dormant plant. Each embryo is the result of a distinct process of fertilization in which the pollen of the same or another flower has taken part. The ovule is contained in the ovary. The ripened ovary is the seed-case or pericarp. The pericarp, with the parts that are amalgamated with it, is known technically as the fruit. In many cases there is only one seed in the fruit; and the seed and its case may adhere and form practically one body. Many of the so-called seeds of horticulturists are really fruits containing one or few seeds. Such are the seeds of beets, lettuce, and sea-kale. The winged seeds of elms, hop-tree (Fig. 3391), and ashes are really fruits containing a single seed. Acorns, walnuts, butternuts, and chestnuts are also fruits; so are grains of corn, wheat, and the “seeds” of strawberry. The keys of maple are double fruits, with two seeds (Fig. 3356). Petals and sepals are also true seeds, the fruit part being the pod in which they are borne. Seeds of apples and pears are also true seeds, the fruit being the fleshy part that surrounds them.

Germination is the unfolding and the growing of the dormant or embryo plant. The first visible stage in germination is the swelling of the seed. Thereafter the integument is ruptured, and the caulicle appears. When the caulicle protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 3593). Germination is not complete, however, until the young plant has made vital connection with the soil, has developed green assimilative organs and is able to support itself (Fig. 3334). See, also, Figs. 3580 and 3290. Seeds that have sufficient life to sprout may still be too weak to carry the process to complete germination. The ideal test for the viability of seeds is to plant a few in soil in conditions that simulate as nearly as possible those in which they are finally to be planted. This test eliminates the seeds which are very weak and are not able to grow under ordinary
conditions and to push themselves through the soil. The sprouting test made in a specially prepared device, in which all conditions are regulated to a nicety, may be of the greatest value for purposes of scientific study and investigation and for the making of comparative tests between various samples, and the greater the sprouting test, the greater the germinating power; but one must not expect that the actual germination will always be as great as the percentage of sprouting. The test for sprouting shows only which seeds are alive. In many cases, the differences in results between the sprouting test in a specially prepared device and the germination tests in well-prepared soil in the open may be as great as 50 per cent. Viability varies with seasons and other conditions. While it is true as a general statement that the older the seed the less the viability, yet the reverse may be true within narrow limits. Sometimes lettuce and melons that germinate only 50 per cent in December germinate 70 to 80 per cent in April. For a discussion of technical methods of seed-testing, see Vol. II, “Cyclopedia of American Agriculture,” and other works.

In order that seeds shall germinate, they must be supplied with moisture and suitable temperature. The requisite temperature and moisture vary with the different kinds of seeds, and these factors are to be determined only by experience. Seeds may be planted in any medium that supplies these requisite conditions. Although seeds are ordinarily planted in the ground, such practice is not necessary to germination. They may be planted in coconut fiber, moss, or other medium. However, the ground may supply the requisites for germination, and it also supplies plant-food for the young plantlet when it begins to shift for itself; and, furthermore, the plants are in the position in which it is desired they shall grow. In the case of many seeds, germination is more rapid and certain when the seeds are sown in coconut fiber or other medium, for the conditions may be more uniform. As soon as germination is fairly complete, the plants are transplanted to the soil.

The depth at which seeds shall be sown depends on many conditions. Out-of-doors they are planted deeper than in the house, in order to insure a uniform supply of moisture. A depth equal to twice the diameter of the seed is an old gardeners’ rule. This applies well to the sowing of most seeds under glass when the soil is well prepared and is kept moist, but in the open ground three to four times this depth is usual. Seeds are placed near the building, where it can be visited frequently and where water may be applied as needed. If the bed is to be used late in the season when the soil is naturally dry, it is well to cover it the previous spring or fall with a coating of not too rich manure. This retains the moisture, and the leaching from the manure adds plant-food to the soil, thereby enabling the young plants to secure an early start. When the seeds are to be sown, the manure is removed and the surface is then in perfect condition. In the handling of young plants in seed-beds, one must take pains that the plants are not too thick and that they do not suffer for light, else they may become “drawn” and be practically worthless. In greenhouses and hotbeds, it is well to handle common vegetables and flower seeds in gardeners’ flats (Fig. 3597). These flats are easily handled, and the soil is so shallow that it can be kept in uniform conditions of temperature and moisture. The seeds of some of the finer and rarer kinds of ornamentals to please is required the special treatment. These treatments are usually specified in the articles devoted to those plants. Details of the handling of very delicate seeds are well discussed in the article on Orchids; see the article Palm and others, and the discussion of propagation of conifers, page 360, Vol. I.

As a rule, seeds germinate best when they are fresh, the best results being obtained when opened only a year old. Some seeds, however, of which those of melon, papaw, and cucumbers are examples, retain their vitality unimpaired for a number of years, and gardeners do not ask for recent stock. Seeds of corn-salad should be a year old to germinate well. Very bony seeds, as of haws and viburnums, often do not germinate until the second year. In the meantime, however, they should be kept moist. Seeds of most fruit and forest trees should be kept moist and cool, otherwise they lose vitality; yet if kept too moist, and particularly too close and warm, development of young plants will suffer. Nuts and hard seeds of hardy plants usually benefit by being buried in sand and allowed to freeze. The freezing and the moisture soften and split the integuments. Sometimes the seeds are placed between alternate layers of sand or sawdust: such practice is known technically as stratification.

L. H. B.

Seed-breeding may be considered from at least two very distinct viewpoints: first, the origination and development of new and improved varieties, either through selection or cross-breeding; and second, the development and raising of truer purer stocks of strains of proved value. See Breeding of Plants, Vol. I.

The first, as a rule, seems the most attractive in the sense of promoting knowledge and experience, but the growing of better and purer strains of the sorts which have proved best suited to one's local conditions and individual requirements is of far greater practical value. An important consideration of success in raising new varieties is the widest obtainable knowledge not only of the varietal forms of the species generally grown, but of the many stocks which at different times and in different locations have been found to be of so little practical value that they have never come into general cultivation. A second requisite is familiarity with the growing habits of the plant, and those of similar species, and the dexterity which can come only through practice in the crossing of the flowers and securing good growth and development of the fruits. There should also be developed a capacity for a quick judgment as to the probable correlation between conspicuous variations with others less discernible by the eye but which may affect the cultural value. Last, the development of new varieties of real value can come only through the practice of almost infinite patience which makes one content to throw into the dump thousands upon thousands of plants, many of which had seemed most promising, and to be satisfied if after years of labor one
CIV. Seed-growing in California.—Above, drying and turning lettuce stalks on the sheets. Below, cutting onion heads.
The second, and perhaps the most important branch of seed-breeding, is the raising of purer strains of stocks of proved value. An illustration of the need of work in this direction can be drawn from a recent trial planting of garden beets in which it was found that practically every root grown from 2-rod plantings of each of 214 samples of seed purchased under distinct varietal names from the most reputable seedsmen of America and Europe could be grouped into not over twenty distinct forms, and the roots so thrown together show as little variation as the crop from any one of the twenty most uniform samples in the trial. Often the only difference between two lots sold under different names would be in the proportion of the roots of each lot that conformed to the same varietal form. It is thought that seed-stocks of most species of garden vegetables would show similar variation, though possibly not to the same degree, and this is not so generally due to carelessness in growing or handling as to the want of adherence on the part of the seed-grower to clear-cut ideals of varietal form. Every plant grown from seed has a certain definite and changeless character which was inherent in the seed from which it was grown and is made up of a balanced sum of different tendencies, potentialities, and limitation of development inherited in different and varying degrees from each of its ancestors for an indefinite number of generations, plus more or less influence from climatic and other conditions effecting the development of the seed-producing plant. Generally the influence of the immediate parent is the dominant one, but not infrequently a characteristic of an ancestor which has been transmitted unexpressed for many generations appears in such strength as to change the whole character of the plant.

Under these conditions, a necessary preparation for the growing of better stocks is the formation of a very clear and comprehensive conception of the exact varietal character of the stock to be grown, and a rigid adherence to that ideal in the selection of seeding plants from year to year, never giving way to the ever-present temptation to use some superlative individual which differs in any respect from the original ideal of the stock. A most important aid, if not a requisite, for such persistence is the writing out and placing on file for frequent reference the fullest practical description of the exact varietal character of the sort. With this in hand, a few plants which come as near as possible to that ideal are selected, and the seed of each saved separately. The next season samples of each of these lots are planted in a preliminary trial. As they develop, and with the written description of the desired form in hand, they are carefully compared and the lots which most uniformly adhere to the described form are selected. The next season the reserved seed of the lots which seemed the best in the preliminary trial are planted in blocks as far as possible from each other, or any plants of the species, and the seed raised used for larger plantation for use as stock seed, in the meantime starting another selection from individual plants to take the place of the first, as it deteriorates. An illustration will show the value of careful selection and the necessity for constant renewal of even the purest of stocks. A very carefully bred strain of a variety of watermelon was used to plant a 20-acre field grown for seed. When about three-fourths of the fruit was ripe, several hours were spent in looking over the field for “off” stock and less than fifty fruits were found which should be removed. Fully 75 per cent of the fruits were so near alike that they could not be distinguished from each other. Seed from this field was used for planting seed crops and it was so good that little attention was paid to the stock; as a result, some years later, a crop grown in the same vicinity from seed of the same strain, but several generations removed, instead of less than fifty “off” fruits on 20 acres, had fully 75 per cent of the fruits more or less distinctly “off” and less than 20 per cent were as uniformly ideal of the variety as were 99 per cent of those of the first crop.

What might be termed commercial seed-growing has developed very rapidly in America in the past ten years, and there has not only been an increase in quantity, but an improvement in the varietal quality of the seed grown. Seed dealers having secured, sometimes at great cost, desirable stocks, enter into contracts with farmers located in sections where soil and climate are most favorable for the development of the best qualities of the sort and the securing of a full crop of the seed, to plant a given area and deliver to them the entire seed product. This the farmer does, often with little regard to selection, only taking the requisite pains to guard against contamination and mixture with other crops.

The United States Census of 1910 gives the total valuation of the vegetable- and flower-seed crop grown in the United States in 1909 at $1,411,013 (see page 3136), but it is thought that the amount actually produced was much larger, seed-dealers and -growers generally being inclined to depreciate the extent and profit of the business in order to lessen competition. Since then the amount grown and listed has increased materially, an estimate by a very experienced dealer of the area devoted to vegetable-seed crops in 1915 being as follows:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Acres seeded</th>
<th>Harvested (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed beans</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Cabbage</td>
<td>3,000</td>
<td>3,000</td>
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<tr>
<td>Celery</td>
<td>2,000</td>
<td>2,000</td>
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<tr>
<td>Collards</td>
<td>2,000</td>
<td>2,000</td>
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<tr>
<td>Corn</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Corn (seed)</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Crown thistles</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Watermelons</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Garden peas</td>
<td>50,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Radishes</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>50,000</td>
<td>50,000</td>
</tr>
</tbody>
</table>
This is the estimated area contracted for by growers especially for seed, but in the case of many crops, such as melons and peas, the amount of seed grown is greatly increased by crops which were originally planted with the intention of selling them as green vegetables, but which because of market conditions are allowed to ripen and are harvested and sold as seed.

WILL W. TRACY.

The seed trade of America.

The history of the seed business in colonial times is largely one of importation from Holland and England, when small hucksters carried a few boxes of popular seeds with an assortment of drygoods, foodstuffs, or hardware. Corn, barley, peas, onions, fruits, and vegetables, necessary in fact for direct use, first claimed the attention of the colonists. Toward the end of the eighteenth century we begin to find references to the growing of stock seeds, in the newspapers of the day are a number of advertisements of shopkeepers who dealt in seeds. Agricultural seeds were an article of commerce as early as 1747 (Pieters), clover, onions, beans, peas, carrots, cabbage and cauliflower, and others, being raised for seed in the colonies at that time, though chiefly imported. At that time Boston did most of the business. Among the earliest advertisers of seeds for sale were Nathaniel Bird, 1763, a book-dealer of Newport, R. I.; Gideon Wells, "On the Point," 1774; Samuel Hall, a dealer in farm goods in New York in 1776; William Davison of New York in 1768, while in Philadelphia, in 1772, we find one Pela­tiah Webster advertising clover and duck-grass seed; James Loughead, "colly-flower" seed in 1775, while David Reid kept a general assortment.

It was not until the opening of the nineteenth century that America began to find that seeds could be grown here as profitably as they could be imported. Grant Thorburn, in New York, and David Landreth, of Philadelphia, seem to have been the largest dealers at that time. Tho­rburn's was perhaps the first business of importance devoted entirely to stock seeds, although this honor is disputed by the descendants of David Landreth. Thorburn, in his autobiography, says that he began his business by buying out the stock of one George Ingles for $15, Ingles agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small beginnings from which has grown a trade which now amounts to many millions; and this relation between seedsmen and growers is largely typical of relations which have obtained in the trade ever since.

With the development of the railway and the postal service the business grew rapidly, new land was found suitable for different varieties of seed, and a letter could carry to the countryman the garden seeds for his yearly consumption. There is probably no trade which has been more widely benefited by cheap postage and improved mail facilities, but of late years the distribution by Congressmen has tended to negative this benefit. The originally beneficent distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no criticism, but it has degenerated into an abuse, which because of market conditions are allowed to ripen and are harvested and sold as seed.

The statistics of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always taken the lead in the seed export trade, and until recent years garden seeds have not been a considerable factor in the total values. In 1826 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade had existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1855 to $2,185,706 in 1853, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregated $5,383,063. In the ten years ending with 1880, clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $20,739,277. The aggregate was increased by more than $3,000,000 before the end of 1890. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad. The value of "flower and vegetable seeds" reported in the Thirteenth Census (for 1899) is $1,411,013 as against $226,019 for 1899, an increase of above 70 per cent. Aside from this the statistics of imports and exports of seeds have been taken as given in the Yearbook of the Department of Agriculture.

The following table will give as close an estimate as can be made of the present annual cost of the chief staple garden seeds handled in America:

<table>
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<th>Seed Type</th>
<th>Annual Cost</th>
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<tr>
<td>Garden peas</td>
<td>$1,500,000</td>
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<tr>
<td>Garden beans</td>
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<tr>
<td>Onions seed</td>
<td>250,000</td>
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<tr>
<td>Lettuce seed</td>
<td>250,000</td>
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<tr>
<td>Cabbage seed</td>
<td>150,000</td>
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<tr>
<td>Sweet corn</td>
<td>150,000</td>
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<tr>
<td>Tomato seed</td>
<td>150,000</td>
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<tr>
<td>Radish seed</td>
<td>125,000</td>
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<tr>
<td>Sweet corn</td>
<td>125,000</td>
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<tr>
<td>Celery seed</td>
<td>60,000</td>
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<tr>
<td>Thistles seeds</td>
<td>60,000</td>
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<tr>
<td>Flower seeds</td>
<td>200,000</td>
</tr>
<tr>
<td>Sweet peas, flowering</td>
<td>100,000</td>
</tr>
<tr>
<td>Probable invoice cost of imported garden seeds</td>
<td>$2,000,000</td>
</tr>
</tbody>
</table>

Probable invoice cost of imported garden seeds, $2,000,000
SEEDS AND SEEDAGE

The seeds usually offered by seedsmen in their catalogues, or in the seed-stores throughout the country, are secured from various parts of the world, and the seedsmen who sells seed at retail to the planter directs seldom grows his own seed, although some of the larger firms now grow seed-farms to grow certain specialties, and most of them conduct trial and experimental grounds.

The wholesale seed business is divided into two branches, so-called small-dealers, who buy from the farmers such things as grass seeds, clover seeds, and farm seeds used for planting large areas; the other line is the general seed-dealer who carries a limited stock of grass seeds, clover seeds, and the like, and specializes on vegetable seeds and flower seeds. He is usually not a grower of seed, but buys from seed-growers who specialize on a few things.

A large part of the vegetable and flower seed used in America is imported from England, France, Germany, Holland, and Denmark, especially such things as beans and mangels, cabbage and cauliflower, turnip and rutabaga, and the small flower seeds. In Germany, the seed-growers usually own or lease their own seed-farms, while in other countries, especially France, much of the production is conducted under the subcontracting plan, the grower keeping an agent in a certain locality and letting out small contracts with the farmers. The finer vegetable seeds and flower seeds, as well as the larger horticultural lines, are grown in this way.

In America, the smaller vegetable seeds and sweet peas are grown principally in California, where the growers own or lease their own seed-farms, and practically all of their capital is invested in the seed business. What are considered the "smaller vegetable seed-farms" and "California specialties" are carrot, endive, leek, lettuce, onion, parsnip, parsley, radish, salify, and flowering sweet peas. The preeminent California specialties are lettuce, onion, and sweet pea seed. There are no less than 5,000 acres, principally in the coast counties of central California, devoted to these three things. Pole beans, culinary peas, and some vine seeds are also produced in central California. These are grown on the subcontracting plan, much as in other places. Peas are now grown largely in Utah, Idaho, and Montana, as well as in Wisconsin, Michigan, and northern New York. Sweet corn and vine seeds are grown largely in Nebraska, northern Ohio, New York and New England. Watermelon seed is grown largely in the South; also okra. The best cabbage seed is produced in Long Island and to some extent in the country near Puget Sound in Washington. Pepper and eggplant, and some tomato seeds, are grown in New Jersey, and tomato seed is also grown in Michigan and California. Various other items are grown in greater or less quantities in various sections, such as beet and parsnip in New England, radish in Michigan, turnip in Pennsylvania, but the main sources of supply of these last-named articles are the European countries previously mentioned.

Seed-growers who subcontract their crops, usually operate large farms for the production of their stock seeds, where they do their selecting and developing, and where they grow the seeds which they send out to the farmers who produce crops from their stock. Such crops as are subcontracted are "rogued" and inspected throughout the season by the grower's agent. Seed-growing, as it affects vegetable and flower seeds, is conducted more or less scientifically and represents a very high state of intense farming, perhaps the highest known out-of-doors.

Seeds must be produced in regions where they can be grown not only profitably on account of climatic conditions, but also with abundant labor, where the quality can be maintained. Climates with a cold winter are usually required for biennial crops, such as carrot, beet, onion; when grown in California, the strains must be often renewed. Certain other crops require a dry summer climate, such as lettuce and sweet peas; other kinds require a moist or wet summer climate, as cabbage and cauliflower.

Many seed-growers now specialize on one or two lines, and there are large growers who raise nothing but tomatoes; others who grow only sweet corn; others who grow only field corn; and others who grow only sweet corn, others field corn, and others confine themselves to watermelon. Owing to the frequency of crop failures in seed production, as in other farm crops, the grower contracts with at least two sources of supply and usually both are separated.

Commission box assortments comprise one of the major branches of seed distribution, and one firm has nearly 150,000 customers to whom is consigned these assortments. Many of the larger horticultural lines also carry small lots of staple seeds in bags to sell in bulk and are therefore seed merchants in a small way. They usually rely for their base of supply on the seed-houses who consign them the box.

Dealers in garden seeds are also large dealers in flowering bulbs, such as hyacinths, tulips, narcissi, crocuses, and the like. These are chiefly imported from Holland, south of France, Italy, and Japan.

The trade is divided into the main branches of garden and flower seeds and bulbs, and agricultural products. The latter is practically a business by itself, devoted to such seeds as grass-gra_s, timothy, clover, red-top and alfalfa, some of which are exported or imported as the exigencies of the season's product demand. Flower seeds are subjected to no import duties, while on garden seeds there is a tariff figured on a specific basis. It is a moot point whether this tariff at the present time operates to the advantage of the trade, the principal seedsmen generally of the opinion that it tends to stimulate over-production in this country.

The main business of the country is in the hands of about 150 firms, but practically every grocerman in country towns and villages carries a stock during the spring season. This man, however, deals as a rule with the larger houses, and constitutes the principal class of middlemen for retail trade.

The seed-growing and merchandizing industry is represented by the American Seed Trade Association.

C. C. Mosse & Co.

SEEMANNIA (named for Berthold Seemann, 1825-1871). Gesneriaceae. Strigose-pubescent perennial herbs with rhizomes, suitable for the warmhouse: stes. stout, simple; lvs. verticillate in 3's or 4's, very short-petioled, frequently canescent below; the upper oval, pointed, acute; flowers solitary in axils: fls. red-purple; calyx-tube turbinate, adnate, lobes 5, narrow; corolla-tube bent downward, broadly and obliquely subcampanulate, the limb with 5 short, erect-spreading lobes; disk annular, undulate and not divided; ovary almost entirely inferior: caps. nearly inferior.—Two species, S. Amer. S. silvestrica, Hanst. (S. ternifolia, Regel). Plant 3-4 ft. high: lvs. 3-4 in a whorl, very shortly petioled; fls. calyx with 5 narrow lobes; corolla short-glabrous at base. Winter. Peru. Cult. 4, p. 182.

SELAGINELLA (diminutive of Latin Selago, old name of a club moss). Selaginellaceae. Club Moss. A large group of mostly tropical plants with small scale-like leaves and of diverse habit, ranging from minute prostrate annuals to erect or even climbing perennials.
Easily recognized by the production of two kinds of spores—powdery microspores from which the male prothallus arises and larger microspores produced 4 in a sporangium just within the axil of the terminal lvs. of the st. which often form a 4-angled spike. In all our cult. species the lvs. are in 4 ranks, the 2 upper smaller and pressed against the st., giving it a flattened appearance. Selaginellas are graceful fern-like greenhouse plants, often known to gardeners as lycopodiums. The botany of the genus is in an uncertain state, both as to nomenclature, and the limits of species. They are plants of the Pteridophyta or fern allies.

Selaginellas are favorite plants in every good conservatory, being greatly admired for their feathery moss-like foliage. They have various shades of green, and some of them are remarkable for metallic and iridescent tints, especially bronze and bluish colors, the latter being very unusual among plants in general. S. Willdenovii is a very choice large-growing species of the bronze and blue class. Another is S. ucutata, often called "rainbow moss." Selaginellas are often grown for their own sake as specimen plants, but they are also very commonly used as edging for greenhouse beds, for covering unsightly spots under the benches, and for hiding the surface soil of large tubs, orchid pots, and the like. (See Fig. 3598.) They are also delightful subjects for table decoration when grown in pans or jardimieres. For this purpose a well-grown selaginella should be a dense compact mass of fluffy and feathery green, not a weak thin straggling plant, as compared in Figs. 3599 and 3600. Selaginellas are also employed in bouquets of flowers, fronds being used for "green" instead of asparagus or fern. Occasionally a fancier of the more difficult species grows a large specimen in a Wardian case for exhibition. In general, selaginellas are of easy culture. As a rule they prefer shade and moisture and are somewhat tender in foliage compared with some of the commonest of commercial ferns. S. denticulata, S. Kraussiana, S. Martensii, and some other

commercial favorites may be rapidly propagated without any preliminary treatment in the cutting-bench. Cuttings of these species about an inch and a half long may be inserted directly into small pots of light sandy soil, placed in a shady position. Sylinge them lightly three or four times a day for a week, at the end of which time they will take root. They will soon grow into salable plants. The popular S. Emmelianana, which is generally considered by florists a variety of S. cuspidata, requires different treatment. It is much slower and sometimes requires about nine months from the making of cuttings until the young plants are ready for potting. Fill regular fern-boxes with fern soil, adding one part in five of sand, and press firmly. Choose mature fronds of the S. Emmelianana, cut them into pieces half an inch long, scatter thinly over surface of soil, and put just enough finely screened soil on top of the cuttings to attach some small portion of them to the soil. Water thoroughly, cover with glass, and place in a temperature of 70° F. In this condition they will soon form roots and little plants at almost every joint. When sufficiently large they should be separated and transplanted singly an inch apart into boxes, where they may be left until large enough to be potted. The following list of selaginellas for special and general purposes is not designed to be complete, but merely suggestive. For commercial purposes, S. denticulata, S. Kraussiana, S. Martensii, and S. Emmelianana; for carpeting the soil, S. denticulata; for table decoration, S. Emmelianana and S. Martensii, for cutting, the commercial kinds; for veranda-boxes, S. Braunii; for bronze and blue colors, S. Willdenovii and S. ucutata; for specimen plants and exhibitions, S. Braunii, S. Lyallii, S. viticulosa, S. Wallischii, and S. Willdenovii. Also the following, which are generally considered more difficult subjects: S. atroviolacea, S. hamatodes, and S. molliceps; for curiosity, S. serpens and S. lepidophylla. The curiosities of the genus call for special mention. S. serpens is remarkable for its changes of color during the day. In the morning the foliage is bright green; during the day it gradually becomes paler as though bleached by the light; toward night it resumes its lively green hue again. For S. lepidophylla, see Resurrection Plants. The following species also deserve a few running notes: S. Braunii is an old favorite which is often incorrectly labelled S. Willdenovii in collections. Its branches, or "foliage" in the popular sense, are exceptionally tough and wiry for the genus. Variegated forms appear in S. Martensii, S. Kraussiana, and S. involvens, the last-named species being prolific in singular form. It is better adapted for use as a pot-plant than for mINGling in a fernery, because of its strong-growing erect fern-like habit. The branchlets are thrown up from creeping stems and do not root readily, so that this species is usually propagated by division or spores. (W. H. Taplin and N. N. Bruckner.)

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KEY TO THE SPECIES.

A. Lvs. all similar, many-ranked: 1. rupestris

AA. Lvs. 4-ranked, of two sorts, forming an upper and a lower plane: mostly hothouse exotics.

B. Foliation of the spikes uniform. C. Main st. elongate, usually rooting throughout. D. Plants perennial: lvs. firm. E. Sta. continuous, l. c., without joints.

S. Emmelianana.
SELAGINELLA

Med. region throughout.—Trade names are vars. aërea and follis variegatus.

3. *sérpen*s, Spring. Sts. 6–9 in. long, trailing, bright green, copiously branched: lvs. of lower plane crowded, oblong, spreading, ciliate at the rounded base; lvs. of upper plane obliquely oblong, acute. W. Indies.—Long in cult.


5. *uncináta*, Spring (*Lycopodium césium* and *Selagi­nella césia*, Hort.). Sts. 1–2 ft. long, extending in a somewhat naked tip beyond the branches, doubly grooved above, with short, alternate branches: lvs. thin, blue-green, with a distinct midrib, slightly more produced on the upper side; lvs. of upper plane cupulate, much imbricated. China.—In 1885 John Saul offered "S. césia arborea" with the remark that *S. césia* was a synonym thereof.

6. *plumós*a, Baker. Sts. 6–12 in. long, flat above, often forked near the base: lvs. of lower plane close, bright green, much more produced on upper side of midrib, ciliate on both sides at base; lvs. of upper plane half as long, ovate, much imbricated. India, Ceylon, China, Malay Isls.

7. *conína*, Spring (*S. serruláta*, Spring). Sts. 1 ft. or more long, copiously pinnately branched, with more or less fan-shaped compound branches: lvs. of lower plane crowded, bright green, glossy, much dilated and rigidly ciliate on the upper side at base; lvs. of upper plane one-third as long, long-cupulate, much imbricated. Mascarene Isls.—Var. *follis variegátis*, Hort., is cult.

8. *stoloniféra*, Spring. Sts. 1 ft. or more long, with a more or less naked tip, angled above and below, with short, compound branches: lvs. of lower plane closely set, rigid, acute, short-ciliate and minutely auricled at base. W. Indies.

9. *Kraussínia*, A. Br. Sts. 6–12 in. long, flat on the back, rounded on the face, copiously pinnate, with compound branches: lvs. of upper plane spaced on the branches and main st. acute, slightly imbricated over the st.; lvs. of upper plane obliquely ovate, acute. Afr., Madeira.—*S. Brownii*, Hort., is a dwarf form from the Azores. Vars. aërea and variegátis are American trade names.

10. *Cunnínghamii*, Baker. Sts. copiously pinnate, the lower branches compound: lvs. of lower plane ovate or oblong, cordate and very unequal-sided at base, much imbricated over the st.; lvs. of upper plane distinctly cupulate. Brazil.—Similar to preceding, but with longer lvs.

11. *brasilienís*, A. Br. Sts. copiously pinnate, the lower slightly compound: lvs. of lower plane mostly spaced, acute, cordate at base, ciliate and imbricated over the st.; lvs. of upper plane half as long, cupulate. Brazil.—Similar to preceding, but with shorter lvs.

12. *áspus*, Spring. Sts. 1–4 ft. long, angled above, with short, simple or forked branches: lvs. of lower plane pale green, serrulate but not ciliate, cordate on the upper side; lvs. of the upper plane ovate. Canada to Texas.—*Lycopodium densum*, cult. at the Harvard Botanic Garden, is said to belong here.


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1. *rupéstris*, Spring. A small, rock-loving perennial, with branching sts. 4–5 in. long, many-ranked lvs. ending in a white aavn, and square, 4-angled spikes. Native of the eastern half of the U. S., but replaced by many allied species in the Rocky Mts. and on the Pacific coast. The writer has separated 6 of these and Dr. Hieronymus, at Berlin, has also characterized 10 others.

2. *denticuláta*, Link. Fig. 3398. Sts. less than 6 in. long, matted: lvs. of the lower plane slightly spaced, denticate, cordate on the upper side at base and imbricated over the st.; lvs. of upper plane cuspidate.
15. californica, Spring. Sts. 4-6 in. long, 4-angled, copiously pinnate: lvs. of lower plane ovate, minutely cuspidate, denticulate on the upper side at the base; lvs. of the upper plane very small, ovate-oblong. Said to come from Low. Calif. but not known at Kew and doubtfully in cult. in this country.

16. Martensi, Spring. Fig. 3599. Sts. 6-12 in. long, flat or rounded below, angled above: lvs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly incurved over the st. at base; lvs. of upper plane obliquely oblong, cuspidate. Mex.—Exists under many varieties in cult.

17. rubella, Moore. Sts. 1 ft. long, somewhat erect in habit, reddish brown, with 2 grooves on the upper face: lvs. of lower plane dark green, becoming reddish with age, obtuse or obscurely cuspidate, ciliate and incurved over the st. at the upper side of base; lvs. of upper plane ovate-cuspidate. Native country not known.—Has been in cult. since 1870. Var. variegata, Hort., is cult.

18. Pühlerti, Hort. Veitch. Sts. densely tufted, slender, suberect, 2-3 in. long, 3-4 times dichotomously forked: lvs. of lower plane spaced, subobtuse, obtuse, bright green; lvs. of upper plane nearly as long, but ovate and acute. Azores.

19. involvens, Spring. Sts. densely tufted, 2-6 in. long, deltoid, branched nearly to the base: lvs. of lower plane crowded, ovate, with a distinct cusp, bright green, thick, rigid, serrulate on both margins; lvs. of upper plane nearly as long, ovate-lanceolate, cuspidate. Japan to India and the Philippines.

20. lepidophylla, Spring. Resurrection Plant. Sts. 2-4 in. long, densely tufted, spreading in a close spiral so as to form a flatish expanse, curling closely into a ball when quite dry: lvs. of lower plane oblong, obtuse, minutely ciliate, green on the face, paler below; lvs. of upper plane nearly as long, obliquely ovate, obtuse. Texas and Mex. to Peru.—Often sold dry under the name of "resurrection plant" (which see), as the absorption of water will cause the ball with a dull upper face of the sts. long after the plant is dead.

21. cuspidata, Link. Sts. densely tufted, 6 in. or more long, branched nearly to the base, with copiously compound branches: lvs. of lower plane obliquely ovate, cuspidate, dilated and ciliated on the upper side at the base, pale green edged with white; lvs. of upper plane nearly as long, obliquely ovate, cuspidate. Cuba and Mex. to Venezuela.—A plant occurring under the horticultural name Lycopodium cordifolium has the st. a foot or more long and simple in its lower part, and doubtless represents a distinct species.

22. Emmeliâna, Hort. Fig. 3600. Sts. 6-12 in. high, the primary branches ascending, bipinnate: lvs. of lower plane close, obliquely ovate, those of the branchlets narrower and minutely spinulose; lvs. of upper plane raised above those of the lower one-half as large, spinulose-serrate, short-cuspidate. S. Amer.?(.)—Named for Th. Emmel, a German gardener. Var. aërea is a yellow form. This species and its variety are most commonly seen in the American trade. They require a constant supply of moisture. If allowed to dry, the tips of the fronds turn brown and do not recover.

23. Wällichii, Spring. Sts. 2-3 ft. long, with lanceolate branches and simple crowded branchlets: lvs. of lower plane crowded, smaller toward the end of the pinnules; lvs. of upper plane one-fourth as long, cuspidate: spikes ½-1 in. long. India and the E. Indies.—Highly ornamental.

24. Victòria, Moore. Sts. 3-4 ft. long, with lanceolate-deltoid, caduâte branches, with the lower branchlets forked or slightly pinnate: lvs. of lower plane crowded, a line long, truncate at base and obscurely petiolate; lvs. of upper plane one-fourth as long, short-cuspidate: spikes 1½-2 in. long. Borneo and Fiji Isls.

25. gràdilis, Moore. Sts. 2-3 ft. long, somewhat roughened, with lanceolate branches and simple branchlets: lvs. of lower plane ovate-falcate, adnate to st. on lower side at base; lvs. of upper plane ovate-lanceolate, cuspidate. Polynesia.

26. Lôbbi, Moore (S. cöptâta, Hort.). Sts. 3-4 ft. long, with lanceolate-deltoid branches and contiguous simple or forked branchlets: lvs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Borneo and Sumatra.

27. Wildeânovii, Baker. Sts. reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguous: lvs. of lower plane crowded, ovate or oblong, fringed with blue, obscurely petiolate; lvs. of upper plane one-third as long, obliquely oblong, not cuspidate. India and the E. Indies.


29. viticulûsa, Klotsch. Sts. with deltoid 2-3-pinnate branches: lvs. of lower plane ascending, acute, short-ciliated and much imbricated over the st.; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. S. Amer.

30. caûlécens, Spring (S. amëna, Hort.). Sts. stiff, erect, the short final branchlets curling when dry: lvs. of lower plane crowded, ovate, falcate, bright green; lvs. of upper plane one-third to one-fourth as long, cuspidate. Japan, China, and E. Indies. Var. argenteâta, Hort., is advertised.


32. flâbelâtâ, Spring. Sts. erect, deltoid, decompound, with contiguous final branchlets: lvs. of lower plane obliquely ovate, acute, broadly rounded and ciliate at the base; lvs. of upper plane obliquely oblong, cuspidate. Widely distributed in tropical regions.—One of the forms of this is cult. as S. crûsæ, Hort.

33. Vögeliîi, Spring (S. africâna, A. Br. S. Perséliî, Spring). Sts. decompound above, the lower pinna deltoid, petiolate, 3-4-pinnate: lvs. of lower plane lanceolate, ascending, often revolute on both edges, truncate at base; lvs. of upper plane minute, strongly cuspidate. Afr.

34. Liâlliî, Spring. Sts. deltoid above, the lower pinna bipinnate, the final divisions ½-1 in. long, ½-2
35. erythrops, Spring. Sts. under a foot long, deltoid and decumbent above, the lower pinna 3-pinnate, the ultimate divisions ½–1 sin. wide: lvs. of lower plane oblong-lanceolate, acute; lvs. of upper plane minute, acute. Madagascarn.

36. hematodes, Spring (S. Alcina, Spring). Sts. 1–2 ft. long, the deltoid pinnae 3–4-pinnate, the ultimate divisions ½–1 sin. wide: lvs. of lower plane ascending, oblong-lanceolate, acute, dilated on upper side at base, not ciliatc; lvs. of upper plane minute, cuspitate. Venezuela to Peru.

37. geniculata, Spring (S. elongata, Kl.). Sts. 2–3 ft. long, decumbent, with lower pinna 3-pinnate, the divisions ascending and pinnately arranged: lvs. of lower plane ovate, acute: lvs. of upper plane one-third as long, ovate-lanceolate. Costa Rica to Peru.

38. cordifolia, Spring (S. cordata, Kl.). Sts. trailing, a foot long, with short branches often ending in whip-like tips: lvs. of lower plane acute, pale green, ciliated on the upper edge, dilated and subcordate: lvs. of upper plane ovate-lanceolate, cuspitate. W. Indies.

39. molliceps, Spring (S. rubricaulis, A. Br.). Sts. erect, 6–9 in. long, bisulate above, much compound: lvs. of lower plane oblong-lanceolate, dark green, very unequal-sided, serrulate on the upper edge: lvs. of upper plane one-half to one-third as long, ovate or ovate-lanceolate, cuspitate. Afr.

The following American trade names can not be satisfactorily accounted for as species: S. occidentalis is said to be one of the most important commercial species cultivated in Amer.—S. circinata is cult. at Harvard Botanic Garden.—S. Lagenaria was intro. from Columbia and probably belongs to species already described from that country. It is said to be a very light green plant and a strong grower, whereas S. Pitcheriaca is of dwarf habit and with and under surface of fons red and upper surface dark green.—S. Mandibula is a recent intro. by W. A. Manda which can not be satisfactorily placed.—S. paradoxa. Offered by John Saul, 1893.—S. Pitcheriaca. Consult S. Lagenaria. Colombia.—S. ruibrutina and S. triangularis were offered by Saul in 1885.—S. uniflora. Once cult. by Pitcher & Manda, of the United States Nurseries.

F. TRACY HUBBARD.

SELENIA (probably from the Greek moon; said to refer to the round seeds). Crucefura. Small annual herbs sparingly grown in gardens: lvs. pinnatifid: racemes terminal, leafy: lvs. yellow; sepals spreading, colored, subequal; petal erect: silique stipitate, oval berry much compressed; seeds many, acut,d at the base, valves reticulate.—Three species, N. Amer.

aurea, Nutt., is a hardy annual of the mustard family, a native of the U. S. from Ark. and Texas to the base of the Rockies. It is not known to be cult. in Amer., but it seems to be one of the prettiest of our few native ornamental crucifers. It has small yellow fls. about 3½ sin. across, each of the 4 petals having a central band of red. It is also interesting for its finely cut foliage and its flat pods through which the seeds may be vaguely seen, as in the case of lunaria, or "honesty." It grows about 9 in. high. B. M. 6607.

SELENICEREUS (moon goddess and cactus). Cactaceae. Cacti with slender trailing hanging or climbing sts., more or less epiphytic: ribs several, usually low, with closely set areoles bearing small short or acicular spines: fls. large, nocturnal, fragrant; ovary and fr. covered with clusters of small spines often accompanied by long hairs. More than 20 species are known. This genus contains a number of easily grown species which are great favorites in cult. on account of the great size and beauty of the fls. Some of the species are reported to possess medicinal properties. These plants have been referred to Cereus.

A. Fl.-tube and ovary without long hairs.

B. Spines on sts. acicular.

vagans, Brit. & Rose (Cereus vagans, Brandeg.). Sts. slender, numerous, clambering over rocks in the wild state, but in cult. ascending: ribs low: spines rather short, yellowish: fls. 6 in. long; tube, including throat, about 4 in. long, slightly curved, brownish, with small scattered bracts bearing in their axis clusters of 5–8 acicular spines; throat narrow, 2 in. long; sepals linear, the outer ones brownish, the inner ones greenish white, 2¼ in. long; petals white, obovate, 2½ in. long with a short acuminate tip, the margins, especially above, undulate or toothed; ovary covered with acicular spines. West coast of Mex.

Bb. Spines on sts. not acicular.

spinulosus, Brit. & Rose (Cereus spinulosus, DC.). Slender climbing vine, 10–14 ft. long: ribs usually 5, not very conspicuous in age: spines about 8, very short, usually dark: fls. 4½–5 in. long, white, with a pink tinge; ovary and fl.-tube bearded with small clusters of acicular spines but no long hairs. Common in N. E. Mex. and S. E. Texas, but not found in the W. Indies. Blühenden Kakteen, pl. 53.

AA. Fl.-tube and ovary bearing long hairs among the spines.

Bb. Spines of the sts. acicular.

c. Color of spines white.

Donkeleri, Brit. & Rose (Cereus Donkeleri, Salm-Dyck). A slender epiphytic plant, much branched, clinging to the bark of trees by aerial roots, commonly in company with orchids: branches long, slender, nearly terete, about ¾ in. diam. with 6–8 low, almost inconspicuous ribs; spines 10–15, very short, snow-white, closely appressed to the st. Brazil.

c. Color of spines brownish.

grandiflorus, Brit. & Rose (Cereus grandiflorus, Mill.). Creeping or clambering vines: sts. stout, often 1 in. diam., bluish green; ribs 7 or 8, spines acicular, yellowish brown or brownish: fls. very large, fragrant, 6–8 in. long. Jamaica, but said also to be native of Mex., which is doubtless wrong. B. M. 3381.—A number of species resembling S. grandiflorus in a general way, but specifically distinct, are often to be found under this name in collections; they need further study. This species is used in the manufacture of a heart-tonic.
SELENICEREUS

bb. Spines of the sts. not acicular.
c. Sts. blue-green.


c. Sts. deep green.
d. Spines on ribs relatively low and few.

MacDonaldia, Brit. & Otto (Cereus MacDonaldiae, Hook.). Clambering vines of rapid growth, freely branching; branches deep green; the ribs rather low, obtuse, somewhat interrupted: spines 1 or 2, short, porrect, dark: fls. very large, 14 in. long, white. Horduras, probably, but some recent writers claim it came originally from Argentina, glabrous, 107, Cact. Journ. 2: 135.—One of the largest-flowered species of the cactus family and one of the best of the night-blooming kind.

SELENOPHYLLUM. For the species included in this genus in "Cyclopedia of American Horticulture," see Pharmagnumedit. The true Selendophyllums (or Selendopodium) are few and seen not to be in cult.

SELENOCYPRIPEDIUM (compounded from SELINUM (Greek name for parsley). SELF-HEAL: SELF-STERILITY OF FRUITS: SELIGUEA, S. (personal name, from Selligue, naturalist and mechanician). Polypodaceae. A group of ferns referred to Diels (Engler & Prantl, Die Naturlichen Pflanzenfamilien) to Polypondium. Only P. Féei, Mett. (Selliguea Féei, Bory, Gymnogramma Féei, Hook.), appears to be listed. It is described by Schneider as a small stover species of the Malay Isls., Java, and Borneo; a frount's entire, from a creeping rhizome, the barren ones 3-4 in. long and 2 in. or less broad, the fertile ones narrower and longer-stalked.

SEMELE (named for the mother of Bacchus). SEMELE, Linn. f. MARKING-NUT TREE. A moderately sized deciduous tree with large, oblong or obovate-oblong lvs. 8-24 in. long by 5-10 in. wide: fls. greenish white, ½ in. across, nearly sessile, in stout branching panicles about the same length as the lvs.: drupe 1 in. long, smooth, black. India.—The black acid juice of the nut is used for printing cotton cloth. Cult. in S. Fla.

SEMINICA (named for the mother of Bacchus). Liliaceae. CLAMMING BUTCHER'S BROOM. A warhouse plant, hardy outside in the extreme N. and S. of this country, and branched, high-climbing over trees attaining a height of 50-60 ft., cladodia fl-like, alternate or few, solitary at the axils of flesuous-membranaceous scales, ovate-lanceolate, acuminate, leathery: fls. small, yellow, fasciared, the fasciules on the margins of the cladodia, poriath persistent, tube very short, tubinate, almost hemispherical; crown none; ovary sessile or stalked; calyx 5-lobed; corolla oblique, 5-lobed, segments imbricated and deciduous; petals 5, spreading, somewhat unequal; disk annular and rather broad; stamens 5; ovary superior, sessile, 1-3-celled: nut or drupe reniform.—About 30 species, Trop. Asia and Austral.

Selenium, Linn. f. MARKING-NUF TREE. A moderately sized deciduous tree with large, oblong or obovate-oblong lvs. 8-24 in. long by 5-10 in. wide: fls. greenish white, ½ in. across, nearly sessile, in stout branching panicles about the same length as the lvs.: drupe 1 in. long, smooth, black. India.—The black acid juice of the nut is used for printing cotton cloth. Cult. in S. Fla.

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SELENOPIPEDIUM (named for Natale Sellier, a French engraver who worked for Cavanilles). Goodeniodaceae. Two creeping and rooting perennial herbs of Austral. and New Zeal. and one of them extending to Chile: plant creeping and rooting perennial herbs of Austral. and New Zeal., often in tens of thousands, the cladodia and the filaments free instead of grown into leaf-like organs which have the form and function of lvs. but not the morphology. Some members of this genus are probably not regularly in cult., but the roots of one of them are used in Europe and in the United States in the preparation of a fertilizer. The plants are probably not regularly in cult., but the roots of one of them are used in Europe and in the United States in the preparation of a fertilizer.
SEMELE

Gn. 72, p. 432. G.M. 31:477, 479; 37:261.—The members which have the position of lvs. are minute scales, in the axil of which are borne the cladophylla, the latter being 9-4 in. long. It is grown in the open in S. Calif. and is said to look like a tropical smilax and to have dark green tropical foliage likely to be mistaken for some of the Indian climbing palms.

F. TRACY HUBBARD.

SEMIBEGONIIELLA is a recent genus of the Begoniaceae, differing from Begonia in having a tubular male flower (Syngeneum has a tubular female flower), apparently not in cult. S. Sodiroi, C. DC. from Ecuador was described, and the genus founded, in 1908.


Leaves alternate, thick-fleshy, often revolute: cymes panicked, usually densely: fls. white, rose, green, yellow, or purple; calyx 6- to many-cleft or -parted, rarely 5-cleft; petals 6 to many, free or connate at the base, oblong or lanceolate; stamens double as many as the petals, rarely the same number, free; ovary with as many carpels as petals, rarely the same number, free; ovary with as many carpels as petals, free or the base or up to the middle immersed in the calyx-tube: fr. many-seeded follicles.—About 65 species, widely scattered in the mountains of the Old World. The genus was monographed (horticulturally) by J. G. Baker in Gardener’s Chronicle for 1879, and his treatment has been followed here to some extent with the addition of several species and slight modifications to meet more recent knowledge of the genus. Sempervivum is closely related to Sedum, but the floral parts are multiples of 6 or some larger number, while the floral parts of Sedum are in 5’s. The genus is a difficult one for the botanist, and the specific limits are very uncertain and unsatisfactory, no two authors agreeing. The key will undoubtedly prove faulty, but is an attempt to simplify the determination of the species.

Sempervivums are mostly hardy perennials and stemless, and increase by rosettes (Fig. 3602) which are sent out from the parent plant, thereby suggesting the easiest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for the commonest, are the prettiest of them all, by reason of the webs that cover the young rosettes. These coverings are made by the plants themselves and are incidental to development, but in some species are not strongly developed and in all the group are less noticeable in the old rosettes.

SEMPERVIVUM

The species, which grows on the roofs of houses in Europe, is S. tectorum. In the case of S. soboliferum the young rosettes are attached to the parent plant by a more slender thread than usual and more easily detach themselves and roll about. The spider-web species, of which S. arachnoideum is the commonest, are the prettiest of them all, by reason of the webs that cover the young rosettes.

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SEMPERVERIVUM

1. poulchellum
2. St. herbeous, with the basal lvs. in a rosette
3. St. shrubby, with the lvs. in a rosette
4. St. herbaceous, with the basal lvs. in a rosette
5. Fls. usually 12-merous (9-11, merous); widely expanded at maturity.
6. Fls. small; petals not fimbriated externally
7. Lvs. oblong-lanceolate; petals linear-oblong
8. Lvs. obovate-cuneate; petals linear-lanceolate
9. Segms. of calyx oblong
10. Segms. of calyx obtuse to rounded
11. Petals linear-lanceolate; calyx-segments short-triangular
12. Petals elliptical; calyx-segments oval
13. Petals linear-lanceolate; calyx-segments short-triangular
14. Petals linear-lanceolate; calyx-segments oval
15. Lvs. obtuse-cuneate
16. Lvs. obovate-cuneate
17. Lvs. obovate
18. Lvs. linear-lanceolate
19. Lvs. linear
20. Lvs. linear-oblong
21. Lvs. lanceolate
22. Lvs. lanceolate, acuminate
23. Lvs. lanceolate, obtuse
24. Lvs. lanceolate, acuminate
25. Petals lanceolate, acuminate
26. Petals lanceolate, obtuse
27. Petals lanceolate, acute
28. Petals lanceolate, obtuse
29. Petals lanceolate, acuminate
30. Petals lanceolate, obtuse
31. Petals lanceolate, acute
32. Petals lanceolate, acuminate
33. Petals lanceolate, obtuse
34. Petals lanceolate, acute
35. Petals lanceolate, acuminate
36. Petals lanceolate, obtuse
37. Petals lanceolate, acute
38. Petals lanceolate, acuminate
39. Petals lanceolate, obtuse
40. Petals lanceolate, acute
41. Petals lanceolate, acuminate
42. Petals lanceolate, obtuse
43. Petals lanceolate, acute
44. Petals lanceolate, acuminate
45. Petals lanceolate, obtuse

SEMPERVIVUM

41.
42.
43.
44.
45.

SEMPERVIVUM

3143

SEMPERVIVUM

THEORY

AA. Plants with secondary rosettes on offsets or seossile.

D. Fls. usually 6-merous; not widely spreading at maturity.
E. The fla. small; petals not fimbriated on the margin and keel
D. Segma. of calyx linear-oblong; petals linear-oblong
E. Segma. of calyx lanceolate; petals lanceolate
C. The fls. large; petals fimbriated on the margin and keel
D. New rosettes rolled up into round balls
E. Lvs. obovate-cuneate
D. New rosettes not rolled up into round balls
E. Lvs. oblong-cuneate
B. Fls. usually 12-merous (9-14, merous); widely expanded at maturity.

C. Color of fls. yellow or yellowish
D. Surface of lvs. glabrous
E. The lvs. obovate-cuneate
D. Surface of lvs. more or less hairy
E. Blade of lvs. ensiform, linguiform
D. Blade of lvs. obtuse to rounded
E. Blade of lvs. more or less obovate-cuneate
C. Segms. of calyx oblong
D. Petals linear-lanceolate, acute externally
E. Petals lanceolate, acuminate
D. Petals lanceolate, obtuse externally
E. Petals lanceolate, acute externally
C. Color of fls. reddish or purplish
D. Inner lvs. of rosette with their tips connected by fine hairs like a spider’s web
D. (The following 5 species are very closely related.)
SEMPERVIVUM

E. Rosette lvs. glabrous or merely puberulent at a apex.
F. Calyz-segms. lanceolate-linear, acute; cauline lvs. lanceolate-linear... 18. hetero-trichum
FF. Calyz-segms. linear, obtuse; cauline lvs. oblongate to oblong... 19. Moggridgei
EE. Rosette lvs. more or less hairy.
F. Segms. of calyz linear, ... 20. arachnoideum
FF. Segms. of calyz ovate to lanceolate.
G. Cauline lvs. lanceolate; rosette lvs. oblong-obovate. 21. Doellianum
GG. Cauline and rosette lvs. lingulate. ... 22. Laggeri
PP. Inner lvs. of rosettes not connected by fine hairs like a spider’s web.
E. Tips of lvs. with tuft of hairs. 23. Hausmannii
F. Lvs. ovate-oblongate. 24. Brotanum
G. Lfs. ovate or obovate. 25. assimile
H. Lvs. elliptical. ... 26. Laggeri
HH. Lvs. echiiate. 27. pumilum
II. Lvs. lanceolate. 28. montanum
JJ. Lvs. cuneate. 29. flagelliforme
TT. Surface of lvs. of the rosettes pubescent.
G. Stamens two-thirds as long as petals.
H. Barren rosettes not more than 1 in. diam. 27. pumilum
HH. Barren rosettes more than 1 in. diam. 28. montanum
II. Fls. numerous, mauve or red-brown. ... 29. flagelliforme
JJ. Fls. less (4-5), bright red. 30. fimbristatum
EE. Tips of lvs. without tuft of hairs.
F. Surface of lvs. of the rosettes pubescent.
G. Setae lvs. distinct. Fls. rose-red. 31. Pomellii
GG. Setae lvs. indistinct. Fls. bright red. 32. assimile
HH. Stamens half as long as petals.
II. Barren rosettes not more than 1 in. diam. 33. Lamottei
JJ. Fls. rose-red. 34. Pomellii
TT. Lvs. ovate or obovate. 35. Funckii
HH. Lvs. obtuse or acuminate. 36. glaucum
II. Lvs. pale green but not glaucous.
E. Cauline lvs. green-dipped; petals rose... 37. Verloti
EE. Cauline lvs. claret-dipped; petals white-marbled... 38. atlanticum
TT. Red-brown tip of rosette lvs. distinct.
I. The cauline lvs. red and green throughout. 39. triste
II. The cauline lvs. partly green.

SEMPERVIVUM

I. Rosette lvs. glabrous.
K. Outer lvs. of rosette 1½-2 in.; fls. about 3-4 in. across. 40. Greenii
KK. Outer lvs. of rosette 1½-2 in.; fls. about 4 in. acros... 41. calcarum
LL. Rosette lvs. not glaucous. (The following species are frequently kept distinct but no distinguishing key characters can be detected from the descriptions.)

1. pociuliforme, Berger & DeWild. St. simple, erect, more or less elongated: basal lvs. in a rosette, oblong-lanceolate, cuneate at the apex, serratulate, otherwise glabrous; cauline lvs. obovate-spatulate; fls. 5-merous, in a glabrous panicle; calyx glabrous, segments lanceolate-triangular subacute; petals lanceolate, acute. Canary IsIs. (7).

2. canariense, Linn. Subshrub: st. short, thick; lvs. in a flattened rosette, obvate-spatulate, mucronate, acuminate; petals in a petiole, villous; cauline lvs. obovate-rotundate; fls. 7-9-merous, pale yellow or white, in a lax thyrsoid elongated panicle; calyx very villous, segments ovate-lanceolate; petals linear, acute. Canary IsIs.

3. arboreum, Linn. St. arborescent, with terete branches; rosettes concave; lvs. spreading, obovate-spatulate, obtuse, mucronate, base cuneate, rather glabrous; fls. golden yellow in a many-flowered leafy panicle; calyx-segments ovate, rather acute; petals spreading, 10-12, elliptic. Medit. region.

4. chrysanthum, Hochst. Subshrub, 1-3 ft. high; st. thick; lvs. pectinate-ciliate, on barren shoots rosetulate, roundish ovate; cauline lvs. obvate-oblong, rounded above, apiculate; fls. about 8-merous, yellow, or white(?), in a thyrsoid corymb; calyx-segments short-triangular; petals linear-lanceolate. Abyssinia.--Closely allied to S. arboreum and possibly not distinct from it.

5. tabulatum, Hornem. Shrub; st. erect-branched; lvs. oblong-spatulate, base attenuate, flat, ciliate, gathered at the tips of the branches in a flat rosette; peduncles minutely glandular; petals linear-lanceolate, very pale sulfur. Canary IsIs.

6. spathulatum, Bornem. (S. barbatum, C. Smith. Aëonium barbatum, Webb & Berth.). Shrubby; st. stout; branches horizontal near the st., then arched and erect; rosettes flat, not dense; lvs. of the rosettes oblong-spatulate, acute, margin papillose, both surfaces with linear, red-brown markings; calyx lvs. linear-lanceolate, acuminate; fls. 8-10-merous, in rather open panicles, the fls. on the upper side of the branches; calyx-segments deltoid; petals oblong-lanceolate, acute. Canary IsIs.--Some of the material grown under this name is certainly not the species above described, but probably a form of S. tectorum.

7. Heufellii, Schott (S. petersii, Griseb. & Schenk). Barren-rosette 1½-2 in. diam., the young rosettes not pedunculated; lvs. 30-40 to a rosette, obovate-cuneate, distinctly cuspitate, glabrous, lower part pale green, upper third or even half tinted bright red-brown, margin crowded, stiff, white-ciliate, outer lvs. 3½-1 x 3½ in.
Sempervivum
culine lvs. close, red-brown, lanceolate, 3/4–1 in. long; fl.-st. including the infl. 6–8 in. high, densely short / puberulent, yellow-green, pale strigillose, pale purple, lance-ovate-cuneate, in a dense panicule 21/2–3 in. diam.; calyx-teeth linear-oblong, finely glandular-pubescent on the back and red-brown when old; petals 3/4 in. long, linear-oblong, obtuse, with 3 small cilia; keeled and finely glandular outside. Transylvania, Austria, and Greece in the mountains. Of the latest in flower.

8. Regia-Mamillia, Hedr. & Sart. Rosettes about 3 in. diam., the new ones sessile; lvs. 100 or more to a rosette, obovate-cuneate, distinctly cuspidate, all bright yellow, petalless in the upper half, greenish at the base, glabrous, margin ciliate, outer lvs. 1–11/2 x 1/2–3/4 in.; calyx lvs. crowded, lanceolate, brown, slightly pubescent: fl.-st. including infl. 6 in. high, densely pubescent; fls. 6–7-merous, pale yellow, in a dense many-fl. corymbose panicle; calyx finely glandular-pubescent, segms. lanceolate; petals lingulate, obtuse, obscurely tricuspidate, densely glandular externally. Mountains of Greece.

9. S. soboliferum, Sims (S. globiferum, Linn. as to synonymy with many other authors, not Linn. as to plant cited). Hen-and-Chickens. Houseleek. Barren rosettes globose, 1–11/2 in. diam., the copious new rosettes sessile and attached to the parent only by a slender thread and easily becoming detached from it and rolling about: lvs. 60–80 to a rosette, obovate-cuneate, obscurely cuspidate, pale light green, glabrous, margin minutely ciliate, outer ones tinted with red-brown especially on their back, 1/2–3/4 x 1/2–3/4 in.; calyx lvs. very densely crowded, ovate-lanceolate, acute: fl.-st. including infl. 6–9 in. high, very robust, finely pubescent: fls. 6–7-merous, pale yellow, in a short, dense, many-fl. panicle, which is 3–4 in. diam.; calyx-segms. lanceolate, nearly glabrous on the back, margins strongly ciliate, mostly 1–11/2 in. long; obtuse, tricuspidate, margins conspicuously fimbriate. Mountains of Austria. B.M. 1457.—Unless the young rosettes are thinned out the plants are not so apt to flower.

10. Arenarium, Koch. (S. Nebræcii, Schott, Nym. & Kotschy). Rosettes globular, deciduous: lvs. 60–80 to a rosette, oblancoate, acute, bright green, glabrous, outer lvs. slightly tinted red-brown on the back, 1/2–3/4 in. long; calyx lvs. ovate-lanceolate: fls.-st. including the infl. 6–9 in. high, crowded, leafy and finely glandular-hairy, puberulent at the apex above, glabrous beneath, glaucous; petals linear-lanceolate, acute, about 1/2 x 1/2–3/4 in.; tip reddish: fl.-st. slender, glabrous-hairy: fls. 12–merous, pale greenish yellow, striped red; calyx-segms. oblong; petals narrowly linear-lanceolate, acute. Tyrol.—Probably a hybrid; S. montanum x S. Wulfenii.

11. Sempervivum, Linn. (part, excl. synonymy: S. rubenicium, Koch). Rosette 1–11/2 in. across, rather flattened, the young ones globular, borne on scaled peduncules which are rather stout and about 11/2–3 in. long: lvs. obvate-cuneate to elliptical, grey-green, ciliate; calyx lvs. oblong, acute, about 1/2 x 1/2–3/4 in.; tip often red-brown: fl.-st. about 1 ft. high, including infl., densely short-hairy: fls. pale yellow, 12–14-merous, about 1–11/2 in. across; calyx-segms. lanceolate, acute; petals linear-lanceolate, acute, externally glandular-hairy and green-striate, margins glandular-ciliate. Russia in Eu.—As Koch points out in Flora 18, part 1, 1200, t. 1 (1835), the synonymy given by Linnaeus undoubtedly refers to S. soboliferum, a 6-merous species, but that the one plant Linnaeus cites and his "Habitat in Rutenia par. Gretili" undoubtedly refers to the 12-merous plant which Besser knew under the name S. globiferum and which he, Besser, sent to Koch in 1834.

12. Grandiflorum, Haw. (S. globiferum, Sims, not Linn.). Rosettes about 11/2 in. diam., the new ones on decumbent peduncules 1–2 in. long, which have small lvs.: lvs. about 40 to a rosette, obovate-cuneate, obscurely cuspidate, pale green, pubescent, only the tip obscurely red-brown tinted, outer lvs. 11/4–1 x 3/4–11/2 in.; calyx lvs. crowded, lanceolate, 1–11/2 in. long; fls.-st. including infl. 3–8 in. high, densely pubescent: fls. 12–14-merous, 1/2–11/2 in. across, pale yellow, sub sessile in a dense paniculate head; calyx pubescent, segms. lanceolate; petals lanceolate, acuminate, back glandular. Hab. (?). B.M. 307; D. Linn. 211. Rare in cult.

13. Lithophyllum, Schott. Rosettes 1–11/2 in. diam.: fls. 3–6 in. high, puberulent pubescent: lvs. of the rosette spatulate-linear, apex acute, with a tuft of hairs and also long web-hairs connecting the fl-tips, puberulent at the apex above, glabrous beneath, glaucous; calyx lvs. lanceolate-linear, puberulent on both sides: infl. puberulent; fls. 9–12-merous, rose, in a racemose panicle; calyx-segms. lanceolate-linear, acute; petals lanceolate, acuminate, ciliate, apex barbate. S. Eu.—Closely allied to S. Dodecanum and S. arachnoideum.

14. Moggridgei, De Smet. Rosettes 2 in. diam.: lvs. about 100 to a rosette, 3/4 in. long, elongate-cuneate or oblancoate, green, glabrous, margins minutely ciliate,
tips acute and hairy tufted; cauline lvs., the lower oblong-lanceolate, ⅓ in. long, tips bearded, pale green, tips reddish, the upper more oblong: cyme 3-4 times forked: fls. 10-12-merous, ½ in. diam.; calyx glandular-pubescent, segments linear, glabrous; petals in Raceme, acuminate, apiculate. S. Eu. B.M. 6610.—Allied to S. arachnoideum.


24. Pömeli, Lamotte; also misspelled Poemelia. Barren rosette 1½-1¼ in. diam., the new ones nearly sessile: lvs. 50-60 in. a rosette, oblong-lanceolate, with a distinct cusp, a few hairs on both surfaces, the cusp furnished with an inflexed tuft of hairs, outer lvs. ⅓-1 x ¼ in., tinged with red; calyln lvs. much imbricated, lanceolate, hairy, the lower 1-1½ in long: fl.-st. including inf. 6-10 in. high, densely pilose: fls. 10-12-merous, about 1 in. across, rose-red, in a panicle 3-4 in. diam., its simple branches 6-12-fld.; calyx densely pilose, segments linear-lanceolate, glandular; petals linear-lanceolate. France.

25. fimbriatum, Schnittsp. & Lethm. Barren rosette 1½-1¾ in. diam., the new rosettes nearly sessile: lvs. 50-60 to a rosette, oblong-lanceolate, obliquely ciliate, pale glaucous green, not red-tipped, margin short-ciliolate, surface minutely pubescent, outer lvs. ⅓-1 in. long: fl.-st. including the infl. about 6 in. high: fls. 12-merous, about ¾ in across, pale rose; calyx-segments lanceolate; petals linear. Transylvania.

26. assimilis, Schott. Rosettes of barren lvs. 1½-2 in. diam., the new ones nearly sessile: lvs. 60-80 to a rosette, oblong-cuneate, cuspidate, pale glaucous green, not red-tipped, margin short-ciliolate, surface minutely pubescent, outer lvs. ⅓-1 in. long: fl.-st. including the infl. about 6 in. high: fls. 12-merous, about ¾ in across, pale rose; calyx-segments lanceolate; petals linear. Transylvania.

27. pumilum, Bieb. (S. anatimum, Hort.). Barren rosette at most 1 in. diam., the compact new rosettes shortly peduncled: lvs. 30-40 to a rosette, oblong-cuneate, glabrous, brownish-purple, in a dense head, all sessile or sub-sessile; calyx very hairy, segments lanceolate; petals acuminate, very hairy outside. Caucasus.

28. montanum, Linn. Barren rosette 1¼-1¾ in. diam., the few new rosettes on red pilose peduncles 1½-1¼ in. long: lvs. closely packed, 60-80 to a rosette, oblong-cuneate-cuneate, cuspidate, green up to the tip, both surfaces slightly pilose, outer lvs. ⅓-1 x ¼ in.; calyln lvs. lanceolate, hairy all over, tinged red-brown, the lowest ½-⅔ in long: fl.-st. including infl. not more than 3-4 in. high; fls. few (4-8), about 12-merous, 1 in. across, bright mauve-purple, in a dense head, all sessile or sub-sessile; calyx very hairy, segments lanceolate; petals linear. Switzerland.

29. flagellifomx, Fisch. Barren rosette 1½-1¾ in. diam., with the new rosettes on long spreading peduncles and the small lvs. not aggregated into a dense erect head: lvs. 40-50 to a rosette, oblong-cuneate, obliquely ciliolate-tufted, upper surface minutely downy, pale green without a tint of red-brown at the tip, margin ciliolate, outer lvs. ⅓-1 x ¼ in.; calyln lvs. imbricated, lanceolate.
hairy, lowest about 1 in. long; fl.-st. 3--4 in. high including the infl.: fls. about 12-merous, about 1 in. across, bright red, about 8 in. high, in a dense head, sessile, or nearly so; calyx densely pilose, segms. lanceolate; petals linear, acuminate, densely glandular-pilose outside. Siberia (?).

30. **Schnittsnahi**, Lagg. (S. Fänkli, Lej.). Rosette medium-sized, open, the young ones on straight peduncles ½--1 in. long: lvs. of rosette ovate-lanceolate, with a short hair point, glabrous, margin white-lanceolate, dark green, tip red-brown, keeled beneath; calyces lanceolate: fl.-st. erect, furrowed, at top slightly winged, white-hairy; fls. brown-rose, later rose, more than 6-merous; petals broadly lanceolate. Switzerland.


33. **Lamottei**, Bor. Barren rosettes 3--4 in. diam., the copious young rosettes sessile: lvs. ovovate-cuneate, cuspidate, glabrous, margin cilia stiff, outer lvs. 1½--2 in. long and densely rosulate at their tip: fl.-st. including the infi.: fls. more than 1 ft. high, densely glandular-pilosae; fls. 12--16-merous, ½--1 in. across, rose-red, in a panicle 5 x 3--4 in.; calyx densely pilose; petals somewhat keeled. Cent. Eu.—The synonymy is much involved and by some authorities *S. Comotti* is said to be a hybrid, *S. accuminatum* and *S. Schottii* synonymous and distinct, and *S. Schlehanii* also distinct, but the differences seem extremely weak.

37. **Verlöffii**, Lamotte. Barren rosettes 1½--2 in. diam., the new ones nearly sessile: lvs. about 50 to a rosette, oblongate-cuneate, cuspidate, glabrous, pale green, faintly glaucous, only the very tip tinged with red-brown, margin stiff-ciliate, outer lvs. ½--1 × ½--1½ in.; calyces lvs. oblong-lanceolate, red-tinted, lowest 1--2 in. long: fl.-st. including the infl. 6--12 in. high, densely pilose, at least above: fls. 12--14-merous, about 1 in. across, pale or bright red, in a short compact panicle, 2--3 in. diam.; calyx densely pilose to glandular-pilosae, segments lanceolate; petals somewhat keeled. Cent. Eu.—The synonymy is much involved and by some authorities *S. Comotti* is said to be a hybrid, *S. accuminatum* and *S. Schottii* synonymous and distinct, and *S. Schlehanii* also distinct, but the differences seem extremely weak.

38. **atlanticum**, Baker (S. tectorum var. atlanticum, Ball). Barren rosettes 2--3 in. diam., the young rosettes nearly sessile: lvs. oblongate-cuneate, cuspidate, pale green, glabrous when mature, hardly at all tipped with red-brown, outer lvs. 1½--1½ in. long, ½ in. broad above the middle; calyces lvs. oblong-lanceolate, noticeably claret-red-tipped; fls.-st. including infl. nearly 1 ft. high: fls. 12-merous, pale red, 1 in. across, in a short panicle, 3--4 in. diam.; calyx densely pilose; petals linear, acuminate. Morocco. B.M. 6055.
about 1/4 in. across, pale red, in a panicle 1 1/2-2 in. diam.; calyx densely pilose; petals densely ciliated. Habitat unknown.

41. calcareaum, Jord. (S. californicum, Hort.). Barren rosettes about 2 in. diam., young ones nearly sessile; lvs. oblanceolate-cuneate, cuspidate, very glaucous, with a very distinct red-brown tip, glabrous, outer lvs. 1-1 1/4 x 1/4 in.; cauline lvs. densely imbricated, oblanceolate-obovate, 1-1 1/4 in. long; fl.-st. less than 1/2 ft, high, including the fls.: fls. 10-12-merous, 3/4 in. across, pale red in a panicle 3-4 in. long, with 8-12 simple scorpoid branches; calyx densely pilose, segms. lanceolate; petals greenish down the back, densely calyculate. France on the calcareous alps of Dauphiné.

42. arvenense, Leq. & Lamotte. Barren rosette 1 1/2-2 1/2 in. diam., copiously stoloniferous; lvs. about same number as in S. teectorum, oblanceolate-cuneate, cuspidate, bright pale green, glabrous, tips of lvs. with a distinct red-brown blotch 1/2-3/4 in., long, outer lvs. 1 3/4-2 1/2 in. long; fl.-st. including infl. 6-8 in. high, densely pilose; fls. pale pink, in a panicle 2-3 in. long and broad, the lower fls. distinctly pedicelled; calyx-segms. lanceolate; petals linear. France.

43. Bougnatitum, Bail. & Gren. Barren rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, glabrous, green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense.

44. alpinum, Griebl. & Schenk. Rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, bright pale green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense, though referred by some authorities to S. montanum.

45. Boissieri, Hort. Barren rosette very dense, 2-2 1/2 in. diam., composed of about 100 lvs.; new rosettes washed with purple; fls. red.—S. chrysanthum, DC. Crab.

46. alpinum, Griebl. & Schenk. Rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, bright pale green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense, though referred by some authorities to S. montanum.

47. S. affinis, Lamotte, is offered in the trade as having dark green rosettes marked with rose; fls. red. Eu. The botanical description is not available and the species is not treated in recent European floras.

48. alpinum, Griseb. & Schenk. Rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, bright pale green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense, though referred by some authorities to S. montanum.

49. S. alpinum, Griseb. & Schenk. Rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, bright pale green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense, though referred by some authorities to S. montanum.

50. S. affinis, Lamotte, is offered in the trade as having dark green rosettes marked with rose; fls. red. Eu. The botanical description is not available and the species is not treated in recent European floras.

51. S. arvense, Lamotte, is offered in the trade as having dark green rosettes marked with rose; fls. red. Eu. The botanical description is not available and the species is not treated in recent European floras.

52. S. alpinum, Griseb. & Schenk. Rosettes 2-3 in. diam.; lvs. of rossets obovate-oblong lanceolate, cuspidate, bright pale green, red-tinted; cauline lvs. oblone to lanceolate, acuminate, sparingly pilose beneath; fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glabrous, linearly oblanceolate, glabrous, the lower fls. distinctly pedicelled; calyx-segms. lanceolate, petals densely glandular-ciliate. Eu.—Botanically probably a variant of S. arvenense, though referred by some authorities to S. montanum.
the senecios are yellow-rayed. Of the vast number of species, very few have gained prominence in horticulture.

To Senecio belong the genera known as Jacobea, Kleinia, and Cineraria. The latter is a Senecio, although the florist's cineraria is described under that name in Vol. I of this work. Bentham & Hooker refer to Senecio the genus Callisia, which is kept distinct by American botanists. Hoffman (in Engler & Prantl's Pflanzenfamilien) refers the garden genus Emilia to Senecio, but keeps Ligularia (including Farfugium) and Cineraria (not the florist's cineraria) distinct. See Emilia; also Ligularia.

If the greenwood cineraria (which is technically a Senecio as understood by Bentham & Hooker) is omitted, the most popular species are S. micranthos or German ivy, S. elegans or purple ragwort, S. pulcher, and S. Cineraria, one of the plants commonly known as dusty miller, and one of them, Artemisia Sierriana, is sometimes confounded with Senecio Cineraria. Most other species are of very minor importance to the horticulturist. Several species are found in the European trade, and of the sixty or more species native to the United States and Canada, about a half dozen have been offered by dealers in native plants, but they are practically unknown horticulturally. Most of the species are wholly herbaceous, but in South Africa, Australia, Central and South America many species are shrubby. Some species are even arborescent; others are climbers. In South Africa and the Canaries is a small series of plants that has been separated as Kleinia, distinguished mostly by their habit, being for the most part, leafy shrubs or herbs, with terete or angular stems and whitish or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents. S. vulgaris, Linn., from Europe, is a common annual weed in various parts of this country. Since senecios afford both greenhouse and hardy border plants, it is impossible to give general cultural directions. The species are not difficult to manage, however, and most of them propagate readily by means of greenwood cuttings and seeds and by the hardy species, the hardy species may be divided. Most of the tender species require greenhouse conditions. However, the most popular species are

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**KEY TO THE SPECIES.**

| A. St. and la. more or less fleshy: heads rayless. |
|---|---|
| B. Lvs. flat, lanceolate. | 1. articulatus |
| BN. Lvs. erecta, undivided. | 2. radicans |
| AA. St. and la. not fleshy: heads rays or radiate. |
| B. Habit climbing. | 3. kianoides |
| CC. Heads rayless. | 4. scandens |
| BB. Plants pubescent. | 5. macrocarpus |
| DD. Plants glabrous. | 6. auriculatissim |
| EE. Lvs. not conspicuously auriculated at the base. | 7. elegans |
| FF. Lvs. conspicuously auriculated at the base. | 8. pulcher |

- **B. Habit climbing.**
  - 3. kianoides
  - 4. scandens
  - 5. macrocarpus
  - 6. auriculatissimus

- **CC. Heads rayless.**
  - 4. scandens

- **BB. Plants pubescent.**
  - 5. macrocarpus

- **DD. Plants glabrous.**
  - 6. auriculatissimus

- **EE. Lvs. not conspicuously auriculated at the base.**
  - 7. elegans

- **FF. Lvs. conspicuously auriculated at the base.**
  - 8. pulcher

**BB. Habit not climbing.**

- 1. articulatus
- 2. radicans
- 4. scandens
- 5. macrocarpus
- 6. auriculatissimus
(Kleinia) Anteuphorbium, Schz. Bip., is sometimes seen in collections, although it is not known to be in the American trade. It is a glabrous shrub 3–4 ft. high, with woolly sts. constricted at the joints, small, erect, woolly, entire Ivs. that are deciduous on the st., and solitary cymose yellow-flowered heads (with rose tinge) an inch long. B. M. 6099. According to J. D. Hooker, this plant “is one of the oldest Cape plants in cult. having, according to Dodoens, been brought to Eu. in 1570, and cult. in England in Gerard’s garden in 1596. The name Anteuphorbium was given because of its being a reputed antidote against the acrid poison of the Cape Euphorbia.” The names Kleinia spinulosa, K. pendula, and K. suspensa have appeared in the American trade, but they are unidentifiable.

2. radicans, Schz. Bip. (Cacalia radicans, Linn. f. Kleinia radicans, Huds.). Fig. 3603. Sts. prostrate, readily rooting from the nodes; Ivs. woolly, cylindrical, straight or somewhat curved, 1 in. or less in length, ½ in. thick, acute, narrowed at the base into a short petiole; peduncle terminal, bearing a single rayless head. S. Afr.—A desirable plant for the rockery; it grows freely among cacti and other flaxlike plants.

3. mikanoides, Otto (S. seddens, DC.). German Ivy. Fig. 3604. Slender and glabrous, tall-twinning; Ivs. ovate or deltoid-ovate in outline, mostly with a deep basal sinus, sharply 5–7-angled or angle-lobed; heads small, discoid, yellow, in close clusters on axillary and terminal branches; bracts of the involucre shorter than the disk-fls. S. Afr. G. 35:343.—Very common conservatory and window-garden plant, easily prop. by cuttings.

4. seddens, Buch.-Ham., not DC. A hardy plant with woody climbing sts. reaching a height of several feet; branches slightly hisrate; Ivs. short-petiolate, elliptic-lanceolate in general outline, undivided or bearing two or more divisions at the base of the blade, triangular-dentate, grayish green and finely pubescent on both surfaces; infl. a terminal panicle; heads radiate, rayed, yellow. China. R. H. 1909, p. 407.—Intro. by de Villorin, Verrières-le-Buisson, France.

5. macroglossus, DC. Cape Ivy. An herbaceous glabrous climbing perennial: Ivs. petiolate, deltoid-hastate, 1-½ in. long and broad, usually with 2 salient acuminate basal lobes, entire or subdentate, cordate to almost truncate at the base; flowering branches 1-3-headed: heads radiate with 8–12 yellow rays; disk-fls. 40–50: achenes glabrous. S. Afr. G. 26:20.—A coolhouse climber.

6. auriculatissimus, Brit. A perfectly glabrous climbing perennial, freely branching with disparately spreading branches; Ivs. petiolate, transversely oblong to subreniform, 2–3 in. broad, coarsely crenate-dentate, bright green above, paler beneath; petioles 1–2 in. long, slender, channelled above, sharply dilated at the base into 2 broad auricles completely clasping the st.: heads radiate, about 1 in. diam., disposed in loose terminal corymbose cyme; ray-fls. about 13, rays yellow: achenes 5-ribbed, puberulent along the ribs. Brit. Cent. Afr. G. C. III. 27:133, descr. B. M. 7237.—On account of the peculiar foliage and bright yellow fls. it is a striking plant and very worthy of more general cult.

7. elegans, Linn. (S. purpureus, Hort. Jacobaea elegans, Moench). Purple Ragwort. Annual, viscid-pubescent, erect or diffuse, 1–2 ft. high; Ivs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinusae chiefly broad and rounded, clasping at the base. Heads in loose corymbs, the rays purple; disk-fls. yellow. S. Afr. B. M. 238. Var. erectus, Harv. St. slender but erect: Ivs. pinnate or 2-pinnatifid.—S. elegans is an old garden plant. A common form of it has double fls. Var. albiflos, Hort., has white fls.

8. pälcher, Hook. & Arn. Robust, 2–4 ft. high, white-cobwebby; st. simple or nearly so and scarcely leafy; Ivs. oblong-lanceolate, 1–10 in. thick, shallow-lobed and crenate-toothed; heads 2–3 in. across, with many long, red-purple rays and a yellow disk. Uruguay and Argentina. B. M. 5059. R. H. 1877, p. 94; 1896, p. 329. Gn. 49, p. 122. G. M. 40:745. G. 31: p. 489, desc.—A very bold species, with striking erect habit and large fls. in summer. Perennial, although it has been described as annual. In protected places and well-drained soils, it is hardy in S. New England.

9. grandiflorus, Berg. (S. venustus, Ait.). An herbaceous perennial 4–5 ft. high: st. simple or sparingly branched, virgate, strigate, glabrous or nearly so, rather leafy except toward the infl.: Ivs. sessile, pinnately parted into linear divisions with revolute margins, glabrous or sparingly pilose; numbers numerous, radiate, strongly calyculate, disposed in a loose nearly naked corymbose cyme; rays purple; disk-fls. yellow: achenes strigate, glabrous or puberulent in the furrows. S. Afr. B. R. 901. Var. albidos, Harv. (S. dlbidos, Mey.). Both ray- and disk-fls. pale or whitish.

10. Dicia, Linn. Erect, 3–4 ft. high: radical Ivs. oval-oblong or oblongate, 6–15 in. long, dentate, glabrous and glaucous, gradually narrowed into a winged petiole; st.-lvs. oblong-lanceolate, sessile and somewhat deciduous: heads yellow, with 5 or 6 rays. Eu.—Hardy perennial.

11. macrophyllus, Bieb. (Jacobaea macrophilla, Mey.). A stout herbaceous perennial, 3–4 ft. high, glabrous or nearly so: lower lvs. oblong-oblong or oblongate, 6–18 in. long, 1–4 in. broad, gradually narrowed into a winged petiole, pale green, not glaucous; upper st.-lvs. sessile, semi-amplexicaule and somewhat deciduous on the st.: heads radiate, disposed in a terminal compound corymbose cyme. Eu.—Closely related to the preceding. Not infrequent in European gardens and occasionally offered in trade catalogues.—Not the same as Ligularia macrophylla, DC.; see supplementary list.
12. Doronicum, Linn. Leopard's Bane. A hardy, 
herbaceous perennial, floccose-tomentulose to glabrous; 
Ivs. thickish, ovate to lanceolate, 2-7 in. long, 3/4-1 1/2 in. 
broad, the lower usually rather coarsely dentate and 
narrowed into a winged petiole, the upper much reduced, 
sessile and entire: heads few, large, including the bright 
yellow or orange-colored 
ray-fls. 1-2 1/2 in. diam.; 
bracts of the involucre as 
well as the bracteoles 
atent, black-tipped: 
achenes striate, glabrous. 
S. Eu.—Frequently 
offered by European deal-
ers, but seldom grown in 
American gardens.

13. Idgens, Richards. An herbaceous peren-

tial, floccose-woolly when 
young but becoming 
early nearly or quite glabrous: 
st. practically naked 
above: Ivs. oblong-obo-

vate to lanceolate, 1 1/2-8 in. long, 1/2-1 in. broad, 
estiately denticulate, the 
lower narrowed into a 
winged petiole: heads 
radially few, radate, 
including the yellow rays 
1/2-1 1/2 in. diam.: 
bracts of the involucre as 
well as the subtending bracteoles 
acute, black-tipped: 
achenes striate, glabrous.

simple, erect, 8 in. to 3 ft. high, 
striate, glabrous or 
more or less 
crisp-hirsute; upper st. Ivs. much reduced, sessile: heads 
up to 2 ft. in length: infl. a 
terminal several- to 
many-headed corym-
bose cyme; involucre as 
well as the petiole 3-8 in. long, 
Y/3-2 in. broad, 
tomentulose in the fl.-axils, 
the lowermost Ivs. becoming 
dilated below into an 
auricle partially clasping the st.; 
the base into 2 large auricles partially clasping the st.; 
the typical form with rays.

15. saxfragoides, Hook. f. A perennial herb from a 
stout rootstock: st. about 
1 ft. high, branched, covered 
at the base with a long silky-woolly tomentum and 
clothed above with white hairs 
intermixed with purple setae: 
radical Ivs. petiolate, oblong-
eliptic to nearly orbicular, 3-5 in. long, 1/2-1 in. broad, 
denticulate, appressed-villosus, setose 
along the margins of the 
petiole 2-6 in. long, 
two-thirds to nearly 
or quite as broad, crenate 
and more or less 
tinged with purple 
beneath, glabrous or 
ocasionally slightly tomentulose; rays of the involucre 
1/2-10 in. long; st. 
Ivs. variable, petiolate to 
sessile and amplexicaul, 
lyrate to pinnate, 
reduced toward the infl. 
some times to linear 
bracts: infl. a terminal several- 
to many-headed corysthy 
cyme; heads 1/2-3 in. high, 
radiate; involucre cam-
ulate, glabrous or occasionally 
slightly tomentulose; bracts of the involucre 13-21, linear, acute; 
ray-fls. 8-12, rays yellow; disk-fls. numerous: 
achenes glabrous. Lab. to Ga., west to 
N. D. and Ark. B.B. 
3:544.—Frequently grown in American gardens.

16. Bolandier, Gray. A slender 
herbaceous perennial: st. 
ascending or erect from 
creeping rootstock, 6-20 in. 
high: radical and lower st.-Ivs. 
undivided and 
crenately lobate-dentate to pinnately 
narrowed into oblong-obovate 
to almost rotund divisions, glabrous above, 
usually pubescent beneath, including the petiole 2-6 in. long, 1/2- 
1 1/2 in. broad; heads few, radate, disposed in a corysthy 
cyme; involucre of about 13 bracts, commonly 
tawny-pubescent; ray-fls. 5-8, rays yellow; disk-fls. 
25-40: achenes glabrous. Calif. and Ore., near the 
coast.

17. aureus, Linn. Golden 
Ragwort. Fig. 3605. An herbaceous perennial: st. 
1-2 ft. high, glabrous or not infrequently 
tomentulose in the fl.-axils, 
along the margins of the 
petioles, and in the infl.: 
lower Ivs. petiolate, 
undivided and rotund-ovate, 
somewhat triangular-ovate 
and dilated below into an 
auricle partially clasping the st.; 
the lowermost Ivs. becoming 
dilated below into an 
auricle partially clasping the st.; 
the base into 2 large auricles partially clasping the st.; 
the lowermost Ivs. becoming 2 ft. in length: infl. a 
many-headed corysthy 
cyme; heads 1/2-3 in. high, 
radiate; involucre cam-
ulate, glabrous or occasionally 
slightly tomentulose; bracts of the involucre 13-21, linear, acute; 
ray-fls. 8-12, rays yellow; disk-fls. numerous: 
achenes glabrous. W. China. G.C. III. 40:43, 
desc.—Originally intro. by 
Veitch & Sons, and more re-
cently by E. H. Wilson, who 
has traveled in China.

18. Paberi, Hemsl. A stout coarse herb, glabrous or 
glabrescent; st. several, 4-8 ft. high, strato-angled, 
hollow: Ivs. pinnatifid, coarsely dentate, expanding at 
the base into 2 large auricles partially clasping the st.; 
the lowermost Ivs. becoming 2 ft. in length: infl. a 
many-headed corysthy 
cyme 6-8 in. diam.; heads 
radiate with 3-5 deep yellow rays; disk-fls. 8-15, yellow. 
W. China. G.C. III. 40:43, 
desc.—Frequently grown in American gardens.

19. tanguticus, Maxim. (S. Hentzi, Hemsl.). A tall stout 
herbaceous perennial, glabrous or 
nearly so; st. 6-7 ft. high, 
branching above, leafy: Ivs. 
broadly ovate or deltoid in 
general outline, 5-7 in. long, 
and broad, pinnately divided 
into lanceolate coarsely and 
remotely toothed divisions, dark 
green above, paler beneath; 
achenes the lower Ivs. long 
and dilated below into an 
ampullaceous base: heads very 
numericous, radiate, disposed in 
a terminal pyramidal panicle; 
ray-fls. 3 or 4, rays yellow; 
disk-fls. 3 or 4, corolla-l�es 
revolute. W. China. B.M. 
7912. Gn. 64, p. 287.—A con-
spicuous and attractive species; flowers in Sept. and Oct. Frequently offered by American dealers.

20. **Jacobaea**, Linn. TANSY ROCKET. STINKING WISHES. An erect biennial or perennial herb: st. 1-3 ft. high, leafy; basal lvs. petiolate, sublyrate; st.-Ivs. sessile, 1\(\frac{3}{4}\)-6 in. long, 3\(\frac{1}{4}-2\) in. broad, 2-3-pinnatisect; heads numerous, radiate with yellow rays. Eu. Naturalized in N. E. Amer. along the coast.—Occasionally cult. in gardens.

21. **uniflorus**, All. A low herbageous perennial, densely white-tomentose throughout: st. 2-5 in. high, usually terminated by a solitary head: lvs. mostly radical, spatulate to oblong, entire to incised-dentate, 1-2 in. long, 3\(\frac{1}{2} \) in. or less broad: heads radiate; rays yellow. S. Eu.—An alpine plant, occasionally grown in Amer. and desirable for the rockery.

22. **fastigiatus**, Nutt. An herbageous perennial, floccose-tomentose throughout, somewhat glabrate: st. 1-2 ft. high: lower lvs. narrowly oblong-oblancoate, including the long slender petiole 3-6 in. long, 3\(\frac{1}{2} \) in. or less broad, entire or nearly so, usually with revolute margins; upper st.-Ivs. much reduced: heads radiate; commonly several in a terminal corymbose cyme; ray-fls. about 8, rays yellow. Idaho, Ore., and Wash.—Intro. by Franceschi, Santa Barbara.

23. **Pâmeri**, Gray. S."*alpina*, about 3 ft. high, branching, densely white-tomentose throughout: lvs. oblong-oblancoate, 1\(\frac{3}{4}\)-4 in. long, 3\(\frac{1}{2}-1 \) in. broad, entire to slightly sinuate-dentate, narrowed below into a more or less winged petiole: heads about 3\(\frac{1}{2} \) in. high, radiate, disposed in terminal subcorymbose cymes: ray-fls. 12-18, rays yellow. Guadalupe Isl., Low Calif.—Intro. by Franceschi, Santa Barbara.

24. **Gréyi**, Hook. f. A small spreading shrub 1\(\frac{3}{4}-3 \) ft. or more high: branches, under surface of lvs., and petioles densely covered with a soft white tomentum: lvs. oblong or oblong-obovate, 1\(\frac{3}{4}-3\) in. long, obtuse, entire, nearly glabrous on the upper surface: heads radiate, disposed in large terminal corymbose cymes; ray-fls. 12-15, rays yellow. Guadalupa Isl., Low. Calif.—Intro. by Franceschi, Santa Barbara.

25. **Cinerária**, DC. (Cinerária maritíma, Linn. *Senecio acañthifolius*, Hort.). Figs. 3606, 3607. Perennial. 2-6 ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obtuse segments; usually densely radiate; 1\(\frac{1}{4}-1\) in. high, disposed in small, compact cymes. F.M. 1872: 22. *Var. candidissimus*, Hort., has very white foliage. Var. *auro-marginatus*, Hort., has lvs. bordered with orange-yellow.—S. *Cinerária* is an old-fashioned garden plant, sometimes known as "dusty miller," and at the present time it is much used in American gardens for ribbon-ends and margins; the commoner "dusty miller" is *Lychnis Coronaria*, and still another one is *Artemisia Stelleriana*.

26. **Douglasii**, DC. Fig. 2608. A tufted perennial, white-tomentose throughout to essentially glabrous: sts. 1-3 ft. high, distinctly woody below, leafy: lvs. undivided and linear or narrowly linear-lanceolate to pinnatifid with few to several linear-attenuate divisions; infl. a terminal open corymbose cyme; heads about 3\(\frac{1}{2} \) in. high, radiate; involucres compound, composed usually of 21 bracts subtended by numerous attenuate bracteoles; ray-fls. commonly 18, rays yellow; disk-fls. 50-70: achenes pubescent. S. Utah to Arik., west to Calif., and northern Lower Calif.—First collected in Calif. by Douglas in 1833.

27. **magníficus**, F. Muell. A tall stout undershrub, glabrous and glaucous; st. sparingly branched, terete, leafy: lvs. thickish, sessile, oblong-lanceolate or oblancoate, 2-6 in. long, coarsely remotely and saliently dentate: heads relatively few, radiate, disposed in terminal corymbose cymes; ray-fls. 8-12, rays golden yellow; disk-fls. numerous. Austral. B.M. 7808.—Intro. by J. H. Maiden in 1899 and brought to flower at Kew in Oct., 1900.

28. **Kirki**, Hook. f. (S. glástifolius, Hook. f. *Solidago arboréscens*, A. Cunn.). An erect stoutly branching shrub, 7-15 ft. high; glabrous throughout: lvs. variable, narrowly oblancoate to oblong-obovate, 2-5 in. long, 3\(\frac{1}{2}-2 \) in. broad, entire or sinuate-dentate, narrowed into a slender petiole or cuneate at the base: heads numerous, large, radiate, disposed in a terminal compound corymbose cyme; ray-fls. 10-12, rays 3\(\frac{1}{4}-1 \) in. long, white: disk-fls. yellow. New Zealand. B.M. 8524.—The white rays and yellow disk-fls., and the profuseness of bloom, render this species a very unusual member of its genus; it should prove an interesting plant in horticulture.

29. **grandifíliús**, Less. (S. Ghiésbriechti, Regel). A leafy shrub, 9-15 ft. high; glabrous throughout: lvs. variegated, oblong-oblong-obovate, 6-18 in. long, one-half to two-thirds as broad, acute, sinuate-dentate and remotely callous-denticulate, dark green and glabrous or nearly so above, somewhat toway-tomentulose beneath, cordate to rounded at the base; petals stout, 1\(\frac{1}{4}-5 \) in. long: infl. a terminal many-headed subcorymbose cyme; heads radiate; ray-fls. about 5, rays yellow; disk-fls. about 10: achenes glabrous. S. Mex. Gt. 9: 2986. J. H. III. 60: 318.—An attractive leafy winter-flowering shrub.

30. **Prainíanus**, Berger. Shrub, about 3 ft. high; lvs. long-petiolate, ovate-deltoid, or suborbicular, 5-7 in. long, palely 7-9-lobed, cordate at the base, somewhat hirsut above, pubescent on the prominent nerves beneath: infl. a terminal much-branched drooping panicle; heads rayless. S. Mex. G.C. III. 50, p. 82 (whence the above description, and from which the plant would seem to be a Cacalia).—Said to be a very ornamental plant resembling the following species.

31. **Petasítis**, DC. (Cinerária Petasítis, Sims). VELVET GROUNDSEL. CALIFORNIA VELVET GROUNDSEL. A robust perennial 3-8 ft. high, somewhat hirsute-velutinous on the younger parts: lvs. petiolate, broadly ovate or sub-ovibar, 2-7 in. broad, cordate to subtruncate at the
3610. Senecio cruentus var. Webberianus, one of the early forms of the garden cineraria.

suborbicular, ½-1¼ in. broad, 5-7 lobed, araneous-tomentose in the young stages above but soon glabrate, densely and permanently white-tomentose beneath: heads radiate, most solitary on an elongated nearly naked peduncle; ray-fls. about 13, rays purple. Teneriffe. B.M. 53 (as Cineraria lanata). G.C. III. 50:333.-First brought into cult. about 1793.

33. cruentus, DC. (Cineraria cruenta, Mass.). Short-stemmed perennial, floccose-woolly; lvs. large, cordinate to ovate to cordate-triangular, angled or undulate and sinuate-toothed, rather long-stalked; fls. purple-red. Canary Is. B.M. 406.-The supposed parent of the florists' cinerarias (Fig. 3609) for discussion of which see p. 771, Vol. II. According to The Garden, March 1, 1890, it was in 1777 that the type of the florists' cineraria was first intro. from the Canary Is. by Mason. Whether the present highly improved races of cinerarias are direct descendants of S. cruenta or the result of hybridization is not now determined. The garden or modified race began to develop very early. Fig. 3610 is Cineraria Webberiana, Paxt. (Senecio cruenta var. Webberianus, Hort.), copied from The Garden, which "was raised in the spring of 1841 by Mr. Smithers, gardener to Mr. R. Williams, and has bright green leaves and boldly coloured flowers—a form that would give delight in these days." It is said that the first double cineraria is thought to have been Mrs. Thomas Lloyd, certificated in March, 1880.

Several species which have been described under the genus Senecio, some being of rather recent intro., seem to the writer to be more satisfactorily treated under the genus Ligulana. Among those appearing to be of considerable importance from a horticultural standpoint are the following: Ligulana clavata, Maxim. (Senecio clavorum, Maxim.). A robust herbaceous perennial, 4 ft. high, at first white-tomentose, later radiate, lvs. long-petiolate, glabrate; heads large, many-fl., radiate with orange-yellow rays; disk-fls. dark brown. Japan and China. B.M. 51:756. (Senecio clavata, Maxim. Gardeners Mag. and Sept.—Ligulana macrophylla, DC. (Cineraria macrophylla, Ledeb. —Senecio Ledebouri, Sch. B. 22, p. 160. Vol. IV.—Senecio Puri, Turrill. St. erect, radiate, densely tomentose; disk-fls. dark brown, crowned: lvs. long-petiolate, reniform, about 9 in. long, 15 in. broad, deeply cordate, coarsely toothed, glabrous on both surfaces: infl. many-camelled: lvs. many, 12 in. or more long, 2½ in. wide at the base; heads radiate; rays-fls. 1-5, rays yellow; disk-fls. 5-6. China. B.M. 8472.—Ligulana Veitchiana, Greenm. comb. nov. (Senecio Veitchianus, Hemsl. G.C. III. 38:212. 1905). A very stout perennial herb with simple flowering st. 3-6 ft. high; radical lvs. 15-16 in. long, 10-11 in. broad, sharply dentate; heads very numerous, about 2½ in. diam.; ray-fls. 10-12, rays yellow. China. G.M. 50:741.—Ligulana Weit­teniana, Greenm. comb. nov. (Senecio Weitmannianus, Hemsl. G.C. III. 38:212. 1905). Giant Groundsel. A robust herbaceous perennial with a flowering st. 3-5½ ft. high; radical lvs. long-petiolate, the blade reniform-cordate, 10-30 in. broad, sharply dentate; infl. an elongated columnar-like spike, branched at the base; heads very numerous, radiate, about 1 in. in diam.; rays-fls. 8-12, rays yellow. China. G. 34:113. G.C. III. 42:201. Thus and the preceding one are desirable plants for ditch-borders and bog-gardens.

J. M. GREENMAN.

SENNA: Cassia. S. Bladder: Coluteae.

SENSITIVE FERN: Onoclea sensibilis. S. Plant: Mimosa pudica.

SEQUEL (after Sennych, otherwise George Guest, a Cherokee half-breed of Georgia, about 1770-1847, originator of the Cherokee alphabet). Pinacea. Bro TREES OF CALIFORNIA. REDWOOD. Tall massive often gigantic forest trees, grown as ornamental evergreens in Europe, in California, and to a limited extent in the eastern states; of chief interest because of their great age and large size. S. gigantea is the most massive of all trees, although exceeded in girth by several others, notably the African baobab. S. sempervirens holds the record as the tallest tree in the world, at least so far as actual measurements have been made, one specimen in Humboldt County, California, measuring 340 feet, according to Sargent. Greater heights assigned to species of Eucalyptus were erroneous (see note under E. regnans, p. 1157).

Large trees with thick red fibrous and deeply grooved bark: heartwood dark red, soft, durable, straight-grained; sapwood thin and nearly white: lvs. persistent, 1-⅕ in. wide at the base; heads to 3½ ft. high, with trunk: stamens bearing 2-5 pollen-sacs; pistillate catkins terminal, composed of many spirally arranged stamens bearing 2-5 pollen-sacs; pistillate catkins terminal, composed of many spirally arranged scales, each with 4-7 ovules at base; cone woody, persistent, the divergent scales widened at summit which is rhomboid, wrinkled, and with a depressed center; seeds flattened; coryledons 2.

semper'virens, Endl. CALIFORNIA REDWOOD. Fig. 3611 (adapted from Amer. Forestry xx:323). Tree 100 to 340 ft. high, with trunk: 10-25 ft. in diam. and often clear of limbs for 100 ft. in mass: great gigantic trees, the narrow crown with horizontal or downward-sweeping branches: lvs. linear, mostly ½-1 in. long, 1½-4½ in. wide, spreading in flat sprays, or the upper lvs. and those on main st. of the branches only 1-5 in. long and awl-shaped; cone oval, ⅓-½ in. long, ½-3½ in. broad, maturing the first autumn; scales 14-26; seeds elliptic, narrowly margined, 2 lines long. Conifer to northern and central Coast Range of Calif. on slopes exposed to sea winds. G. 13, p. 172. G.W. 13, p. 531; 14, p. 511.—Reproduces by seeds and by stump-sprouts, the latter numerous and remarkably persistent, often producing mercantable lumber. Var. glac'ea, Hort. Foliage with a decidedly bluish cast.
The two great sequoias of California have a place of their own in science, history, and literature. Haenke, the botanist of the Malaspina expedition of 1791, first collected *S. sempervirens*, the coast redwood of California. Four years later Menzies, of the Vancouver expedition, secured specimens near Santa Cruz. Lambert published it in 1824 as *Taxodium sempervirens*. Douglas referred it to the same group, but in 1847 Endlicher created the separate genus Sequoia.

Two living sequoias, *S. sempervirens* and *S. gigantea*, are all that remain of many species that flourished in Tertiary times over a large part of the northern hemisphere. More than forty fossil species have been discovered, but there is still much confusion in regard to the botany of the extinct kinds. They have been found, however, from Italy north to Spitzbergen, and across northern Asia. Several now extinct species, such as *S. aquistiloba*, *S. Heerii*, and *S. Lanosorpa*, grew in California and Oregon in Miocene times. Asa Gray and others have told the story of the rise and fall of this great family of conifers, which was once as abundant as any tree-group in the world, but was cut off, swept away, destroyed by the glacial age, and survived only in parts of California.

The coast redwood, or *S. sempervirens*, seems to be a descendant of the fossil *S. Langsdorfi*; *S. gigantea* appears related to the fossil *S. Sternbergii*. The famous petrified forest of Arizona was a species of Sequoia, according to the United States Geological Survey. These Arizonian giants which grew millions of years ago, went down under a permanent ocean, were covered with sandstone, and rose again with the present continent. In like manner vast periods of time lie between the present forest and its ancient representatives. The value and interest of these wonderful trees are greatly increased by reason of their botanical and historical importance.

At the present time the coast redwood occupies only a narrow belt of country near the Pacific Ocean, nor is it continuous even there; the giant redwood, or California big tree, exists only in a few small and isolated groves, scattered over less than 60 square miles in all, extending along the western side of the Sierra Nevada range. Compared with the enormous territory once occupied by now extinct species of sequoia, the modern representatives of this ancient and honorable family are reduced to a very small area.

The first-known of the sequoias, and much the more valuable species, economically speaking, was *S. sempervirens*, the coast redwood of California. This is one of the most important timber trees of the world, and its forests, comparatively limited in area, have yielded and are still yielding, the most easily obtained, the most valuable and profitable fencing and building lumber of the Pacific coast. The reproductive powers of the tree are enormous; no other known conifer so persistently sprouts from the stump, so rapidly makes new forests, or so well resists fire. But it does not surpass any of their ancient representatives.

The climate where the redwood thrives is comparatively equable, marked by fogs and cool summer winds from the southwest. The tree delights in rich sheltered mountain valleys and fertile slopes, in dripping fogs and in heavy winter rains. Going east from the ocean, in the redwood region, one suddenly comes to the top of a ridge, to overlook oaks and pines, and at once reaches the plainly marked edge of the *S. sempervirens* forest.

While *S. sempervirens* is sometimes called second in size among the giant conifers of the Pacific coast, the tallest tree yet authentically measured is 340 feet high, exceeding in height the tallest living tree of the Sierra
The most famous of the sequoias and certainly the most widely known of all living conifers is the grand
treetop of the Sierra, \( \text{S. gigantea} \). It is probably the largest tree on earth, and it is the most noble and impressive of trees. The
interest attached to this sequoia is therefore distinctly international, and an immense body of literature has
gathered about it.

Jepson, in his "Silvics of California," 1910, lists thirty-one
known groves of big trees in the California Sierras,
containing 80,499 trees. While private owners control
much of these areas, still a large part is in the National

Forests and Parks, where, under protection, the safety of the tree is assured and reproduction is excellent. In
the Fresno grove, for example (Sierra National Forest),
thousands of young trees are now growing. The low vitality of the seeds of \( \text{S. gigantea} \) long a matter of complaint among nurserymen, appears to be less
marked than formerly, and nearly all the groves show young trees.

The measurements of standing trees and the age-
estimate made in the last decade have materially altered former conclusions. Sudworth has published
an excellent table of measurements in the Calaveras Grove, and Jepson has supplemented them with measures-
ments elsewhere. Sudworth measured thirty trees which were from 9 to 19½ feet in diameter 6 feet above the ground, and from 237 to 325 feet high.
Former measurements were generally taken at the
surface of the ground and hence were most misleading.
A tree in Giant Forest, on the Kaweah, for example, as
measured in circumference at the surface of the ground 72 feet, but at 11 feet, where the bulge ceased,
and the true shaft began, was but 57½ feet in cir-
cumference. The famous Boole tree, in Fresno County,
girths 109½ feet at the surface, and 77 feet at 10 feet
from the ground.

The problem of the age of the sequoia has long
occupied the attention of students; popular literature
has revealed extravagant statements on this subject,
so that many persons believe that trees now standing
were in existence before the pyramids were built. As
regards the coast redwood, so many trees have been cut and the rings counted that its age is now well
known; this species lives from 400 to 1,300 years, or
may possibly reach 1,500 years in a few cases. In
respect to the Sierra redwoods, \( \text{S. gigantea} \), the heavy
logging done in recent years on private lands has
enabled foresters to make careful age-determination.
They find that mature trees range from 400 to 1,500
years. It remains to determine the resisting powers of
mature trees. A few old fallen trees have been found
whose rings showed ages of 2,200 to 2,300 years. John
Muir estimated a partly burned tree at 4,000 years, but
this is open to discussion.

The economic value of the coast redwood is so high
that every principle of wise conservation requires more
careful management of private forests, more complete
reproduction and the reforesting of cut-over areas.
Little attention has yet been paid to the by-products
from the present waste which technical chemists are able to make profitable. This is also true of the *S. gigantea* when lumbered on private lands; the beauty and durability of the timber, and the value of its possible by-products make care in reforesting eminently desirable. Pencil manufacturers are beginning to use the wood of selected trees of *S. gigantea*. The rapidity of growth of both sequoias when young, and when favorably situated, is so great that the forestry of the future is likely to extend rather than diminish these forests.

CHARLES HOWARD SHINN.

SERÂPIAS (ancient name of an orchid, derived from Serapis, an Egyptian divinity). *Orchidaceae*. Terrestrial herbs with the habit of Orchis: sepals connivent in the form of a helmet; petals included, small; labellum not spurred, with erect lateral lobes and a larger undivided, middle lobe; pollinia with a common viscid disk; rostellum laterally compressed; column short. The following species are known from the Medit. region.

The keeps the plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot in leaf-mold, loam, and sand. Always use the genus *Serapias* as formerly understood and known to horticulturists. With the recent use of this name for the Cephalanthera-Epipactis group, however, the following species are thrown in the genus *Serapias*.


**S. lingua**, Linn. St. erect, up to 1 ft. high, bearing several narrow, acute lvs.: sepals lanceolate, greenish or purplish labellum much longer; lateral lobes rounded, erect, middle lobe obtlong-lanceolate, acuminate, smooth, red. Medit. region. B.M. 5868, B. G.C. III. 48:482.

**S. rigidus**, Linn. St. erect, up to 1 ft. high, bearing several narrow, acute lvs.: sepals lanceolate, greenish or purplish labellum much longer; lateral lobes rounded, erect, middle lobe obtlong-lanceolate, acuminate, smooth, red. Medit. region. B.M. 5868, B. G.C. III. 48:482.

**S. lingua**, Linn. St. erect, up to 1 ft. high, bearing several narrow, acute lvs.: sepals lanceolate, greenish or purplish labellum much longer; lateral lobes rounded, erect, middle lobe obtlong-lanceolate, acuminate, smooth, red. Medit. region. B.M. 5868, B. G.C. III. 48:482.

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SERRADELLA is an annual leguminous plant, valuable as a fodder crop on dry, and sandy sterile soils. See Ortnithopus.

SERRÁTULA (from serrae, alluding to the roughly toothed leaf-margins). *Compositae.* A horticulturally unimportant group of composites consisting of about 30 species of herbaceous thistle-like perennials grown for their purple or violet fls.: stala, simple or branched; lvs. alternate, dentate, or much cut into sharp but usually unarmed segms., green both sides or sometimes pale and canescent beneath: infl. of a single pedunculate head or, as in the following, of a lax corymb; heads equal-fl., the involucral bracts in many series, narrowly acuminated at the apex, but not as in many thistles, spiny; fls. purple, but not very showy. Cult. in open border, but perhaps not in Amer. outside botanic garden collections. Eu., N. Afr., to China and Japan.

Tinctoria, Linn. A much-branched, freely flowering perennial, about 2-3 ft. tall: lvs. very variable, usually deeply pinnately cleft or divided and generally lanceolate in outline; the upper sometimes undivided and petioled, the basal usually divided and nearly sessile; fls. in a dense corymbiform infl. or thin, frequently spine-crowned, Eu. July and Sept. Eu., N. Afr., Middle East. *S. atriplicifolia,* Bent. & Hook. Of vigorous growth; lvs. large, heart-shaped; heads globular, attaining height of 5 ft.: fls. purple. Cent. China. N. TAYLOR.

*SÉSAMUM* (Greek name taken by Hippocrates from the Arabic). *Pedaliaceae.* Herbs, erect or prostrate, securvus or rarely glabrous, suitable for the warmhouse, and for the open in the S.: lowest lvs. opposite, the upper and almost all alternate, petiolate, entire, incised-dentate, 3-cleft or pedately cut: fls. pale or violet, solitary in the axis; calyx rather small, 5-parted; corolla glaucescent beneath: stigma 2-celled; cap. oblong or ovoid. —About 20 species, Trop. and S. Afr., E. Asia. The only species of importance is *S. indicum,* which has been extensively cult. in the tropics from ancient times. The seeds are sold in Amer. under the name of benne. They yield about half their weight of oil-of-sesame (known also as benne-, ginelli-, or teel-oil), which is odorless and does not easily become rancid. This oil is universally used for the manufacture of soap and adulteration of olive-oil. Also cult. in northern states as a medicinal herb, the mucilaginous lvs. being used in diuretic and diarrhoeal of children. Of several *S. sesami,* the Old World, of perhaps 50-60 species, sometimes mentioned in horticultural literature as acceptable border plants. 5-cleft and branched, with lvs. compound or 2-3-pinnate, and compound umbels of white fls., the involucres of few or many bracts or sometimes wanting; the fls.: calyx-5-parted, style surpassing the calyx tube; petals notched; styles very short; fr. nearly terebinthaceous, ovate or oblong. *S. ladanotis,* Koch, of wide distribution in Eu., is perhaps most likely to appear as a cult. plant: perennial, 1-2 ft., erect and stout, glabrous or pubescent, with many projecting rays, and many-bracted involucres and involucels.

*SÉSÉLI* (old Greek name for an umbelliferous plant). *Umbelliferae.* MEADOW SAXIFRAGE. Perennial and biennial herbs in the temperate and cold regions of the Old World, of perhaps 50-60 species, sometimes mentioned in horticultural literature as acceptable border plants. 5-cleft and branched, with lvs. compound or 2-3-pinnate, and compound umbels of white fls., the involucres of few or many bracts or sometimes wanting; the fls.: calyx-teeth either prominent or minute; petals notched; styles very short; fr. nearly terebinthaceous, ovate or oblong. *S. ladanotis,* Koch, of wide distribution in Eu., is perhaps most likely to appear as a cult. plant: perennial, 1-2 ft., erect and stout, glabrous or slightly pubescent; lvs. bipinnate, the lfts. ovate and sessile, umbel rounded, with many pubescent rays, and many-bracted involucres and involucels.

*SÉSUVIUM* (derivation unknown). *Aizoaceae.* Erect or prostrate, branched, succulent herbs or subshrubs, adapted to the warmest of climates: lvs. very variable, which is expressed from the seeds is in large doses a laxative.

Indicum, Linn. (S. orientale, Linn.). Plant 1-2 ft. high: lvs. variable, 3-5 in. long, oblong or lanceolate, the lower often 3-lobed or parted: corolla pale rose or white, 1 in. long, tubular, 5-cleft, the 2 lobes of the upper lip shorter. July. Tropics. B.M. 1688.—White- and blackseeded varieties have been known for at least two centuries. Runs wild in the extreme S. WILHELM MILLER.

SÉSÍNÁ (from Sasan, the Arabian name of *S. acrylica*). *Symn. Daubentonia, Oedtidiurn. Leguminosae.* Herbs or shrubs, sometimes arborescent, but short-lived, suitable for the warm- and coolhouse, and for outdoor planting in the far South. Leaves abruptly pinnate; lfts. many-paired, very entire; stipels minute or none: racemes axillary, lax; fls. yellow, red-purple, variegated, or white, slender-pedicelled; calyx broad, tube truncate, toothed or subequally lobed; standard orbiculate or ovate, spreading or reflex, wings falcate-oblong, keel incurved, obtuse or obtusely acuminate, with long claws; stamens free from the standard; ovary often stipitate: legume linear or rarely oblong, compressed, 4-angled or 4-winged. About 30 species, widely distributed in the warmer regions of both hemispheres.
Several species are annual weeds, such as Yellow Fox-tail (S. glauca, Beauv.) with oblong yellow spikes, and 5 or more bristles below each spikelet, and Green Fox-tail (S. viridis, Beauv.), with somewhat pointed green spikes and 1-3 bristles below each spikelet. Many American botanists use the name Chlochloa instead of Setaria. (Dept. Agric., Div. Agrost., Bull. 21, is devoted to this genus.) The setarias are scarcely horticultural subjects, being primarily forage plants; but they are so widespread in cult. and the forms are so confused that a somewhat full discussion of them may be inserted here.

### a. Plant perennial.

macrostachya, HBK. (S. Alopecurus, Fisch. S. alopecoides var. nigra, of the trade). An erect or ascending perennial: spike slender, tapering at apex; bristles 1 or sometimes 2, 1½-1 in. long; spikelets ½ in. long; first glume one-third to one-half, second two-thirds to three-fourths as long as the equal sterile lemma and fr.; first glume inflated at the base of the spikelet. Texas to S. Amer.

#### bb. Plants annual.

mâgna, Griseb. A coarse stout native, resembling common millet: spike ± in. thick, as much as a foot long, tapering above and below; bristles 1-3, scarcely ½ in. long; spikelets ½ in. long, elliptical, first glume one-third as long as second glume and sterile lemma, equaling the spikelet; fertile lemma smooth. Marshes of Gulf States as far north as Md.

îdâlica, Beauv. Common Millet of the U. S. (but not of Eu., this being Panicum miliaceum); also called German Millet and Hungarian Grass. Cm. 3-5 ft. high: spike yellow or purple, compound, more or less glomerate; bristles 1-3, often shorter than the spikelet. Thought to have been derived from S. viridis. Gn. 12, p. 69.—The cult. of millet dates from prehistoric times. At present it is raised extensively in parts of Asia as a food-plant. In the U. S. it is raised for fodder. The "Japanese millets" belong to S. italica, while the "Japanese barnyard millets" are Echinochloa Crussgalli or E. frumentacea.

The forms of S. italica may be distinguished from S. viridis by the articulation of the fruit (fertile floret), or what is commercially known as the seed. In the former species the fruit at maturity disarticulates above the glumes and falls away free from them. In S. viridis the fruit falls away surrounded by the glumes. The variegated forms have been classified by Hubbard (Amer. Journ. Bot. 2: 187, 1915) as follows:

#### a. Fr. yellowish to straw or light brown. (Stramineo-fructa.)

b. Bristles green.

c. Panicle more or less open-lobulate.

Subsp. stamneofructa, Hubb. Bristles noticeably longer than spikelets: a large plant with heads 4-12 in. long, and as much as 2 in. wide, usually strongly lobed. This is one of the forms cult. as German millet. Forma brevistata, Hubb. Bristles shorter than the spikelets or barely exceeding them. Cult. as Golden Wonder millet.

cc. Panicle dense or slightly lobulate at base.

Subvar. germânica, Hubb. Bristles noticeably longer than spikelets: head usually 2-3 in. long; ½ in. broad. One of the forms cult. as common millet.

#### bb. Bristles purple.

c. Panicle more or less lobulate.


cc. Panicle dense or slightly lobulate at base.

Subvar. Mêtzgeri, Hubb. Bristles noticeably longer than spikelets. Cult. as common millet, a common form. Sometimes called Hungarian grass, a name that should apply to var. atra (see below).

#### bbb. Bristles brown.


#### a. Fr. reddish or orange. (Rufrofructa.)


#### aaa. Fr. blackish, brownish black or purplish black with pale yellowish straw lines intermingled, these sometimes predominating. (Nigrofructa.)

Subsp. nigrofructa, Hubb. The common form cult. in U. S. is var. atra with small dense heads, with purple-brown bristles. Commonly cult. as Hungarian grass.

Many other varieties are cult. in the Old World.

### SEVERINA (named for M. A. Severino, a Neapolitan). Rudaceae, tribe Citrea. Small woody plants distantly related to the orange.

Spiny shrubs or small trees with short and stiff branches: spines single, at one side of the bud in the axis of the lvs.: lvs. simple, cotyledonously veined, borne on short apetrous petioles: fls. 5-merous, occurring 2 or 3 together in the axis of the lvs.; petals small, white; stamens 10, free; ovary 2-celled, with 1 ovule in each cell: fr. a small nearly globose berry, black when mature.—Only one species is known, usually called Atalantia buzzûfîla, native to S. China and Formosa, see Swingle, in Journ. Wash. Acad. Sci., Vol. 6, No. 19, 1916.

buzzûfîla, Ten. (Citrus buzzûfîla, Poir. Limonia buzzûfîla, Roxb. Scleroûgya buzzûfîla, Benth. Atalantia buzzûfîla, Oliver). A spiny shrub or dwarf tree native to S. China. intro. into cult. in Eu. late in the 18th or early in the 19th century and often considered by botanists to belong to the genus Atalantia, from which it differs widely in the character of the fr. which is a black berry, the ovary walls becoming succulent as the fr. ripens: lvs. simple, obovate-oblong, very obtuse or emarginate, ½ in. long, having numerous fine veins; spines solitary: fls. axillary, in fascicles or solitary, emarginate; stamens 10, free: fr. a true berry, becoming more or less fleshy at maturity, turning black, 2 (or sometimes 3) -celled, each cell containing a single seed, cells not filled with gum or pulp vesicles; seedlings with subterranean cotyledons, first lvs. very small, spirally arranged. lil. Seemann, Bot. Voy. Herald, pl. 81; Penzig, Studi bot. sugli agrumi, Atl., pl. 11, figs. 6–17; Swingle in Journ. Wash. Acad. Sci., Vol. 6, No. 19, 1916.—This plant, which has lvs. resembling the box (Buxus sempervirens) is common in S. China, in Hongkong, and occurs also in Formosa. It is grown in botanic gardens and Eu. and has been intro. in this country. It is erroneously listed by some nursery firms as Trachys monophylia. It is sometimes used as a hedge-plant in La. and other Gulf States, and is well adapted for this purpose, as it does not grow to large size and has very spiny forms that can be prop. from cuttings. It is being tested by the Dept. Agric. as a stock for the cult. citrus frr., as it is able to thrive in soils too salty to permit citrus to grow.

WALTER T. SWINGLE.

### SEYMÈRIA (named in honor of Henry Seymer, an English naturalist). Sérophulariaceae. Erect branched annual or perennial, mostly hardy herbs, used for bedding on account of their fls.: lvs. mostly opposite, incised-discinate or dissected, the uppermost floral ones reduced.
to entire bracts: fls. in interrupted racemes or spicate, j the pedicels solitary and without bracts, yellow; calyx campanulate, with 5 narrow, entire or dentate lobes; corolla-tube short and broad, rarely exerted, the throat broad; 5-lobed, the lobes broad or oblong, spreading; stamens, 4, subequal: caps. globose at base, the apex frequently compressed, acuminate or beaked.—Ten species. Amer., Texas, and from Madagascar. Seeds are sown in a well-drained bed of rather light rich soil. S. pectinata, Pursh. About 1 ft. high, minutely scabrous-pubescent or glabrate; lvs. pinnately parted into rather few short- or oblong-linear divisions or the upper incisedly few-toothed or entire; calyx-lobes linear; corolla hairy outside. N. C. to Fla. and Ala., perhaps to Texas. S. teretifolia, Pursh. About 2-4 ft. high, very slender; lvs. copiously 1-2-pinnately parted: fls. on filiform pedicels; calyx-lobes setaceous; corolla very deeply cleft, the lobes oblong. N. C. to Fla. and Texas.

SHAD-BUSH: Amelanchier.

SHADDOCK. A name used in the West Indies and Florida for the forms of the pummelo, Citrus grandis, supposed to have been introduced from India into the West Indies sometime in the seventeenth century by a Captain Shaddock. The shaddocks are large usually pear-shaped fruits with a thick peel and have a firm pulp of rather poor flavor. The leaves have very broad, winged pedicels and the twigs are usually more or less hairy, especially when young. Shaddocks were formerly grown in Florida but have been superseded by the grapefruit (see page 1391, Vol. III) as the latter finds more favor in American markets. Pummelos, very like shaddocks, are still grown in India, China, and the East generally. (see page 2857, Vol. V).

SHAGBARK: Hickory.

SHALLOT is Allium ascalonicum, Linn., native of Syria. It is grown chiefly for the small oblong-pointed gray bulbs (into which the parent bulb separates after harvesting in summer), which are used in cookery for flavoring; the leaves are sometimes eaten in a green state. The bulbs are of mild flavor. Shallots are little known in North America. They are grown as garlics (see Garlic), the bulbs or cloves being separated and planted too thickly in any good rich soil. Each bulb produces several, all cohering by the base. The mature bulbs are 2 inches or less long and only about half that in diameter. The leaves are small, terete, and hollow. The plant is hardy. The bulbs will keep several months or even a year. Small onions are sometimes sold as shallots.

L. H. B.

SHAMROCK. Half the world is sure that shamrock is the wood-sorrel, Oxalis Acetosella. The other half is equally certain that the true shamrock is white clover, Trifolium repens. In the time of Spenser’s “Faerie Queene,” shamrock was said to be good to eat. This applies to the former plant, but not to the latter. Moreover, according to Sowerby, the wood-sorrel is in perfection on Saint Patrick’s Day, while white clover is not. The wood-sorrel is sent in great quantities from Ireland to London for Saint Patrick’s Day. On the other hand, it is said that clover is the plant most commonly used in Ireland. Half a dozen other plants have their followers; and these are all plants with three leaflets. Nevertheless there are those who deny that Saint Patrick used the shamrock as a symbol of the trinity. These declare that the water-cress is the true shamrock. The question will always remain an open one. See Dyer’s “Folk-Lore of Plants.”

WILHELM MILLER.

SHAMROCK, INDIAN: A name found in some English books for the Trillium. S.佩: Parochetus communis.

SEYMERIA

SHEPHERDIA (named for John Shepherd, an English botanist). Elaegnaceae. Shrubs, or small trees with scaly fruits, two of which are in cultivation, one for its striking appearance, the second for its edible fruit.

Leaves opposite, petiolate, oblong and entire: fls. small, ducious, in very short spikes or racemes, opposite to small bracts along the rachis, male spikes many-fld., female 2-fld. in the axils of lvs. or on the rachis at leafless nodes; calyx of male fls. 4-parted, of female fls. urm-shaped, 4-leaf; stamens in male fl. 8, alternating with 8 lobes of a thick disk; ovary becoming a nut or achene and invested by the filaments and corolla, forming a drupe-like fr.—Three species. N. Amer. The genus Shepherdia was founded by Nuttall in 1818. Rafinesque’s Lep驾驭rgyi, 1817, is equivalent, and the species have been placed under this name; it is not accepted under the International Rules. In S. argentea, the buf­falo berry, the fl. is edible when made into jellies and conserves, and is much prized in the upper plains region for household uses. The shepherdias are hardy plants, withstanding extremes of cold and drought. They are easy culture, and grow readily from stratified seeds. For ornamental planting, they are prized for bold positions in front of shrubbery masses, where their gray or white colors afford excellent contrasts. S. canadensis, particularly well adapted for planting on dry rocky sterile banks, where most bushes find great difficulty in secur­ing a foothold. S. argentea succeeds better in the upper Mississippi Valley than in the eastern states. Staminate and pistillate plants of it have different forms of buds.

AA. Lvs. green above.

canadensis, Nutt. (Lep驾驭rgyi canadensis, Greene). Spreading twiggy bush 3-6 or even 8 ft. tall, the young branches brown-scyrouf: lvs. ovate, oval, or elliptic, rather thick, green above but rusty beneath: fls. yellowish, in short clusters at the nodes: fl. small (½in. or less long), oval, red or yellow, insipid. Along streams and on lake-banks, Newfoundland to Brit. Col. and in the northern tier of states, and southward toward the mountains in Utah.—The yellow-fruited form has been distinguished as S. zanthochez, Rehder.

AA. Lvs. silvery above.

argentea, Nutt. (L. argentea, Greene). BUFFALO BERRY. Fig. 680, Vol. I. Upright shrub, or sometimes almost tree-form, reaching 18 ft. tall, thorny, the young growth silvery-tomentose sometimes somewhat scaly-bracted, with scaly lvs. or oblong-lanceolate, silvery on both sides: fls. yellowish, in dense small fascicles at the nodes: fl. gloular or ovoid, about ½in. long, red or yellow, acid, edible. Kansas to Minn., west and north. See Buffalo Berry.

S. rotundifolia, Pursh, from Utah, is a silvery tomentose and scaly evergreen bush: lvs. round-oval or ovate, mostly somewhat cordate, short-petiolate: fls. stalked in the axis of the lvs., the staminate mostly in 3’s and the pistillate solitary: fl. gloular, scarly, ripening in July.

L. H. B.

SHIRWOODIA: Shortsia.

SHÓRTYA (named for Dr. Charles W. Short, a botanist of Kentucky). Diapensiacéae. Two scaly-leaved herbs, with the habit of galax.

Rootstocks creeping: lvs. evergreen, round-cordate: fl. solitary on a slender leafless stalk, the calyx with scaly bracts, the corolla bell-shaped and obtusely 5-lobed; stamens 8, the filaments adnate to the corolla, alternating with 5 scale-like staminodia; pistil 3-angled and 3-loculed; style filiform and stigma 3-lobed: fl. a globular capsule. From this, Schizocodon is distinguished by linear-elongated staminodia and fringed corolla. Allied genera mentioned in this Cyclopaedia are Galax, Pyxidanthera, and Schizocodon. Diapensia has two alpine and boreal species, one in the Himalayas and the other in N. Eu. and N. Amer. Berneuxia, the remaining genus, has a single species in Tibet, not in the American trade. Shortsia californica of seedsmen
SHORTIA

1-fld., bracted near the top: fls. inclined or adducting, white, 1 in. across, the obduct lobes undulate. Mountains of N. C. B. M. 7082. G. C. II. 15:596; III. 3:397; 17:453. G. 34:521; 36:121; 37:309. Gn. 38:204: 67, p. 286; 71, p. 73. Fig. 3613. Lvs. all radical, long-petioled, the blades orbicular or broadly ovate-ovibaric, often slightly cordate, at the apex obtuse or even retuse, the margin repand-serrate: peduncles slender, 3-8 in. tall.

SIBIRJEA

(named for the habitat of the plant, Siberia). Rosaceae. Low and depressed perennials, hairy and rare in cult., sometimes used in alpine gardens: lvs. 3-foliolate, alternate; stipules prominent: fls. cyme, yellow, small; calyx flatish, 5-cleft and with 5 bractlets; petals 5, linear-oblong, minute; stamens 5, alternating with the petals. About 5 species, natives of the colder parts of the North Temperate Zone. Reduced by Bentham and Hooker to a section of Potentilla, but separated by most authorities.

procumbens, Linn. Lfts. 3, wedge-shaped, 3-toothed at the apex: petals yellow. Ranges from the arctic regions to the summits of the White Mts. and in the Rockies comes as far south as Utah. It is also found in arctic and alpine Eu. and Asia. B. B. 2:217.—This plant is recommended by some persons, but is not known to be advertised for sale in Amer.

F. TRACY HUBBARD.

SIBBÁLDA (named for Robert Sibbald, Scotch naturalist). Rosaceae. Low and depressed perennials, hairy and rare in cult., sometimes used in alpine gardens: lvs. 3-foliolate, alternate; stipules prominent: fls. cyme, yellow, small; calyx flatish, 5-cleft and with 5 bractlets; petals 5, linear-oblong, minute; stamens 5, alternating with the petals. About 5 species, natives of the colder parts of the North Temperate Zone. Reduced by Bentham and Hooker to a section of Potentilla, but separated by most authorities.

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F. TRACY HUBBARD.

SIBIRJEA (named for the habitat of the plant, Siberia). Rosaceae. subfam. Spiraeae. Two shrubs from N. E. Asia and W. China closely allied to Spiraea, but differing in the narrow entire lvs., the polygamous-paniculate fls. disposed in panicled racemes and in the 2-seeded carpels, and in the long-petiolate leaves. S. lewisii is a deciduous upright shrub with rather stout branches, with alternate, entire, generally oblong lvs. and with small short-stalked white fls. in spike-like racemes crowded into terminal panicles. It possesses no particular ornamental qualities and is rarely cult.: hardy N. The hardiness of the recently intro. S. tomentosa has not been sufficiently tested. Prop. is by seeds sown in spring or by layers. S. leavigata, Maxim. (S. galacifolia, Schneid., Spiraea leavigata, Linn.). Shrub, 5 ft. high, with stout upright branches: lvs. cuneate-oblong, bluish green, glabrous, 1½-3½ in. long: fls. polygamous, greenish white, in terminal panicles, 3-5 in. long, those of the staminate plant somewhat showier. May. Siberia. G. C. III. 31:337; 43:220, 221. G. 36:803. Gn. 67, p. 192; 71, p. 310; 72, p. 292. F. S. R. 3, p. 247.—Offered by importers of Japanese plants, but little known horticulturally. S. grandiflora, Hort., has larger fls. than the type, being as much as 1½ in. across. G. 32:253. Gn. 74, p. 164; 78, p. 177. G. M. 53:205.

L. H. B.
SIBTHORPIA (named in honor of John Sibthorp; 1758-1796). Scrophulariaceae. Hardy or greenhouse perennials, often rooting at the nodes, grown mostly for the flowers.

Leaves alternate or fasicled, peltioted, orbicular-reniform, crenate-serrate or inciso-pinnatifid; pedicles axillary, solitary or fasicled; fls. yellow, yellowish rose or purplish; corolla campanulate, 4-5-lobed, the lobes equal or unequal; corolla-tube short or very short, rotate, limb spreading; anthers sagittate: caps. membranaceous, compressed, loculicidally dehiscent, the valves splitting to the middle.—About 7 species, Eu., Trop. and N. and S. Amer., mountainous of India and S. Amer.

SIBERIA, Linn. A hardy trailing perennial with very slender sts.: lvs. orbicular, less than \( \frac{1}{6} \) in. across, 7-9-lobed; fls. small, on rather stalk pedicel, the 2 upper lobes of the corolla yellowish, the 3 lower pink. Deep woods, Eu. Var. variegata, Hort., a form with bright golden green foliage, is cult. abroad.

SIBERICA, Linn. Tender trailing greenhouse perennial; lvs. much crested: peduncles frequently fascicled, 2 in. long: fls. yellow, 5-8-parted; stems slightly shorter than the corolla. June. Mauritius. B.M. 218 (as Disandra prostrata).

SICANA (Peruvian name). Cucurbiteae. Annual slender subglaabrous tall-climbing vines, used out-of-doors in the S. for ornament; lvs. palmately 5-9-lobed, very graceful and shiny; tendrils 3-5-cleft, the branches adhering at the tip: fls. rather large, yellow, monococious, all solitary; calyx-tube short-campanulate, 5-lobed, the lobes ovate-lanceolate, recurved; corolla inflated-campanulate, 5-lobed above the middle, the lobes broad-ovate; stems 3 in the male fl.: fr. large, fleshy, many-seeded, fragrant and edible.—Three species, S. rhombifolia, Naudin, the CURUBA and PEPINO ANGULO; one species, S. odorifera, Naudin, the PEPINO PERRIGENA (as Disandra prostrata).

S. angulatus, Linn. Bum Cucumber. Annual climbing herb: lvs. very broadly rhombic-ovate, more or less shallow, 5-angled or lobed, pinnately veined; the lobes rather broad-detolled, the midlobe abruptly and narrowly acuminate, the lateral lobes apiculate, base somewhat halberd-shaped with a rounded rather narrow sinus; the petiole slender and glabrate-rose. S. Maine and W. Que. to Fla. and west to Minn., E. Kansas, and Texas.—Used on account of its rapid growth for screening walls, lattice-work, and the like.

SIDA (from the old Greek name for Nymphula alba; given without explanation by Linnaeus). Malvaceae. Herbs or shrubs with the indumentum frequently soft or tomentose, adapted to the warm- or coolhouse or some of them hardy; one species, S. rhombifolia, now cultivated in India for its fiber.

Leaves simple or lobed, usually serrate or dentate: fls. sessile or pedunculate, solitary or glomerate, axillary or in terminal racemose spikes or heads, various colored and sometimes showy, often small, yellow or white; calyx 5-toothed or 5-cleft; staminal column divided at the top into numerous filaments; carpels 3 or more, when ripe separating from the axis, generally 2-awned at the summit; seed 1 to a carpel and pendulous.—About 120 species, widely distributed in Afr., Asia, Austral., and N. and S. Amer.

Sida angulata, Linn. Scrophulent Herbs or shrubs of various colors. B.B. 2:420. Cult. same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to Sida dioica, Linn., but according to Gray's Synoptical Flora of North America the two species belong to separate genera, the fls. of the first being hermaphrodite, of the second dioecious. Nymphula dioica is a strong-growing perennial 5-9 ft. high, with large radical lvs. often 1 ft. across and 9-11-cleft, the segms. cut into lanceolate serrate lobes; fls. dioecious, white, smaller than in Sida Nymphula. For pictures of the two plants, see B.B. 2:420. 422.

AA. Lvs. ovate to cuneate or lanceolate.

S. angulata, Linn. Bum Cucumber. Annual climbing herb: lvs. very broadly rhombic-ovate, more or less shallow, 5-angled or lobed, pinnately veined; the lobes rather broad-detolled, the midlobe abruptly and narrowly acuminate, the lateral lobes apiculate, base somewhat halberd-shaped with a rounded rather narrow sinus; the petiole slender and glabrate-rose. S. Maine and W. Que. to Fla. and west to Minn., E. Kansas, and Texas.—Used on account of its rapid growth for screening walls, lattice-work, and the like.

S. rhombifolia, Linn. Shrubby or subshrubby lvs. very variable, rhomboid-lanceolate to lanceolate, lower surface usually paler or even hoary: fls. axillary, solitary, pale yellow, rarely white, the petals blotched with red at the base. Tropics and subtropics of both hemispheres.—Yields a good fiber, and its cult. for this purpose has recently been encouraged in India. Probably of little value for ornament.
SIDALCEA (compound of Sida and Aloe, related genera). Malvaceae. Some of the sidalceas are annuals, but those in cultivation are hardy perennials, being recommended for the herbaceous border.

Leaves palmately cleft or parted, stipular: fls. often showy, pink, purple, or white, in terminal racemes or spikes, mostly without bracts or involucres beneath; stamens united into groups in a double series: carpels 5-9, reniform, separating at maturity.—About 30 species, natives of W. N. Amer. For monograph, see Gray, Syn. Fl. N. Amer., vol. 1, p. 302. Of easy cult. Prop. by seeds or division.

SIDERATIS (Greek, iron; the plants were supposed to have a healing power for wounds caused by iron. Discordes also used the name for other plants credited with the same ability). Labiatae. Herbs, subshrubs or shrubs frequently lanate or softly pilose, mostly hardy or half-hardy but some of them coolhouse plants: lvs. from more or less creeping root-stocks, the sts. more or less branching or shrubs frequently lanate or softly pilose, mostly hardy or half-hardy but some of them coolhouse plants: lvs. entire or toothed, the floral ones reduced to bracts or similar to the lower cauline: fls. in axillary clusters of 6 to many fls. or in interrupted or dense spikes, small, often yellowish; calyx tubular, 5-10-nerved, with 5 erect somewhat spiny teeth, or rarely muticous; corolla-tube included, bell-shaped; stamens attached to the tube at the base of the corolla; nutlets ovoid, smooth, without reticulations. Of easy cult. Prop. by seeds or division.

SIDEROXYLON (Greek, iron; the plants were supposed to have a healing power for wounds caused by iron. Discordes also used the name for other plants credited with the same ability). Labiatae. Herbs, subshrubs or shrubs frequently lanate or softly pilose, mostly hardy or half-hardy but some of them coolhouse plants: lvs. entire or toothed, the floral ones reduced to bracts or similar to the lower cauline: fls. in axillary clusters of 6 to many fls. or in interrupted or dense spikes, small, often yellowish; calyx tubular, 5-10-nerved, with 5 erect somewhat spiny teeth, or rarely muticous; corolla-tube included, bell-shaped; stamens attached to the tube at the base of the corolla; nutlets ovoid, smooth, without reticulations. Of easy cult. Prop. by seeds or division.

-down, to about 1½ ft. high, with thick oblong-lanceolate or spatulate lvs., the lower ones crenulate, densely white-pilose, Caucus region and Asia Minor. F. TRACY HUBBARD.

SIDEROXYLON (Greek, iron; the plants were supposed to have a healing power for wounds caused by iron. Discordes also used the name for other plants credited with the same ability). Labiatae. Herbs, subshrubs or shrubs frequently lanate or softly pilose, mostly hardy or half-hardy but some of them coolhouse plants: lvs. entire or toothed, the floral ones reduced to bracts or similar to the lower cauline: fls. in axillary clusters of 6 to many fls. or in interrupted or dense spikes, small, often yellowish; calyx tubular, 5-10-nerved, with 5 erect somewhat spiny teeth, or rarely muticous; corolla-tube included, bell-shaped; stamens attached to the tube at the base of the corolla; nutlets ovoid, smooth, without reticulations. Of easy cult. Prop. by seeds or division.
in. long, and small yellow fls.: fr. about 3½ in. through
W. Indies; cult. in S. Calif.—said to yield a sort of
chewing-gum. Wood useful in furniture-making.

F. W. BARCLAY.

SIEVEKINGIA (named for Dr. Sieveking). Orchi-
deeae. Pseudobulbous orchids suitable for the
greenhouse; of secondary importance.
Pseudobulbs usually clustered, 1-nd.: fl. usually
petioled; labelabum immobile, angled with the column,
venticose, either simple or triradiate at the apex.
About 3 species, natives of Cent. and S. Amer. Allied
to Lucena.

Reichenbachiana, Hook. f. Pseudobulbs clustered, 1
in. long, ovoid or obpyriform, blotched with blood-red
when old: fl. single, 4½-5 in. long, petioled, elliptic-lan-
ceolate, acuminate at both ends, dark green, strongly
5-ribbed: fls. about 6 in a pendulous corymb, about 1½
in. across; sepals subequal, ovate, pale straw-colored;
petals linear, acute, golden yellow, they and the lip
margined with long floccose golden hairs; lip spread
broadly, the lateral-ovate, s. dissinate, golden
yellow, blotched with blood-red, midlobe small,
linear, lacerate. Ecuador. B.M. 7576.

SULIVIS, Rechb. f. Pseudobulbs pyriform, approxi-
mate to: fls. perfect, small, diaphanous; peri-
and sepals spreading upward; petals 3 free, the
dorsal keeled, the lateral almost straight forward
and symmetrical; petals 2, rather similar to the sepalas;
labelabum free, inserted at the base of the S-bent rather
broad synostemium, somewhat mobile; column broad,
thin, much shorter than the labiate, the lip
compressed, ovate-oblong, apex l-lvd., base 2-3-lvd.;
long-clawed, 2-keeled; column elongated, very narrow;
not described and the scape including the fl. is only
2 in. high: pseudobulb ovoid or ovoid-oblong,
apex 1-lvd., base 4-lvd.: Ils. linear, subobtuse, or
minutely denticulate, base conduplicate: lapes lateral,
slower, few-fl.: sepals and petals straw-colored with
purple band at base of dorsal sepal and the petals
light yellow with a shiny orange-yellow crest; sepals
oblong spreading; petals subacute, oblong; labelabum
sessile, deltoid-rendiculatum, undulate. Peru.

F. TRACY HUBBARD.

SILÈNE (Greek name of one of Bacchus’ companions
described as covered with snow, also connected with
siônor, salvia; referring to the stickiness of the stem
and calyx of some species). Including Heliospàrma
Campion. Erect, cespitose, decumbent or diffusely
spreading, herbaceous or perennial herbs, some of
them tender and grown in the greenhouses, others hardy
and planted outdoors for their ornamental effect; often
excellent plants for the rock-garden.

Leaves opposite, entire: fls. solitary or variously
simple, white, through pink to rose and purple; calyx
5-toothed, 10- to many-nerved, naked at the base; pet-
als mostly crowned with a scale at the base of the blade;
stamens 10; styles 3, rarely 4: pod 1-seeded, sometimes
3-seeded.—Over 400 species described, widely scattered
over the world. There is a monograph of Silene, with a
key, in the Journal of the Linnean Society, vol. 32
(1896), by F. N. Williams, with 390 good species.
Williams refers the common S. virínas and S. pennyl-
vanica as well as the European S. alpístris to the genus
Melandrium, characterized by a strictly uncel lúcular
caps. with no trace of septation at the base. Only a
few of the known species are in cult.

Silenes are of easy culture. They mostly bloom in
summer and a few continue well into autumn. By
good management the season of bloom may be con-
tinued through spring and summer. Toward this end
the seeds of the common annual kinds should be sown
in early autumn, instead of spring. As a rule, the common
kinds prefer an sandy loam and full sunlight, but the
rock-garden kinds require special treatment, and other
suggestions for cultivation are given after the specific
descriptions. The most popular kinds are the pink and
rose annuals, S. Armeria and S. pendula: the peren-
nuals the most popular among the white-flowered kinds
are S. maritima and S. alpestris, while S. virínas, S. pen-
nyvanica and S. Schaffa are amongst the most popular
kinds with colored flowers. A good horticultural review
of the kinds in cultivation is found in The Garden, vol.
11, pp. 10-13 (1877).

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S. viscosa, 3.
KEY TO THE SPECIES.

A. Duration annual or biennial.
   B. Plants glabrous, although viscid above in No. 1.
   C. All except the lowest lvs. ovate or ovate-lanceolate from a subcordate, clasping base...
   D. All except the lowest lvs. oblong or oblong-lanceolate from a conuate base...

BB. Plants pubescent or tomentose.
   C. Stts. simple, usually fascicled, finally pendulous, and at least above.
   D. Fls. seashore, white...

AA. Duration perennial.
B. Height 1 ft. or more (Nos. 8, 12, 17, and 18 are usually less than 1 ft.; No. 9 is placed here with uncertainty as its height is not definitely stated).
C. Nerves of the calyx 20.
D. Stts. erect: base of lvs. cordate...

BB. Height 2-10 in. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high; No. 3 may belong here but is probably taller than 1 ft.).
C. Nerves of the calyx 20.
D. Plant not cespitose...

BB. Height 2-10 in. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high; No. 3 may belong here but is probably taller than 1 ft.).
C. Nerves of the calyx 20.
D. Plants glabrous.
E. Lvs. linear-oblong...
F. Lvs. lanceolate-spatulate...

DD. Plants pubescent or at least puberulent or pruinose-seaborous.
E. The lvs. in whorls of 4 (the uppermost and lowest sometimes opposite)...
F. The lvs. not in whorls of 4.
G. Blades linear or narrowly lanceolate or oblanceolate.
H. Stts. more or less deciduous or peniculate at the base.
I. Fls. solitary on the peduncles...
J. Fls. mostly in 3-fld. cymes.

II. Calyx oblong or oblate: fls. white or pink...
III. Calyx long-cylindrical, pink, peniculated; fls. bright Carmine...

GG. Stts. erect.
H. Fls. erect...
I. Fortunei var.
J. Fls. nodding...
K. Blades broader, usually ovate or oblate, sometimes broadly lanceolate or oblanceolate.
L. Stts. more or less decumbent or pendunculate.
M. Infl. leafy and borne in the forks of the branches...
N. Infl. not leafy, usually at least partly terminal...
O. Petals obcordate: fls. white or pink...

II. Petals 4-lobed: fls. scarlet...
III. Lvs. linear-oblong...

GO. Stts. erect, usually stout.
H. Fls. crimson or scarlet...
I. Lvs. thin, spathulate or oblanceolate; apex blunt or abruptly acute...
J. Virginica...
K. Lvs. thick, acute-lanceolate; apex acute or acuminate...

HH. Fls. white, greenish white, or bright green.
I. The fls. erect: lvs. tomentose...
J. The fls. nodding: lvs. pubescent but not tomentose...
K. Base of calyx gradually attenuate to the pedicel...
L. Base of calyx truncate and ambilicate...

LL. Height 2-10 in. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high; No. 3 may belong here but is probably taller than 1 ft.).
C. Nerves of the calyx 20.
D. Plant not cespitose...

DD. Plants cespitose.
E. Lvs. linear: plant dwarf, 2-4 in. high...
F. Lvs. lanceolate or oblong-lanceolate: plant 2-8 in. high...

GG. Stts. erect, usually stout.
H. Fls. nodding...
I. Fls. in panicles.
J. Color of fls. white...
K. Color of fls. cardinal-red...
L. Fls. 2-lobed or 2-cleft...
M. Petals 2-lobed or 2-cleft...

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C. Nerves of the calyx 20.


3617. Silene pendula. (×½)

1. Armæria, Linn. Sweet William Catchfly. Fig. 3616. Annual, glabrous, viscid above: sts. 1–1½ ft. high, erect, simple or slightly branched: lowest lvs. spatulate, the others ovate or ovate-lanceolate, from a subscapose, clasping base: fIs. pink or rose, in dense cymes, corymb-like, often dichotomous; calyx 10-nerved, cylindrical, clavate in fr.; petals obovate-cuneate, subretuse at base: caps. oblong. July—Sept. S. Eu. B.B. (ed. 2) 2:66. Var. alba, Hort., is a white-flowered form.

2. compacta, Fisch. Biennial, glabrous, glaucous-cent: sts. about 1½ ft. high, stout, simple or slightly short-branched above: lowest lvs. spatulate-lanceolate, the others oblong or oblong-lanceolate from a connate base: fIs. pink, crowded in dense, sessile heads, with the uppermost lvs. involucrate; calyx clavate; petals obovate, entire: caps. oblong. July. E. Eu., Asia Minor. L.B.C. 17:1638.—Most of the material cult. under this name is S. pendula var. compacta.

3. viscosa, Pers. Biennial, somewhat tomentose, very viscid: sts. stout, leafy, simple: lvs. somewhat undulate, radical oblong; cauleine lanceolate, acute: fIs. white, in short-peduncled, opposite cymes, forming a long verticillate raceme; calyx very viscid, long-cylindrical, 10-nerved, in fr. clavate; petals deeply 2-parted into ovate-oblong segms.: caps. oblong. June—Aug. E. Eu., N. Asia. Var. plena, Hort., is said to grow 1 ft. high and to have bright rose double fIs.—Use basal cuttings.

4. dichóta, Ehrh. Annual or biennial, minutely pubescent: sts. strictly dichotomous: lower lvs. spatulate, the others lanceolate, acuminate: peduncles very short, racemes in pairs, corymbose-fl.: fIs. white, sessile; calyx 10-nerved, the nerves green, more or less hissute, oblong-cylindrical; petals 2-parted to the middle or more, the segms. obvolute-oblong: caps. oblong. Eu., also intro. in N. Amer. and extensively escaped. B.B. (ed. 2) 2:67.

5. pêndula, Linn. (S. græca, Hort., not Boiss. S. rosæ, Hort.). Fig. 3617. Annual, crisp-pubescent: sts. 6–10 in. high, decumbent at base, dichotomously branched above: lvs. oblong-spatulate to lanceolate; floral lvs. oblong-lanceolate: fIs. flesh-colored or rosy, in lax racemes, finally pendulous; calyx hissute, reddish, 10-nerved, somewhat inflated after anthesis; petals large, ovate or 2-parted: caps. ovate. May—Aug. Mediterr. region. B.M. 114.—A variable species whose varieties seem to be nomenclatorially in confusion as the same form appears to bear several names; some of the forms offered in the trade are: Var. alba, Hort., is a white-flowered form. Var. Bonnetti, Hort. (S. Bonnetti, Hort.), has brownish red sts. and lvs.: fIs. shiny purple-red or dark purple. Var. carnea, Hort., is a compact, growing strain rather than a true variety; occurring in several color variations and both single and double.

6. fimbriata, Sims. Perennial, about 2 ft. high, pubescent: sts. erect, leafy and sometimes branched from the axils: lvs. large, ovate, base more or less cordate, margin undulate; the upper lvs. lanceolate, all dark green: infl. ovate-campanulate, teeth short-triangular; petals cuneate at base, obtuse above, deeply many-cut and fringed. Caucasus. B.M. 908.


S. maritima, With. Perennial, caespitose, gray-green, 8–16 in. high: sts. numerous, the barren shoots procumbent, the flowering ascending: lvs. lanceolate or ovate-lanceolate, margin cartilaginous or crenate: fIs. white, 1 or few to a st., but numerous, paniculate; calyx 20-nerved, inflated after anthesis; petals somewhat cleft and with 2 small scales at the base. June—Aug. Eu., N. Afr. Gn. 57, p. 372. G. M. 52:273.—The seaside form is said to be more glaucous than the mountain form. Allied to S. latifolia, but fewer and larger-flowered. Var. plena, Hort. (S. maritima var. flore-
Silene virginica. (X 1/2)

In second racemose panicles; peduncles opposite, 1-3-fl.; calyx subcalvate, obscurely 10-ribiate, glabrous; petals 2-cut, the segment, oblong-linear, obtuse: caps. elliptical. E. Eu., W. Asia.

10. Asterias, Griseb.; also misspelled Asteris. Perennial, glabrous, 3-4 ft. high: sts. tall, simple, rather viscid: lvs. lanceolate-spatulate, 4-5 in. long, obtuse, base attenuate; the uppermost oblong, elliptic-lanceolate: lvs. purple, subsessile, in a many-fl., capitate cyme; calyx membranaceous, reddish, oblong-cylindrical; petals oblong, entire: caps. oblong. Macedonia and Roumania. Var. grandiflora, Hort., is about 3 ft. high and has the crimson-scarlet lvs. in globose heads, Balkan Mts.

11. stellata, Ait. STARBY CAMPION. Perennial, 2-3 ft. high: sts. erect, branched, pubescent: lvs. in whorls of 4 (the uppermost and lowest sometimes opposite), ovate-lanceolate, acuminate, 2-3 in. long: lvs. white, nodding, in an open panicle; calyx campylanulate, pubescent, inflated; petals laminately cleft, unappendaged.
ovate-elliptic, more or less narrowed at base, acuminate, rarely obtuse: fls. scarlet, large, 1 in. or more across, scuruted; calyx funnelform-clavate; petals 4-lobed, commonly with 2 broad ones flanked by 2 narrower ones. caps. ovoid, concealed until dehiscence by the rather broad calyx. Coast Range, Ore. to N. and Cent. Calif.—Doubtful whether in cult.

20. \textit{virginica}, Linn. \textit{Fire Pink}. Fig. 3618. Perennial, 1-2 ft. high, viscid-pubescent: sts. striate, single, simple: lvs. spatulate or ob lanceolate, the lower narrow ed to ciliate-fringed petiole, the upper sessile: fls. very large, 1 in. or more across, crimson or scarlet, loosely cymose, commonly nodding or reflexed after anthesis; calyx clavate or oblong; petals broadly lanceolate, 2 (rarely 4) -toothed at the apex. Open woods and rocky hills, N. Y. to Minn., south to Ga. and Ark. B.M. 3342. Gn. 22, p. 375. G. 8:417. B.B. (ed. 2) 2:64.


22. \textit{gigantèa}, Linn. Perennial, 3-4 ft. high: sts. tall, stout, 4-angled below, viscid-pubescent: lvs. tomentose, the radical densely rosulate, thick, obovate, mucronate; the floral lvs. minute, linear-lanceolate; panicle long, racemelike, with the cymes densely many-flowered, remotely whorled and the uppermost sessile: fls. white; calyx hairy, obconical, 10-nerved; petals 2-parted into oblong segments. : caps. large, ovate. E. Medit. region.

23. \textit{viridiflora}, Linn. Perennial, 1-2 ft. high: sts. simple or branched above, soft-pubescent, very viscid above: lvs. petiolate, ovate-oblong, acute: fls. greenish white, in loose, elongated panicles, few, nodding; calyx glabrous, 10-nerved; petals 2-parted above the middle into linear-oblong segments: caps. oblong. S. Eu.

24. \textit{melifera}, Boiss. & Reut. Perennial, cespitose, 1½-2½ ft. high: sts. erect, stout, very short-puberulent below, very viscid above: lvs. acute, pubescent, the lower and rosette lvs. oval or spatulate-lanceolate, attenuate to a long petiole; the upper lanceolate or linear: fls. small, bright green, in long lax cymose panicles, rather small; petals obovate, green-striate; claws obtuse, the limb deeply 2-lobed, cuneate: caps. ovate-conic. Spain, Portugal, and Algeria.


26. \textit{pumilio}, Wulf. Dwarf perennial: sts. a few inches high, cespitose, glandular, linear, obtuse, ciliate: fls. solitary, rose, ½ in. across, on slender pedicels; calyx fainly 20-nerved, oblong-campanulate, pubescent, somewhat inflated after anthesis, green or violaceous green; petals undivided or notched: caps. ovate-cylindrical. June. Austrian Alps.—A rare and choice plant. Niven says it has hard woody roots which are easily damaged in transit, and therefore those who wish the species should secure seeds.

27. \textit{Lerchenfieldiana}, Baunig. Low cespitose perennial, glabrous and glaucous: sts. decumbent ascending: lvs. rosulate below, lanceolate above, attenuate, ciliate: fls. solitary, rose, ½ in. across, on slender pedicels; calyx fainly 20-nerved, oblong-campanulate, pubescent, somewhat inflated after anthesis, green or violaceous green; petals undivided or notched: caps. ovate-cylindrical. June. Austrian Alps.—A rare and choice plant. Niven says it has hard woody roots which are easily damaged in transit, and therefore those who wish the species should secure seeds.


29. \textit{dianthifolia}, J. Gay. Perennial, densely cespitose, 4-6 in. high, glabrous: sts. erect, 1 (rarely 2) -flowered: lvs. ciliate at the broadened base, maroon, the lower congested, the upper shorter; calyx reddish-nerved, short obconic-cylindrical, teeth ovate; petals 2-parted above the middle into linear-oblong segments: caps. ovate. Asia Minor.


31. \textit{alpestris}, Jacq. Perennial, 4-6 in. high, cespitose, more or less viscid above: sts. dichotomous: lvs. mostly radical, lanceolate-linear, rather obtuse: fls. white, rather large, shining, in corymbose panicles; calyx short, campanulate-clavate, not inflated, 10-nerved; petals obovate, 4 -lobed at the apex, and with 2 teeth at the base of each petal. May-Aug. Mountains of E. Eu. Gn. 63, p. 251.—It forms a dense mass of underground stems and is easily prop. by division or seeds. Var. \textit{grandiflora}, Hort., is a large-flowered form offered in the trade. G.C. III. 55:442. Var. \textit{Richentreichii}, Hort., is offered in the trade as a smaller form, about 6 in. high.

32. \textit{Saxifraga}, Linn. (S. \textit{petrae}, Waldst. & Kit., not Adams). Perennial, somewhat shrubby, densely cespitose, bright green: sts. numerous, 3-10 in. high, ascending, filiform, glabrous or scabrous-puberulent, viscid above: lvs. linear or linear-lanceolate, acute, glabrous or scabrous-puberulent, margin serrulate-ciliate: fls. whitish, very often solitary or in 2-3-flowered cymes, erect on very long pedicels; calyx tubular-clavate glabrous, 10 -staminate, staminal green or reddish, puberulent; petals 2 -parted, the lobes obovate: caps. ovoid-oblong. Eu. and Asia Minor. L.B.C. 5:454.
33. \textit{odonopetalà}, Fenzl. Perennial, densely pubescent: sts. 4–6 in. long, leafy, subsimple, glandular-villous above: lvs. lanceolate or linear-lanceolate, 1-nerved, acute or somewhat obtuse; fls. cyamo, 1–7-fld., white; calyx pubescent, rather viscid, whitish, coapmate; petals 2-lobed: caps. ovate. Asia Minor and Syria.

34. \textit{Elfbæthæa}, Jan. Perennial, 4–6 in. high: sts. tufted, erect or ascending, viscid-pubescent: lvs. narrowly lanceolate, acute, the lower 2–3 in. long, gradually becoming smaller upward; panicle terminal; fls. bright rose-violet, 1½ in. across, cylindric at first cylindrical, at length oval and bladdery, pale dull green, veined and margined purple; petals 2-lobed, white-clawed, blade cuneate-filament, margin crenate-dentate. Italy. B.M. 5400. G. 8: 412.

35. \textit{cilíata}, Pourr. Perennial, 3–6 in. high, pubescent, cespitose from a woody rhizome: sts. slender, simple, or slightly branched, nearly naked: lvs. of the rosette and lower st. linear-lanceolate or linear, the upper shortened and gradually narrowed from a broadened base: fls. in a few-fld. cyme, pedicelled, white or ivory-white; calyx ciliate, short-pubescent, green-, red-brown, or purplish striate; petals 2-lobed. Eu.

36. \textit{répens}, Patrin. Perennial, 8–10 in. high, with a long repent root: sts. several, erect, simple or branched, more or less searbo-pubescent: lvs. narrowly oblong on or below, glabrous, somewhat viscid above: lower lvs. oblongate-spatulate, acute, ciliate on the ribs and margin; upper lvs. linear, acute: fls. white, racemose-pincinate on opposite, axillary, 1–5-fld. peduncles: calyx cylindrical-clavate, inflated, 10-lobate, pubescent-villous; petals 2-cut, the segments oblong, obtuse, the claw glabrous. Russia, E. Siberia, Caucasus, China and Japan, and in N. Alaska.

37. \textit{Reichenbachii}, Vis.; also spelled \textit{Reichenbachiana} in the trade. Perennial, miniature, shrub-like, tufted: sts. somewhat woody at base, puberulent below, glabrous, somewhat viscid above: lower lvs. oblongate-spatulate, acute, ciliate on the ribs and margin; upper lvs. linear, acute: fls. white, racemose-pincinate, nodding; peduncles usually 1-fld.: calyx linear-clavate, 10-nerved, pubescent: petals 2-cut, the segments oblong, obtuse, the claw glabrous. E. Siberia, Caucasus, China and Japan, and in N. Alaska.

38. \textit{rupéstris}, Linn. Perennial, 2–8 in. high, loosely cespitose, glabrous: sts. numerous, erect from a branched base, 1½–2 in. high: lvs. lanceolate, acute, the lower attenuate at base: fls. flesh-color, in repeatedly dichotomous cymes, numerous, long-pedicled; the pedicels filiform; calyx obconical; base slightly umbilicate; petals obovate, deeply emarginate: caps. ovoid-oblong. Eu.


42. \textit{pusilla}, Waldst. & Kit. Perennial, dwarf, villous on the petioles and at the base of the st., viscid above. cespitose, many-stemmed: sts. low, slender, leafy, dichotomous: lvs. radical, spatulate, the others short-lanceolate: peduncles long, capillary, 1 (rarely 2) -fld.: calyx glabrous or minutely glandular, turbinate; petals glabrous-clawed, blade white, obtuse, 4-toothed: caps. ovoid-alate-globe. Considered by some to be only a variety of \textit{S. quadrifólia}.


44. \textit{pennsylvánica}, Michx. (\textit{S. carolínæa}, Walt.:). \textbf{Wild Pink.} Perennial, 6–9 in. high, from a strong taproot, viscid-pubescent: sts. few: lvs. mostly basal, spatulate or oblongate, acute, base tapering to the long, ciliate petiole-pincinate on opposite, axillary, 1–5-fld. peduncles: calyx cylindrical-clavate, inflated, 10-lobate, pubescent-villos; petals 2-cut, the segments oblong, obtuse, the claw glabrous. Russia, E. Siberia, Caucasus, China and Japan, and in N. Alaska.

3168 \textbf{SILENE}

\textit{Silphium} (from the Greek name of an umbelliferous plant of northern Africa). \textit{Compasitae}. \textit{Rosinweed}. Tall-growing hardy perennial herbs native of the United States which are grown for their rather large showy flowers, which, except in one species, are yellow. Leaves opposite, alternate or verticillate, often forming water-holding cups by perfoliation of the st.: heads many-fl.: involucres thick, somewhat follicaceous bracts; ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted discoidal ligules; achenes much flattened, falling free or only with the subtending bract.—About 25 species. \textit{Silphiums} are of easy cult. in any good soil. They require full sunlight and are prop. by division or seed.

\textbf{SILPHIUM}\n
\textit{S. Flower}: \textit{Albína}. S. \textit{Oak}: \textit{Gnèbèa rohómba}. S. \textit{Tree}: \textit{Abústia fahóbr}. S. \textit{Vine}: \textit{Péricon gregà}. S.-weed: \textit{Aeolípan}.

\textbf{SILPHIUM} (from the Greek name of an umbelliferous plant of northern Africa). \textit{Compasitae}. \textit{Rosinweed}. Tall-growing hardy perennial herbs native of the United States which are grown for their rather large sunflower-like heads of flowers which, except in one species, are yellow. Leaves opposite, alternate or verticillate, often forming water-holding cups by perfoliation of the st.: heads many-fl.; involucre of thick, somewhat foliaceous discoidal bracts; ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted discoidal ligules; achenes much flattened, falling free or only with the subtending bract.—About 25 species. \textit{Silphiums} are of easy cult. in any good soil. They require full sunlight and are prop. by division or seed.

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SILPHIUM

July-Sept. Ohio, west and south. B.B. (ed. 2) 3: 461. - It is said of this species that the st.-lvs. tend to point north and south.

AA. Foliage not cut.
B. St.-lvs. small.

terebinthinaeum, Jacq. PRAIRIE DOCK. St. about 6 ft. high, nearly or quite smooth: lvs. nearly all basal, usually 1 ft. long, ovate, cordate, dentate; fl.-heads 1½-3 in. across; rays 12-20. July-Sept. - Ont. and Ohio to Iowa and La. B.B. (ed. 2) 3: 462. - A striking and decorative herb.

bb. St.-lvs. large.

cc. Lvs. connate-perfoliate.

perfoliatum, Linn. (S. erythraea, Bernh.). CUP PLANT. INDIAN CUP. St. square, usually dentate, branched above, about 6 ft. high: lvs. thin, ovate or deltate, adnate to the lower st.; lvs. alternate, abruptly pinnate, sessile or petiolate; the axils, pedicelled; calyx-tube shortly and broadly turbinate, adnate, 5-angled or 5-winged, the limb foliaceous, broadly 5-cleft or -parted; corolla-tube nearly equal at the base or the posterior gibbous, long or broadly cylindrical, the upper part swollen or bell-shaped; lobes 5, spreading, or the 2 posterior smaller; stamens included, attached to the tube of the corolla; anthers broad, the cells confluent at the apex; glands of the disk 5, distinct, or the 2 posterior more crowded together or connate; ovary half inferior; style dilated at the tip; stigma concave, entire or slightly 2-lobed. - Species 20-25, Brazil. Allied to Gesneria, Isoloma, and Achiemines, and of similar cultural requirements.

The genus includes the cult. gloxinia, which is properly Sinningia speciosa, Benth. & Hook., but which is treated in this book under Gloxinia. Other than this species, the sinningias are little known horticulturally, although some of the species have much merit.

SILYBUM (an old Greek name applied by Dioscorides to some thistle-like plants). Compositae. Erect, glabrous herbs, sometimes grown in European gardens for ornament and also for the edible heads, roots, and for the oily seed and edible fr.: lvs. alternate, white-maculate above, sinuate-cleft to the middle or base: achenes smooth, obovate, terete, corymbosely branched above: lvs. lanceolate-ovate to ovate-lanceolate, opposite; fl.-heads numerous, 1-2 in. across, with 15-25 rays. Aug., Sept. Western prairies. B.B. (ed. 2) 3: 460. N. TAYLOR.

SÍLÍYBUM

(SINNINGIA)

SINNIGA

(SINNINGIA) (for the naturalist, F. W. Simmonds). Buxaceae. Evergreen shrubs, sometimes cult. for ornament or for the oily seed and edible fr.: lvs. opposite; fls. direnses, in the fl.-axis, apetalous; sepals imbricate; staminate fls. in clusters; stamens numerous; pistillate fls. single; ovary 3-celled, 1 ovule in each cell. A single species. Related to Buxus.

Sinningia speciosa, Benth. & Hook., is stated to have been one of its parents.

Regina, Sprague, G.C. III. 36, p. 88: "The turning-point in the history of our cultivated gloxinias, however, was in 1845, when an erect and regular-flowered plant was raised by Mr. John Fyfe, gardener at Rosethay, Bute; this had a white corolla with a violet center, and five perfect stamens, instead of the four usual in Gesneria-ceae. Unfortunately for the systematic botanist, no exact record of its parentage was made, though in Flores des Regras, t. 311, where it was figured three years later, Sinningia speciosa is stated to have been one of its parents.

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cessive pairs of leaves are usually close together on the stem, the effect is that of two many-flowered whorls, and is very fine." Brazil. G.C. III. 36:201. B.M. S182. Cl. 55, p. 206. This is a handsome and strikingly colored plant, with long flowering period. Var. hydrobioides, Hort., is a garden hybrid with much larger flowers. Var. grandiflora, Hort., is advertised, the flowers "several times larger than the type, and well displayed above the handsome dark green and purplish red foliage."

**conspicua**, Nichols. (Ranunculaceae, Regeli). Root tuberous: st. 1 ft. high: lvs. ovate-oblong, short-acuminate, somewhat heart-shaped at the base and dentate: fls. yellow, paler on the outside, marked on the lower part of the tube with purple dots and lines; calyx-tube (entirely united with the ovary) equally 5-parted, the segments lanceolate, spreading; corolla-tube obliquely and narrowly campanulate, swollen and recurved at the base; glands of the disk 2: caps. 1-celled: seeds many.

**ornata**, Benth. & Hook. (Ranunculaceae ornata, Van Houtte). A hybrid of the above species with a garden variety of Gloxinia, with flowers of a bright red; the result is a plant resembling *S. conspicua*, but differing in having the lvs. tinted on the veins and petals with purple and in having a somewhat more elegantly shaped fl., pure white while with purple lines on the outside of the corolla-tube and the inside of a yellowish-green, lined with purple. F.S. 23:2423.—Probably not now in the market.

**SINOFRANCHETIA** (for Adrien Franchet, French botanist who wrote much on Chinese botany). *Lardizabalaceae*. Deciduous climbing shrub allied to *Holboellia*, but easily distinguished by the deciduous lvs., by the roundish small sepals of the fls. borne in very long racemes, and from the last chiefiy in the structure of the fls. borne in very long, axillary, 8-12 in. long; fls. unisexual, short-stalked, 0.5 in. across, white striped brownish; sepals ovate, 4-5 in. long, the lateral lfts. obliquely ovate; racemes axillary, 8-12 in. long; fls. unisexual, short-stalked, 0.5 in. across, white striped brownish; sepals ovate; stamens 6, free, short: carpels 3, developing into ovoid many-seeded, bluish purple berries about 0.5 in. across. Cent. China. H.I. 29:2842.—The fruit racemes of bluish purple berries are strikingly handsome: the plant has proved perfectly hardy in southern England, but tender at the Arnold Arboretum. Prop. is by seeds and by layers, possibly also by cuttings like *Houtte*). A hybrid of the above species with a garden variety of Gloxinia, with flowers of a bright red; the result is a plant resembling *S. conspicua*, but differing in having the lvs. tinted on the veins and petals with purple and in having a somewhat more elegantly shaped fl., pure white while with purple lines on the outside of the corolla-tube and the inside of a yellowish-green, lined with purple. F.S. 23:2423.—Probably not now in the market.

**SINOFRANCHETIA** (for Adrien Franchet, French botanist who wrote much on Chinese botany). *Lardizabalaceae*. Deciduous climbing shrub allied to *Holboellia*, but easily distinguished by the deciduous lvs., by the roundish small sepals of the fls. borne in very long racemes, and from the last chiefiy in the structure of the fls. borne in very long, axillary, 8-12 in. long; fls. unisexual, short-stalked, 0.5 in. across, white striped brownish; sepals ovate; stamens 6, free, short: carpels 3, developing into ovoid many-seeded, bluish purple berries about 0.5 in. across. Cent. China. H.I. 29:2842.—The fruit racemes of bluish purple berries are strikingly handsome: the plant has proved perfectly hardy in southern England, but tender at the Arnold Arboretum. Prop. is by seeds and by layers, possibly also by cuttings like *Houtte*). A hybrid of the above species with a garden variety of Gloxinia, with flowers of a bright red; the result is a plant resembling *S. conspicua*, but differing in having the lvs. tinted on the veins and petals with purple and in having a somewhat more elegantly shaped fl., pure white while with purple lines on the outside of the corolla-tube and the inside of a yellowish-green, lined with purple. F.S. 23:2423.—Probably not now in the market.

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**SIPHOCAMPYLLUS**


**SIPRONIA:** Heres.

**SISYRINCHIUM** (an old Greek name first applied to some other plant). Iridaceæ. SATIN FLOWER. BLUE-EYED GRASS. Rush Lily. Hardy or half-hardy perennials, usually with fibrous roots, sometimes used in the hardy border.

Stems simple or branched, 2-edged or winged: lvs. grass-like, lanceolate or terete: fls. small, fugacious, in umbellate clusters from a usually 2-lvd. spathe, blue or yellow, perianth nearly flat or bell-shaped, segms. 3, sharply silike: caps. globular, 3-angled.—About 150 species, all American, mostly in moist fields and sandy places and along shores. The species are of easy cult. in any good garden soil. They are very little known as horticultural subjects.

_a._ Fls. yellow.
_b._ St. leafless.


**b._** St. ½-bearing.

**c._** The st. slightly 2-edged.


**SITUCA** (S. anceps, Ker-Gawl.). Perennial, 1–3 ft.: st. leafless.

**cyaneum**, B. & B. (S. cyaneum, Cav.) Evergreen shrubs: lvs. alternate, short-petioled, elliptically lanceolate or terete: fls. blue, about 1 in. long: pedicels 3 in. long: calyx-teeth acute: petals serrate: berries black, berry-like fruit. They are mostly in woods, as they belong to a small group of short lived shrubs, not being reliably hardy far north as Wash­ington, D.C. S. portuguese is somewhat harder than S. japonica or Dennstredtia characterized by prostrate rhizomes and a cup-shaped nearly spherical involucre placed at the base of the depression of the lobes. The fern in question is Dennstredtia cicutaria, Moore (Sitolobium cicutarium, J. Smith. Dicksonia cicutaria, Hook. & Baker), a W. Indian species with bipinnate lvs.: lower pinnae 12–18 in. long and 6 in. broad, with deeply cut linear-acuminate pinnaules, the segms. oblong-deltoid and deeply cut.

**SITUM** (from Siam, old Greek name used by Dioscorides). Umbelliferae. Glabrous herbs, including one of economic value, S. Sisarum or skirret (which see), the roots of which are used as a vegetable: lvs. pinnate, the pinna dentate: umbels composite, terminal or lateral: involucres and involucral bracts numerous: fls. white, calyx-teeth acute: petals reflexed: fr. ovate or oblong, laterally compressed or constricted at the junction of carpels.—About 4 species, northern hemisphere, also one species in S. Afr., sp. to be subspecific.

**Sisarum**, Linn. SKEWER. Plant, 3–4 ft. high, tuberous-rooted: lvs. pinnatifid; segms. oblong-acute, serrate: involucres fl.; submersed, referred to E. Asia.

**latifolium**, Linn. WATER PARSNIP. Sts. 3–5 ft. high, angular, furrowed and erect: lvs. pinnate; lfts. oblong-lanceolate, evenly serrate, pointed: umbels terminal; involucres many, lanceolate. Ditches and rivers, England.—Like Ferales and certain other umbelliferous plants, it is valued less for its edible roots and handsome foliage than for its fls. F. TRACY HUBBARD.

**SKIMMIA** (Japanese, Skimm, meaning a hurtful fruit). Rutaceae. Ornamental woody plants grown chiefly for the bright red berries and the handsome foliage.

Evergreen glabrous shrubs: lvs. alternate, short-petioled, entire, dotted with transverse glands: fls. perfect or dioecious, the stamine fragrant and in large panicles; segms. 4–5; style with 5–lobed stigma; ovary 2–5-loculed: fr. a drupe with 2–4 1-seeded stones.—Four species from the Himalayas to China and Japan.

The skimmias are densely branched, usually low shrubs with medium-sized generally oblong acute leaves, small white flowers in terminal panicles and showy bright red, black berry-like fruit. They are tender, not being reliably hardy as far north as Wash­ington, D.C. S. fortunei is somewhat harder than S. japonica. Handsome shrubs for borders of evergreen shrubberies and especially valuable for planting in cities, as they belong to the best smoke-enduring evergreen shrubs; they are particularly beautiful when

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**cc.** Spathes very unequal in length.


**mucronatum**, Michx. Hardy perennial similar to the last: sts. narrowly winged: spathe usually purple-tinged, not gibbous: outer bract with the margin united a little above the base, 3 1/2–2 3/4 in. long, the inner 3 1/2–3 1/2 in. long: perianth violet (rarely white): caps. straw or greenish yellow. W. Mass. to Va. and Mich. B.B. (ed. 2) 1:554.

**F. W. BARCLAY.**

**F. TRACY HUBBARD.**

**SITOLOBIIUM** (name refers to the grain-like fruchti­cation). Polyopodaceae. Under this name one fern is still listed, but the group now forms a section of Dick­sonia or Dennstredtia characterized by prostrate rhizomes and a cup-shaped nearly spherical involucre placed at the base of the depression of the lobes. The fern in question is Dennstredtia cicutaria, Moore (Sitolobium cicutarium, J. Smith. Dicksonia cicutaria, Hook. & Baker), a W. Indian species with bipinnate lvs.: lower pinnae 12–18 in. long and 6 in. broad, with deeply cut linear-acuminate pinnaules, the segms. oblong-deltoid and deeply cut.

**SITUM** (from Siam, old Greek name used by Dios­corides). Umbelliferae. Glabrous herbs, including one of economic value, S. Sisarum or skirret (which see), the roots of which are used as a vegetable: lvs. pinnate, the pinna dentate: umbels composite, terminal or lateral: involucres and involucral bracts numerous: fls. white, calyx-teeth acute: petals reflexed: fr. ovate or oblong, laterally compressed or constricted at the junction of carpels.—About 4 species, northern hemisphere, also one species in S. Afr., sp. to be subspecific.

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Evergreen glabrous shrubs: lvs. alternate, short-petioled, entire, dotted with transverse glands: fls. perfect or dioecious, the stamine fragrant and in large panicles; segms. 4–5; style with 5–lobed stigma; ovary 2–5-loculed: fr. a drupe with 2–4 1-seeded stones.—Four species from the Himalayas to China and Japan.

The skimmias are densely branched, usually low shrubs with medium-sized generally oblong acute leaves, small white flowers in terminal panicles and showy bright red, black berry-like fruit. They are tender, not being reliably hardy as far north as Wash­ington, D.C. S. fortunei is somewhat harder than S. japonica. Handsome shrubs for borders of evergreen shrubberies and especially valuable for planting in cities, as they belong to the best smoke-enduring evergreen shrubs; they are particularly beautiful when
covered with their bright red fruits, which are retained through the whole winter if not eaten by birds. In the greenhouse two crops of berries on a plant may be seen occasionally. The skimmias are of rather slow growth and thrive best in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome fruits they are sometimes cultivated in pots in a sandy compost of peat and loam. As the skimmias are polygamous and mostly unisexual, it will be necessary to plant staminate plants among the pistillate ones to secure well-fruited specimens. Propagation is by seeds sown in fall or stratified and by cuttings under glass with gentle bottom heat. William Scott writes: "Seeds sown in the fall and grown along in a coolhouse during winter can be planted out in a good loam the following spring, when they will make a vigorous growth, and can be lifted the following October. Their red berries make them very desirable as a Christmas berry plant."

**Japanese, Thumb. (S. obesata, Moore. S. fragrans, Carr. S. fragrantissima, Hort.).** Shrub, 5 ft. high, except the minutely pubescent infl. quite glabrous: lvs. crowded at the ends of the branchlets, short-petiolated, elliptic-oblong to oblong-ovate, narrowed at both ends, obtusely pointed, bright or yellowish green above, yellowish green beneath, 3½-5 in. long, 3-½ in. wide, 2½-3½ in. long: fr. small, ½ in. long; fls. white, sometimes fragrant; perianth 6-parted, white or yellow, ½ in. long; stamens 6; ovary 3-celled: seeds few, arranged in 1 series.-About 10 species, N. and Cent. Amer. and Temp. Asia.

**Vagnera** is an older name for this genus and is used sometimes cultivated in pots in a sandy compost of peat and loam. As the skimmias are polygamous and mostly unisexual, it will be necessary to plant staminate plants among the pistillate ones to secure well-fruited specimens. Propagation is by seeds sown in fall or stratified and by cuttings under glass with gentle bottom heat. William Scott writes: "Seeds sown in the fall and grown along in a coolhouse during winter can be planted out in a good loam the following spring, when they will make a vigorous growth, and can be lifted the following October. Their red berries make them very desirable as a Christmas berry plant."

**Skirret** (Stium Sisyrum, Linn.) is a vegetable of minor importance, the route of which are used like salisly or oyster plant. It is a hardy perennial umbelliferous herb, native to eastern Asia. It grows 3 to 4 feet high, has pinnate foliage and small white flowers in compound umbels. The roots grow in large clusters, something like those of a sweet potato or dahlia, but they are much longer, more cylindrical, and somewhat jointed. The roots have a sweet and slightly flousey taste and, if well grown, are tender. The chief objection to this vegetable is the woody core, which must be removed before cooking, as it is not easily separated from the flouesy part at the table and detracts from its quality. The thickness of the core varies greatly, no matter whether the plants are propagated by seed or otherwise.

**S. argentea, Mast.,** has obovate lvs. and a short panicle. S. rubella, Rehd. & Wilson. Shrub, or small tree, to 15 ft. : lvs. ovate, or oblong-ovate, 3½-5 in. long: fr. small, ½ in. long; fls. white, sometimes fragrant; perianth 6-parted, white or yellow, ½ in. long; stamens 6; ovary 3-celled: seeds few, arranged in 1 series.-About 10 species, Asia and N. Amer.

**Skunk cabbage** (Lysichiton王某, Linn.) is a vegetable of rather slow growth and thrive best in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome fruits they are sometimes cultivated in pots in a sandy compost of peat and loam. As the skimmias are polygamous and mostly unisexual, it will be necessary to plant staminate plants among the pistillate ones to secure well-fruited specimens. Propagation is by seeds sown in fall or stratified and by cuttings under glass with gentle bottom heat. William Scott writes: "Seeds sown in the fall and grown along in a coolhouse during winter can be planted out in a good loam the following spring, when they will make a vigorous growth, and can be lifted the following October. Their red berries make them very desirable as a Christmas berry plant."

**S. foliosa, Thunb.** (S. japonica, C. A. Mey. Low, tufted perennial, very variable in foliage: lvs. long, oblong-lanceolate, acuminate, dark green above, light green beneath, 3½-5 in. long: fls. white, in oblong-ovate, obtuse, 3-½ in. long; fr. small, ½ in. long; fls. white, sometimes fragrant; perianth 6-parted, white or yellow, ½ in. long; stamens 6; ovary 3-celled: seeds few, arranged in 1 series.-About 10 species, Asia and N. Amer.

**Small-fruits** (Blackberry, Blueberry, Currant, Dewberry, Gooseberry, Raspberry.)

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**S. Rubella, Rehd. & Wilson. Shrub, or small tree, to 15 ft. : lvs. ovate, or oblong-ovate, 3½-5 in. long: fr. small, ½ in. long; fls. white, sometimes fragrant; perianth 6-parted, white or yellow, ½ in. long; stamens 6; ovary 3-celled: seeds few, arranged in 1 series.-About 10 species, Asia and N. Amer.

**Smilacina** (resembling Smilax). Liliaceae. 
**False Solomon's Seal.** Perennial herbs, with simple stems from rootstocks (Fig. 3620), used for the hardy border or the wild-garden. Ligularia are alternate, nerved, and usually sessile: panicles or racemes terminal; fls. white or greenish white, sometimes fragrant; perianth 6-parted, white; petals spreading, without—passers; stamens ovary 3-celled: berry globose, 1½—2 inch in. broad. About 25 species, N. and Cent. Amer. and Temp. Asia. Vagnera is an older name for this genus and is used by some American writers; but on the principle of fifty years of established use, Smilacina is retained in the "nomina conservanda" list of the Vienna Congress.
SMILACINA

Smilacinas are of easy culture in any good soil. They prefer a rich loam in a moist but not wet partly shaded place. They are handsome plants both in foliage and flower, particularly when growing with natural companions. S. racemosa is probably the most attractive.

The genus Smilax, of which there are twenty-five species native to the United States, has been used very little in this country for planting in ornamental grounds, its value as a decorative plant having been largely ignored. The vines of the wild plants have been gathered locally for decorations and S. lanceolata, the Florida smilax of the trade, is extensively shipped from the southern states to the northern centers for use in large decorations. Most of the common woody species of the North are unsuited for planting in restricted areas as they spread rapidly by underground stems. None of the native species listed below is ordinarily handled by nurserymen.

The smilax of florists is Asparagus asparagoides. See p. 3175; also p. 409, Vol. I.

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SMILAX

SMILAX (ancient Greek name). Leitzen. The greenbriers, useful for winter greens and outdoor planting.

Usually woody climbers with paired tendrils on the base of the petiole; sometimes shrubs or herbaceous perennials, young shoots little branched, old woody shoots becoming much branched above; shoots arising from a rootstock, slow-growing and woody in 9 with large fleshy tubers; in some species with long creeping rhizomes; lower lvs. reduced to scales, the upper simple

- slightly lobed, 3-7 (or more) -nerved, deciduous or completely evergreen, usually variable in outline on different types of branches: fls. rather small, dioecious, usually numerous in axillary peduncled umbels; pedicels uniform in length: berries normally globose, 1-6-seeded, blackish or red. - Over 200 species generally distributed over the world.

The genus Smilax, of which there are twenty-five species native to the United States, has been used very little in this country for planting in ornamental grounds, its value as a decorative plant having been largely ignored. The vines of the wild plants have been gathered locally for decorations and S. lanceolata, the Florida smilax of the trade, is extensively shipped from the southern states to the northern centers for use in large decorations. Most of the common woody species of the North are unsuited for planting in restricted areas as they spread rapidly by underground stems. None of the native species listed below is ordinarily handled by nurserymen.

The smilax of florists is Asparagus asparagoides. See p. 3175; also p. 409, Vol. I.
1. *herbacea*, Linn. A hardy perennial vine 4–10 ft. high, unarmed; Ivs. ovate to lanceolate, acute to cuspidate, obtuse or cordate at base, long-petioled, 7-9-nerved, glabrous and glaucous beneath; umbels 15–50-fl., long-peduncled; fls. carrion-scented; berry bluish black, about ¼ in. diam., normally 3–6-seeded. April–June. N. E. U. S. B. B. 1920. B. B. (ed. 2) 1:527. This species is undesirable on account of the strong carrion odor of the tis. There are several herbaceous species in N. Amer. and E. Asia, but only this and the following have been intro. to the trade.

2. *lasioneira*, Hook. (S. herbacea var. inodora, Hort. *Nemixia herbacea* var. melica, A. Nels). Similar to the above but with the Ivs. pulvulent-pubescent beneath; peduncles shorter than the Ivs.; fls. not carrion-scented. From Colo. to Man. in the Great Plains and E. Rocky Mts.—Distinguished from the other herbaceous forms by the lack of the carrion odor.

3. *hispida*, Muhl. (S. *Pseudo-china*, Auth., not Linn. *Bamboo Brier*. Fig. 3623. Rootstock short, woody, slow-growing, never spreading far; sts. clustered, high climbing, 20–50 ft. green, densely spiny below, unarmed or nearly so above: spines straight, black, slender, usually most numerous at lower nodes, never on upper nodes; Ivs. ovate, larger ones heart-shaped, decussate; peduncle longer than the petiole. Conn. to Minn., south to N. C. and Texas, absent from the coast. B. B. (ed. 2) 1:529. G. F. 5:53 (adapted in Fig. 3623).—This is the only one of the northern species that does not spread rapidly by rootstock; by proper attention to pruning this species will make an upright hedge-plant of merit.

4. *Siboldii*, Miq. Closely related to *S. hispida* from which it differs in its weaker habit, more pointed narrower Ivs. which in the growing plant are distinctly crenulate; peduncles fewer-fl., and little longer than petioles. Japan and Korea.


6. *excelsa*, Linn. Similar to the above in habit: sts. large, angled, with few heavy spines: Ivs. heavier and larger; fls. 3–10 in umbel: berries ¼ in. diam., coral-red. Peru, S. Eu. to Azores.

7. *Walteri*, Pursh. *Underground* sts. slender, creeping: sts. slender, terete, brownish; armed below with stiff short spines, naked above: Ivs. ovate to oblong: umbels few-fl., on short peduncles: berries over ½ in., densely packed in umbels, bright coral-red, white-flowered sports are known. Swamps in sandy regions, N. J. to Fla., west to Missouri River Valley. B. B. (ed. 2) 1:530.—The berries of this species are useful for winter decorations in the holiday season.

8. *glaucia*, Walt. *Cat-Brier*. Fig. 3622. *Underground* sts. spiny, tuberous but with long slender rhizomes: sts. slender, brown, spines below, disappearing above, when present always some at nodes: spines stout, recurved; the entire ovate Ivs. and often whole plant glaucous; berries 3-seeded, small, peduncles and pedicels slender, longer than petioles. Dry ground, Mass. to Fla., and Texas. B. B. (ed. 2) 1:528. G. F. 5:425 (adapted in Fig. 3622).—Ordinarily counted a bad weed, but perhaps of use in landscape plantings.

9. *Bona-nex*, Linn. *Saw-Brier*. *Underground* sts. spiny, often with large tubers, also long, creeping rhizomes: sts. stout, green, densely covered with stiff spines below, lower part of large sts. with a characteristic stiff stellate pubescence not found elsewhere in the genus: Ivs. variable, on vegetative branches distinctly hastate or with basal lobes, spiny on margins and midnerv below, smooth and green on both sides; upper Ivs. triangular, ovate, thick, fine net-veined: peduncles much longer than petioles, flat, many-fl.: berries 1-seeded, black, not glaucous. Va. and Fla., west to Kans. and N. Mex. B. B. (ed. 2) 1:529.—A rank-growing vine that becomes a bad weed along borders of woods and in half-wooded pastures.

10. *lanceolata*, Linn. *Florida Smilax*. *Underground* sts. short, large, fleshy tubers, densely clustered, suggesting large potatoes: sts. stout, often ¾ in. diam., lightly scabrous, glaucous when young, spiny below with stout recurved spines, unarmed above,
climbing to the tops of tall trees often 70-80 ft., much-branched above. The leaves are lanceolate, 2-4 in. long; peduncles shorter than pedi culoa, flowering in summer; young berries remaining over winter and ripening the next summer; berries 3-seeded, ½ in. or more diam. To Florida, Ark., and Texas. July, Aug. (A. asparagoides, ed. 2) 1:530. - The best American smilax for cult. as an ornamental vine.

11. *laurifolia*, Linn. False China Brier. Similar to the above in habit: lvs. narrow, oblong, thick, green on both sides, turning dark brown on withering; berries smaller. To Fla. and Texas. Aug. B.B. (ed. 2) 1:530.—This plant is always found near water, usually associated with *S. Walteri*.


*S. angustifolia*, Lind. & Rod. Tender foliage plant: st. wiry, slender, armed with short, stout thorns. lvs. lanceolate, becoming 8-10 in. long, dark green, blotted with gray, 3-nerved, short-petioled; fls. and fr. unknown. Bolivia. I.H. 85:312. J.H. 111: 86-77. According to F.F. Smith, this species is a robust healthy plant doing well in a moderate temperature and quickly forming ornamental specimens, which should be cultivated. *Ed.*


SMILAX, FLORISTS. The smilax of florists is an *Asparagus* (*A. asparagoides*, page 409). It is one of the most popular of all greenhouse vines for use in decoration.

Commercially, smilax is grown in deep solid beds under glass, and the tall growth is tied to strings. These strings are cut for sale. Some growers do not renew their beds of smilax for three or four years. It is doubtless most profitable to replant every year with young stock, which are 8 to 12 p. (Greek micron) and are beset with brownish or blackish spores known as chlamydospores. This plant is always found near water, usually associated with various parts of the host (or attacked plant), the swellings being eventually filled with brownish or blackish spores known as chlamydospores, which emerge, as a fine dust-like powder, when the cells burst or cracks. The chlamydospores produce upon germination a structure known as a promycelium (basidium) which gives rise to terminal or lateral sporidia (*cassidiospores*). The smut on Indian corn may be taken as typical. The disease usually appears on the leaves, ruptures, exposing the dark olive-green mass of spores. It spreads by the mycelium, which is 8 to 12 μ (Greek micron) and is beset with fine spines. Unlike most other cereals, maize can be inoculated at any age. Several smuts have been described, viz., loose smut of oats (*Ustilago avenae*), maize and teosinte smut (*Ustilago zeae*), loose smut of wheat (*Ustilago tritici*), smut of blue-stem grass (*Sorosporium avenaceum*), rye smut (*Urocystis occulta*), onion smut (*Urocystis cepula*), and mold smut of chicory (*Urocystis colchica*). For the loose smut of oats and wheat, the treatment of the seeds with hot water before planting is efficacious. The smut is best controlled by destroying the affected plants before the smut matures. The smut of corn is in part caused by *Emericella unida*, and is treated with sulfur, or formalin. JOHN W. HARSHBERGER.


SMOKINDUM (Greek, indurated mark; from the callous fr.). *Anacardiaceae*. Glabrous shrub, allied to *Rhus*: lvs. alternate, long-petioled, small, oval, and as much as possible clear off all the strings, because they may be useless if cut. Good drainage should always be provided.

SMOKINGIUM (Greek, smoking). The young bitterns of some species of *Neogilia of Regal* (see), a genus which has been given four years earlier to a genus of fungi; it is accepted by Fritzsch in Engler & Prantl’s *Pflanzentum.* The name under Smithi- antha of the cult. kinds are: *S. cinnabarina, Kuntze, S. aerinina, Kuntze, S. multiflora, Fritzsch; (S. ambabils, Kuntze), S. achinaeoides, Fritzsch.

SNAKEROOT (Smith’s flower, named for Miss Matilda Smith, botanical artist, Kew). A name proposed for the species of *Neogilia of Regel* (see), a genus which has been given four years earlier to a genus of fungi; it is accepted by Fritzsch in Engler & Prantl’s *Pflanzentum.* The names under Smithi- antha of the cult. kinds are: *S. cinnabarina, Kuntze, S. aerinina, Kuntze, S. multiflora, Fritzsch; (S. ambabils, Kuntze), S. achinaeoides, Fritzsch.

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Amer. The following account comprises the species ridges; column slender; pollinia •About 30 or more lute around the cllumn, terminal portion large, undul­solitary; sepals and petals spreading; labellum convo­membranaceous, few, in short, terminal racemes, or

SNAPDRAGON: Antirrhinum.


SOBOLEWSKIA (named for G. Sobolewski, Russian botanist). _Cruciferz._ Erect panicleically branched glabrous annual or biennial herbs, adapted to outdoor use: lvs. long-petioled, rotundate, coarsely crenate: fis. in corymbuse racemes, slender-pedicelled, without bracts, white; petals spreading, uniform at base: silique clavate, compressed or nearly terete, curved, leathery, glabrous annual or biennial herbs, adapted to outdoor in corymbuse racemes, slender-pedicelled, without

Tree: [image]

Leaves with sheathing bases, plicate-venose: fis. membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading: labellum convolute around the column, terminal portion large, undulate, often limbricate, smooth or with longitudinal ridges; column slender; pollinia 8.—About 30 or more species, inhabiting the mountains of Mex. and Trop. Amer. The following account comprises the species that appear to be in the American trade, but others are to be found in the collections of fanciers. The plants have slender read-like sts. clothed with lvs. throughout their entire length. The sts. are tufted, forming bushy plants varying in height according to the species. The fis. are among the largest of the orchids, those of _S. macrantha_ attaining a diam. of 9 in. across the sepal.

They are, however, very transient, fading a few days after opening.

Sobralias are charming orchids, and when room can be given to large plants they well repay the space and care they require. Many of them, to be sure, are very fuzzy in their blooming, some lasting only a day, but nearly all of them make up for this by a succession of flowers which is more or less rapid. In size the individual blossoms vary from that of an ordinary _Cattleya labiata_ to one scarcely 1½ inches across, and the plants themselves present as great variety, ranging from such as _S. fragrans_, which grows less than a foot high, to that giant of the tribe, _S. Cattleya_, which will reach a height of nearly 10 feet. They also give as much variety in their coloring, ranging from a shade of lavender which is almost a blue through different shades of purple to the rich claret-color of _S. Lowii_, and from yellow to the purest white. Where space for large and bushy plants can be afforded, some of the sobralias will prove most charming plants, having the double advantage of pre­senting in a well-grown plant not only beautiful blossoms but a subject which is thoroughly attractive as a foliage plant. They also have the added advantage of being, in most instances, of rather easy culture. Given a suitable soil and a liberal supply of water they are almost sure to grow and bloom, although they will do better if they are given their time for rest, when less water is allowed without permitting the material about the roots ever to become quite dry. (F. J. Le­Mayne.)

INDEX.

a. Fis. white (see also Nos. 6 & 7).

b. Lip shorter than sepal, orange, center lined brown.

1. _leucôxantha_, Reichb. f. Sts. tufted, 3 ft. high, spotted: lvs. 4–6 in. long, lanceolate, acuminate: fis. 6–9 in. across; sepal linear-lanceolate, spreading and recurved, white; petals shorter, oblong, undulate above, also pure white; labellum with a ventricose tube; limb large, circular, notched in front and the margin irregu­larly lobulate and wavy, throat golden yellow, with a

BB. Lip nearly as long as sepal, yellow, center marked with orange.

2. _virginãlis_, Cogn. Sts. up to 3 ft. tall; lvs. coria­ceous, broadly lanceolate, 6–9 in. long, 1–1½ in. broad: fis. solitary, sessile, white except the yellow disk and throat; sepal revolute at apex, 3½ in. long; petals a little shorter than sepal, undulate; lip as long as petals, strongly undulate crisped. Colombia. C.O. 3. Var. _llâcina_, Cogn., has the lip tinted lilac. C.O. 3a.

AA. Fis. yellow.

B. Lip crisped and undulate on margin; fis. 5 in. or more across.

3. _xanthâleucâ_, Reichb. f. Sts. about 2 ft. high, tufted: lvs. spreading and drooping, lanceolate, 6–7 in. long, with speckled sheatha; fis. solitary, lemon-yellow, with a deeper shade on the lip; sepal linear-lanceolate, spreading and recurved; petals similar but shorter; blade of the labellum orbicular, crisp, and undulate,
Sobralia


bb. Lip fimbriate on margin; fls. less than 3 in. across.

4. franges, Lindl. A small species with sts. about 1 ft. high: lvs. 1 or 2; oblong-lanceolate, 4–5 in. long; fls. 2–3 in. long, pale salmon-yellow; sepals oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and many fimbriated crests. Colombia. B.M. 4882.—One of the smallest of the genus.

aaa. Fls. chiefly purple or rose.

5. macrantha, Lindl. Fig. 3324. Sts. tufted, redlike, 4–7 ft. high, leafy all the way up: lvs. broadly lanceolate to oblong-lanceolate, long-pointed, 8–10 in. long; fls. several at the ends of the sts., rose-purple, with the front of the labellum deep purple; sepals linear-oblong, 4½ in. long, reflexed and twisted; petals broader, oblong, wavy above; labellum 5 in. long, with the expanded portion almost circular, 3 in. across and 2–lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several thin yellow ridges. May–July. Mex. and Guatemala. B.M. 4446. F.S. 7:669. P.M. 14:241 (var). G.C. 1. 0. 3: 75. Var. Kienstiana, Hort. (var. alba) has white fls. G.C. III. 48: 182. Var. athioida, Hort. Fls. very large, creamy white. Var. nana, Hort. Fls. smaller than type; lip dark violet-purple.

6. Bräntia, Kränzl. Sts. 3 ft. high: lvs. lanceolate, acuminate, 1 ft. long; fls. pubescent, with the labellum darker and having a yellow disk; sepals linear; petals twice as wide; middle lobe of the labellum very broad, divided into 2 diverging, rather acute lobes; anther-ker with a long recurved horn on each side. Resembles a medium-sized S. macrantha, distinguished by the long horns of the column, and black spots (not hairs) on the fl-sheaths. S. Amer.

7. Fenzliana, Rechbr. f. Sts. slender: shentha blackish, asperulate: lvs. oblong, acutish: fls. rose-colored; sepals oblong, acute; petals obvolute-cuneate, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the anther. Nicaragua. Var. alba, Hort., has pure white fls.


9. Cáttleya, Rechbr. f. Sts. stout: lvs. oblong, acuminate, peltate, bearing several lateral clusters of strong, thick fls. of a firm fleshly texture, with purplish brown sepals and petals and a purplish lip, with a white column and 3 yellow lines over the center of the lip. Colombia.

10. Löwii, Rolfe. An imperfectly known species intro. about 1802 from Colombia. It grows about 1½ ft. high and has fls. of a bright uniform purple.

Soil

The physical properties of soils concern the size and other physical property; chemically, into calcareous, humus, alkaline, and according to other striking chemical features. In the soil survey of the United States Department of Agriculture a local name is adopted for each type under which the specific character is given; examples of these are Hartford sandy loam, Norfolk sand, San Joaquin adobe.
arrangement of the particles, and the relation of these to each other and to the organic matter; also the soil atmosphere, the soil moisture, and the physical forces of heat and gravitation. In these there is an intimate relation with physiography or the form and exposure of the surface of the land, as well as to climatology.

There are, undoubtedly, constant physical changes going on in the soil, as well as chemical changes, which have much to do with the best development of vegetation. The soil-moisture may be looked upon as a nutrient solution, dissolving its material from the difficultly soluble compounds in the soil and from fertilizers artificially applied. The amount of substances in solution varies with the moisture content and with the way moisture is supplied to the soil. The dissolved substances, naturally present in the soil or derived from fertilizers, influence the solubility of the soil components, rendering them more or less soluble according to their nature and existing conditions. It is probable that there is a normal weathering of the soil material which produces a certain concentration in the soil solution which will be maintained on the gradual withdrawal of nutrient material by the plant. However, this natural weathering is often not sufficient in amount to produce the yield and quality desired, and this may be increased by methods of cultivation and fertilization so that crops may annually remove larger quantities of nutrient substances without any particular exhaustion to the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils in humid climates, as they are liable to be leached away and also to recombine, forming difficultly soluble compounds with the material of the soil-grains. A soil in good heart or good condition when the physical conditions, such as the water-supply, soil atmosphere, and temperature relations, are favorable, and when the weathering of the material is sufficient to furnish an abundant and constant nutrient solution in the soil moisture.

One of the most potent agents in the weathering of soils is the organic material contained. This is unquestionably due largely to the amount of carbon dioxide formed, which renders many of the nutrient matters much more soluble. Moreover, the organic matter forms a culture medium for bacteria, ferments, and the various organized and unorganized agents which assist in breaking down the organic material, and facilitate as well the weathering of the other soil components. Soils in general have remarkable power of absorbing on the surface of the soil-grains vast quantities of carbon dioxide, ammonia, and other gases, and of other nutrient materials, which, while soluble and actually dissolved, do not readily diffuse out into the solution between the soil-grains.

3625. How the gardener makes his soil, by letting it decay in piles. The larger pile is composed of sods.

The influence of fertilizers is therefore twofold: the direct addition of plant-food for the immediate use of plants, and the action of the fertilizing components upon the solubility of the otherwise difficultly soluble compounds in the soil. There are other offices which are very strikingly shown in the case of lime. This substance, when in the form of either caustic or slaked lime, corrects the acidity which is very often present in soils. It changes the structure of soils. It renders some of the soil components more soluble, especially when the lime is in the form of the sulfates or gypsum, and it has undoubtedly a physiological rôle which enables the plant to assimilate larger quantities of other nutrient matters even in amounts which would be detrimental if the lime-soil were not present in excess.

The principal objects of the cultivation of the soil are to secure proper aération, to conserve the moisture supply, and to improve the drainage. The irrigation and artificial drainage of soils are treated elsewhere.

The physical properties of texture and structure, that is, the size and arrangement of the soil-grains, have a greater practical importance with field crops and the relation of crops to soil under extensive cultivation than with the vegetables grown in the greenhouses, where intensive methods are used. Particularly in the eastern states, where the natural rainfall is relied upon for the water supply, these physical properties have great influence in determining the relative value of different soils. This is due in large part to the influence of the physical properties upon the water supply, and the commercial values of many soils are dependent largely upon this one condition. This is notably the case with the early truck crops, with corn, wheat, and grass lands, and with special products such as celery, cranberries, and other horticultural crops. With intensive cultivation, however, the flavor, appearance, texture, and general quality of the crop assume greater commercial importance, and even with intensive methods these are largely influenced by the character of the soil. This is shown in a striking manner in the localization of certain interests, even under the most intensive system of agriculture, such as the production of the fine lettuce around Boston, of the currants, stolons, tomatoes, and roses in other districts. With the present specialization in these lines, it is not only necessary that one should have a knowledge of the methods of cultivation, but should have the proper soil conditions as well as suitable climatic conditions; and to such an extent has this specialization been carried that different varieties of roses, for example, are best grown in different localities where the soils are slightly different. These matters must be realized by the horticulturist in order to attain the highest degree of success in any particular undertaking.

Milton Whitney.

Soils for potting.

Strictly speaking, there are but two distinct kinds of soils, though there are several modifications or physical differences in both. These are mineral soils and organic soils or peat. Peat is formed in temperate climates by the accumulation of vegetable matter in swamps, or in some parts of the world under peculiar atmospheric conditions (see Peat). Mineral soils, which cover the greater portion of the earth's surface, are formed by the disintegration of rocks and stones through the agencies of water, frost, or the atmosphere. Peaty soils are composed almost entirely of vegetable matter, with but little mineral matter. Mineral soils are just the reverse. The physical differences in peat are practically reduced to two, viz., the absence or presence of fiber. The physical differences in mineral soils vary considerably from almost pure clay to almost pure sand; indeed, the mechanical (or physical) analysis of mineral soils is based largely upon the proportions of clay and sand.
The composition of soils can be still further known by chemical analysis, but to the average gardener this is not necessary. Moreover, it is an operation of great nicety and one that requires an experienced chemist to perform. The chemical constituents which plants derive from the soil are present in varying degree, but they are sure to be present in ample quantity in the potting soil selected by an experienced gardener. The air and water may furnish as much as 95 per cent of the material with which the plant body is built up in some cases, and only the remaining 5 per cent be strictly derived from the soil. Three important nutrient elements are nitrogen, phosphoric acid, and potash. Nitrogen composes four-fifths of the atmosphere and the soil absorbs it chemically through the action of bacteria when the soil is in good physical condition. Hence the importance of remembering always that air in the soil is as important as water.

The ideal condition of a soil is one in which it resembles a sponge, a condition in which it will retain the greatest amount of nutritive substances and water without losing its capacity for absorbing air.

The capacity of soils to retain moisture varies considerably. A clay loam is more retentive of moisture than a sandy loam. The experienced gardener therefore selects a clay loam for his strong-rooting, large-leaved tropical plants, because transpiration is so much greater in these plants. For a general collection of greenhouse and small-growing tropical plants he selects a good loam. For cacti, agaves, and other succulent plants which will not take as much water at all seasons as other plants, he selects a sandy loam. For ferns, most of the Ericaceae and Gesneraceae, he selects peat; while for nepenthes, orchids, bromeliads, and the epiphytic aroids he selects fern or kalmia root. Other materials which a gardener should always have on hand when he has a large and varied collection of plants are: leaf-mold, which is made by collecting leaves and storing them for at least two years, turning them over occasionally to facilitate decay; living or fresh sphagnum moss; sand; charcoal, and some convenient manures, such as pulverized sheep-manure and bone-meal.

Growing plants in pots is very different from growing them in borders or the open ground. The experienced gardener digs the turf only from good pasture or meadow land, so that it shall be full of the fibrous roots of the grass. But before using the turf for potting it should be placed in square piles, turf downward, for at least six months in order to kill the grass and all vegetable life. Fern root should also be collected and stored the same length of time in order to kill out the ferns. (Fig. 3625.) Raw and very coarse soils are usually sifted before being used for most greenhouse plants. Shallow sieves are used for this purpose. (Fig. 3626.)

Except for sowing seeds and for potting seedlings and freshly rooted cuttings, thoroughly decayed and homogeneous soils should not be sifted, but should be broken into small lumps, as the small lumps assist materially in astringing the soil. If the soil is sifted too much it becomes very fine, packs close and allows too little aeration. Leaf-mold is decayed vegetable matter, or humus. It may have little manurial value, but is used by gardeners to make soils "light" or spongy. For most young plants a good proportion added to the soil is excellent as it encourages root-growth. Peat while not a new medium for potting cuttings of the larger number of plants. It is also added to soils to increase their porosity, especially when potting very young plants. Silver sand is best.

In potting plants, experienced gardeners make potting mixtures or add a variety of materials to the soil to suit the requirements of different plants. For young seedlings or for freshly rooted cuttings, the compost should be of a light and porous nature, but as plants increase in size and vigor a heavier and richer mixture is usually given, that is, if plants are to be grown on as specimens; but the proportion of nutrient substances used in a potting mixture should be determined by the vigor of the plants. It is always better to use too little plant-food than too much; if too much is used it often becomes available faster than the roots of plants can absorb it, with fatal results. Many amateur plant-growers in their over-anxiety to grow fine plants make this fatal mistake.

In most gardens the greenhouse space is limited, and a gardener cannot always develop his plants to their fullest capacity or he has to reduce his variety and numbers. This, then, determines in the mind of an experienced gardener the composition of his potting mixtures. His aim should be to grow the finest possible specimens in the smallest possible pots and space.

SOILS, STERILIZING. Greenhouse and plant-bed soils are specially liable to infection by disease organisms, as they are intensively cropped and not exposed to the action of frost and weather. Careful growers now resort to methods of artificial sterilization.

In practice, the sterilizing is accomplished either by heat applied by live steam, or by a chemical process employing a formalin drench. In either case, the work must be thoroughly performed if satisfactory results are to be expected; it will be required at least as often as every other year, and the situation is safer if sterilizing is practised annually.

Steam sterilizing is of two methods: by buried perforated pipes, and by a pan inverted over the soil and under which the steam may be conveyed. The latter is probably preferable in most cases. In either case, live steam should be applied for an hour or more.

"The perforated pipe method appears to consist, at its best," according to Selby and Humbert in Circular No. 151 of the Ohio Experiment Station, "in a system or set of perforated pipes, with crosshead and high-pressure boiler connection. These pipes are connected and buried in the soil of the bed, either with or without partial banking up of the soil; the surface of the bed is then covered with canvas or other covering and the steam passed into the system for such a period as is required to heat the soil to the necessary temperature. This temperature for best results is 180° to 212° F. maintained for a period of an hour or more. The time required to reach this temperature will vary with the boiler area, the pressure and other steam and soil factors. The length of pipes of the system will be adapted to the beds, being one-half or one-third the total length of large beds. Generally, 1 3/16-inch pipe is used with 3/4-inch holes bored in a straight line about 1 foot apart. These pipes are buried in the beds 12 to 16 inches apart."

Edward J. Canning.
For the inverted pan method, "The apparatus consists," according to W. W. Gilbert, "of a galvanized iron pan, 6 inches deep and 6 by 10 feet in size, which is inverted over the soil to be sterilized and the steam admitted under pressure. The pan is supplied with steam hose connections, has sharp edges, which are forced into the soil on all sides to prevent the escape of steam, and is fitted with handles for moving it from place to place, the weight of the entire pan being not over 400 pounds."

Remarking on the formaldehyde or formalin drench method, Selby and Humberg say that "Soils to be treated by any method of sterilization should be prepared as for use by addition of manure so that the latter is incorporated with the soil before treatment. The soil after spading or plowing is ready for treatment, whether by steaming or drenching. For the work of drenching it is rather difficult to make exact estimates as to cost of appliances, as well as labor outlay, since the appliances are the usual watering devices of greenhouses or coldframes, and the labor will be somewhat variable according to the effectiveness of these devices. The appliances used may be extremely various, though usually some form of sprinkling-can, a force pump with hose and nozzles or application through the overhead Skinner watering system. For outside beds the hose and force pump offer a convenient method. The best strength appears to be three to three and one-half pints or pounds to each fifty gallons of drench applied at the rate of seven-eighths to one gallon to the square foot of surface."


Leaves entire, leathery, shiny; fls. very large, white; the pedicels solitary and thick; calyx long-tubular, 2-5-cleft at the top; corolla funnelform, the tube cylindrical, the throat oblique and broad-campanulate, lobes SOLANUM (Latin, solamen, solace or quieting). Solanaceae. Nightshades. A vast group of temperate and tropical herbs, shrubs and even trees, comparatively poorly represented in temperate North America, of various horticultural adaptabilities, comprising ornamental subjects and also the potato, tomato, eggplant, ground cherry or physalis, red pepper or capsicum, also medicinal plants.

Leaves alternate: infl. mostly symподial and therefore superaxillary or opposite the lvs.; corolla gamosepal, free, or very short-connate; bifid; the tube cylindrical, the throat oblique and broad-campanulate, lobes broad; stamens 5; ovary 2-celled: berry globose, pulpy.

---About 4 species, Trop. Amer.

Solandas are attractive plants and their needs are simple. A warm greenhouse—one in which the temperature is never allowed to fall below 50° well suit them very well in the eastern states. The plants would probably do well outdoors in Florida and the far South. They take plenty of light and sunshine at all seasons of the year, and water should be given freely from early autumn till the latter part of spring, as they make their growth and bloom during that period. In summer, when the wood is ripening, a dry state is preferable for them. The soil that gives the most satisfactory results is a good, somewhat sandy loam. It is unwise to disturb the roots of established plants more frequently than is necessary. The chief point in growing solandas is to obtain short, sturdy branches, for those of rank growth seldom or never develop flowers; for this reason the use of rich soils and strong fertilizers should be avoided always. Propagated by cuttings of firm young shoots taken with a heel and placed in slight bottom heat. S. grandiflora is perhaps the best. The flowers do not last more than two or three days. They are of a pretty greenish white color when they first open and turn slowly to a rich brownish yellow. (Michael Barker.)

A. Plant about 2 ft. high, with trailing branches.

**longiflora**, Tussac (S. levii, Hook.). Lvs. oblong-ovate or obovate, acute; petioles purplish; fls. fragrant; corolla usually 1 ft. long, 3 times as long as the calyx, contracted at the throat, white or yellowish. B.M. 4845.

AA. Plant becoming 12-20 ft. high.

**grandiflora**, Sw. Fig. 3627. Lvs. obvate-oblong, acute, glabrous, thick; fls. fragrant; corolla twice as long as the calyx, not contracted at the throat, white or somewhat yellowish. B.M. 1874. G.C. III. 21:737.

**guttata**, Don. Shrub about 12 ft. high, erect, branched: lvs. alternate, pedioled, elliptic-oblong, acute or very short-acuminate, entire, rather glabrous above paler and copiously pubescent beneath, base broadened, rounded, 3-6 x 2-3 in.; fls. terminal, solitary, fragrant, ocrea-yellow, large; calyx tubular, pubescent, 3 in. long; corolla funnelform, 9 in. long, 5-lobed, lobes crenate and undulate, 5 purple-brown ridges at the throat. Mex. B.R. 1551.

**Hartwegii**, N. E. Br. Branched shrub: lvs. alternate, glabrous, elliptical, acute, short-acuminate or obtuse, base acute; fls. solitary, terminal, yellow, 6-8 in. across; calyx 3-4-lobed; corolla 2-10-celled, ripening into a berry which is sometimes paler and copiously pubescent beneath, base broadened, rounded, 3-6 x 2-3 in.; fls. terminal, solitary, fragrant, ocrea-yellow; calyx tubular, pubescent, 3 in. long; corolla funnelform, 9 in. long, 5-lobed, lobes crenate and undulate, 5 purple-brown ridges at the throat. Mex. B.R. 1551.

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Leaves alternate: infl. mostly symподial and therefore superaxillary or opposite the lvs.; corolla gamosepal, free, or very short-connate; bifid; the tube cylindrical, the throat oblique and broad-campanulate, lobes broad; stamens 5; ovary 2-celled: berry globose, pulpy.

---About 4 species, Trop. Amer.

Solandas are attractive plants and their needs are simple. A warm greenhouse—one in which the temperature is never allowed to fall below 50° well suit them very well in the eastern states. The plants would probably do well outdoors in Florida and the far South. They take plenty of light and sunshine at all seasons of the year, and water should be given freely from early autumn till the latter part of spring, as they make their growth and bloom during that period. In summer, when the wood is ripening, a dry state is preferable for them. The soil that gives the most satisfactory results is a good, somewhat sandy loam. It is unwise to disturb the roots of established plants more frequently than is necessary. The chief point in growing solandas is to obtains short, sturdy branches, for those of rank growth seldom or never develop flowers; for this reason the use of rich soils and strong fertilizers should be avoided always. Propagated by cuttings of firm young shoots taken with a heel and placed in slight bottom heat. S. grandiflora is perhaps the best. The flowers do not last more than two or three days. They are of a pretty greenish white color when they first open and turn slowly to a rich brownish yellow. (Michael Barker.)

**INDEX.**

| 1. tuberosum, Linn. Potato. Figs. 3628, also 3152, 3153, Vol. V. Low, weak-stemmed, much-branching perennial with tender, herbaceous tops, and perpetuates itself sexually as means of thickened or tuberous underground stems, golden or pubescent-hirsute; lvs. unevenly pinnate, the 5–9 oblong-ovate lfts. interposed with much smaller ones: lvs. variable in color, white passing through various tints and shades of purple, violet, and blue, in long-attenuate dichotomous clusters, fr. a gland 1/4–1 in. or more in diam., usually through lack of viable pollen not produced in the highly developed modern varieties except in favored localities and in the case of certain varieties, but fruiting abundantly in S. Chile and in Peru. Temp. Andes of Peru and Bolivia. See *Potato.*

2. Magála, Schlecht. *Darwin Potato.* Rough-hirsute branched perennial, with angled more or less winged sts. at least near the insertion of the lvs.: lvs. unequally pinnate, the terminal lft. 4 in. long, the lateral ones 2–3 pairs, elliptical, unequal at the base, acute at the apex, the interposed lfts. very small or sometimes wanting entirely: lvs. in dichotomous branches, the pedicels articulate about the middle; calyx hirsute, the lobes abruptly narrowed to a linear-acuminate point; corolla pure white, slightly lobed, the lobes acute. Inflowed along the Chilean coast from the vicinity of Valparaiso southward, and occasionally on the islands as far as the Chonos Archipelago. B.M. 6756.—Tubers gathered by the writer were about 4 in. long, dark purplish in the skin and flesh. Apparently very difficult to hybridize with *S. tuberosum.* It was at one time considered by some to be the original of the potato. Darwin describes the plant in his "Naturalist's Voyage."

3. Féneldier, Gray (*S. tuberosum* var. *boreale*, Gray). Herbaceous perennial with st. about 18 in. high, angled, and foliage somewhat resembling the common potato; lvs. 4–5 1/2 in. long, with 1–2 pairs of short-stalked lateral lfts., these 1 1/2–2 1/2 in. long, the terminal lft. somewhat larger, broadly ovate and abruptly rounded or subcordate at the base, acute at the apex, interposed lfts. very few, all pubescent on both surfaces with scattered hairs: lvs. violet, the pedicels 1/2–3/4 in. long; calyx-lobes about 1 line long, ovate, short-acuminate; corolla about 3/4–1 in. diam., the lobes pubescent without. New Mex.

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**3628. Tubers of potato.—** *Solanum tuberosum.* (X 1/2)


**INDEX.**

| 1. tuberosum, Linn. Potato. Figs. 3628, also 3152, 3153, Vol. V. Low, weak-stemmed, much-branching perennial with tender, herbaceous tops, and perpetuating itself sexually as means of thickened or tuberous underground stems, golden or pubescent-hirsute; lvs. unevenly pinnate, the 5–9 oblong-ovate lfts. interposed with much smaller ones: lvs. variable in color, white passing through various tints and shades of purple, violet, and blue, in long-attenuate dichotomous clusters, fr. a gland 1/4–1 in. or more in diam., usually through lack of viable pollen not produced in the highly developed modern varieties except in favored localities and in the case of certain varieties, but fruiting abundantly in S. Chile and in Peru. Temp. Andes of Peru and Bolivia. See *Potato.*

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ovate, usually confluent with the rachis, obtuse at the apex, ½–1½ in. long, the terminal one somewhat larger, the upper lateral pair sometimes more or less adnate with the terminal, interspersed lfts. very few or none; calyx slightly pubescent, the lobes ovate-acute, about a line long; corolla white or pale violet, rather deeply lobed, pubescent on the outer surface, rather strongly so toward the apex of the lobes. E. Argentina and Uruguay, usually in moist situations. Trans. Hort. Soc. vol. 5: 1. 10.—Of no value in the improvement of the common potato. See suppl. list, p. 3186.

AA. Species grown for the edible frs.: lvs. simple.

9. nigrum, Linn. BLACK NIGHTSHADE. Morella of the French. Low unarmed herbaceous annual or suffrutescent in warm climates, glabrous or the young parts sometimes sparingly pubescent: lvs. simple, ovate, narrowed at both ends, entire or more frequently sinuate-toothed, petioled: fls. small, white, in pedunculate lateral cymes; calyx much shorter than the corolla with small obtuse lobes; corolla about ⅜ in. diam.: berry globular, black, about ⅜ in. diam. A widely distributed weed in all temperate and tropical regions.—In the Dakotas, according to Hansen, the plant is often called “stubbleberry,” as it volunteers freely in wheat-stubble, and the fr. is used there for pies and preserves. Hansen finds that the plants with-

stand considerable frost. In warm countries, according to Vilmorin, the lvs. are sometimes eaten as spinach is, “and apparently without any injurious result, although such use brings no dangerous effect.” The species is extremely variable, and much difference of opinion exists in regard to the poisonous qualities of the berries. Possibly differences exist in this respect in different forms but not correlated with characters recognizable by the systematist. Var. guineense, Linn., with scarcely angled to angular smooth st., broadly ovate lvs. glabrous above and glabrous or sparingly pilose below, deeply lobed calyx and relatively large fr., is the “garden huckleberry” (Fig. 3629). This form is cult. to some extent in some sections and the fr. used for pies and preserves. Another form, S. Barbankii, bitter, with foliage rather dark green above, and erect or ascending peduncles, is stated by the originator to be a hybrid between the “garden huckleberry” and S. villosum of the Pacific coast. In some characters it appears to be intermediate between its supposed parents, and it is used as is the former.

10. muricatum, Ait. (S. guatemalense, Hort.). PEPINO. MELON PEAR. MELON SHRUB. Fig. 3629. An erect spineless bushy herb or subshrub. 2–3 ft. high, the branches often with rough warty excrescences, and usually glabrous or nearly so: lvs. entire or with slightly undulate margins, rarely ternate, oblong-lanceolate, or ovate, tapering to the more or less margined petiole and also toward the more or less obtuse or sometimes acute apex, the surface sparingly soft-pubescent: fls. in a long-stalked cluster, rather small, the corolla bright blue, deeply 5-lobed, puberulent on the outer surface, inclined or nodding: fr. ovoid or egg-shaped, long-stalked, drooping, yellow overlaid with splashes of violet-purple, 4–6 in. long when cult., flesh yellow and seedless under cult. Said to be a native of Peru and cult. in other parts of Trop. Amer. at temperate elevations. G.F. 5: 173. G.C. III. 3: 309.—This plant attracted some attention in this country about 25 years ago. It appears to have been intro. into the U.S. from Guatemala in 1882 by Gustav Eisen. A full review of the history and botany was made in Cornell Exp. Bull. No. 37 (1891). The fr. is aromatic, tender, and juicy, and in taste suggests an acid eggplant. In a drawer or box, the fr. may be kept till midwinter. In the N. the seasons are too short to allow the fr. to mature in the open, unless the plants are started very early. The pepino is properly a cool-season plant, and when grown in pots in a cool or intermediate house will set its frs. freely. It is readily prop. by means of cuttings of the growing shoots. The plant will withstand a little frost.

11. Melongena, Linn. (S. insanum, Linn.). Erect and much-branched herb or subshrub, 2–3 ft. tall, woody or scurvy, spiny; lvs. large and heavy, ovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose beneath, shallowly sinuate-lobed: fls. large, mostly in clusters, the calyx waxy and often spiny, the spreading, deeply lobed, purplish corolla 1 in. or more across: fr. a large berry. Afr. and S. Asia. Original habitat probably S.W. Asia.

Var. esculentum, Nees (S. esculentum and S. odoratum, Dun.). COMMON EGGPLANT. GUINEA SQUASH. Aubergine. Figs. 3797–381, 1383, Vol. II. Cult. for its large frs., which are usually oblong, obovate, or egg-shape in form, and purple, white, yellowish or striped; differs from the wild plant in having fewer spines, mostly solitary fls., and much larger and more variable frs. There are 2 well-marked subvarieties: var. serpenth, Bailey. SNAKE EGGPLANT. Fr. greatly elongated and curled at the end. Var. stenanth, Bailey. DWARF PURPLE EGGPLANT. Fig. 1382. Low and diffuse, many of the branches finally resting on the ground, usually dark-colored, nearly glabrous and always spiny: lvs. small and relatively thin, less lobed: fls. small and longer-stalked: fr. purple, purplin. See Eggplant.
3630. Solanum Pseudo-capsicum. (x10)

12. aviculare, Forst. (S. lacinatum, Ait.). A leafy unarmed soft-wooded glaucous shrub 4–8 ft. high, with spreading branches, smooth or rather rough, barked, decurrent from the petiolo; lvs. variable in size and shape, 4–12 in. long or sometimes even longer, lanceolate or linear-lanceolate, entire or irregularly pinnatifid and the lobes linear or lanceolate and acute; fls. in cyrpose clusters in the axis of the upper lvs. or lateral; calyx-lobes broad and obtruse; fr. with an abrupt point; corolla violet, ¾–1 in. diam., the lobes short and broad; fr. a broad ovoid edible berry ¾–1 in. long, yellowish, New Zealand; also common in many parts of Australia, Tasmania, and in Norfolk Is. B. M. 349.

13. glaucum, Dun. (S. glaucophyllum, Deaf.). A perennial plant 6 ft. or more high, with round erect sts., suckering annually; lvs. 5–6 in. long, ¾–1½ in. broad, ovate-lanceolate to oblong-lanceolate, entire, narrowed toward the base and decurrent from the petiolo, acuminate at the apex, the surface glabrous and somewhat glaucous; fls. in terminal and lateral branched racemes or corymbs; corolla blue, star-shaped, about 1 in. diam., the lobes ovate: berry small, ovoid-globose, yellow. Province of Buenos Aires in Argentina, and in S. Brazil. B.M. 7945.

14. Pseudo-capsicum, Lind. JERUSALEM CHERRY. Fig. 3630. A small branching leafy shrub, reaching 3–4 ft., erect and glabrous throughout; lvs. narrowly lanceolate, oblanceolate, or oblong, entire or the margins slightly wavy, narrowed at the base to a short petiole, mostly obtuse at the apex, the surface bright green and shining, the veins prominent: fls. solitary or few in lateral clusters, small, white: fr. globose, scarlet or rarely yellow, ½–¾ in. diam. Widely distributed in tropical and semi-tropical regions, naturalized in Fla. Probably a native of the Old World, perhaps Madeira. --An old-fashioned plant usually grown as small specimens in pots for its showy scarlet fls., which persist for a long time. Var. nanum, Hort., is a dwarf compact form. Var. Weatherillii, Hort., Weatherill's hybrid, is a form with strongly veined undulate lvs. and pointed orange-colored fls.

15. Hendersonii, Hort. Very like S. Pseudo-capsicum, but the white fls. very numerous, and the fr. ovoid or olive-form, orange-red. A horticultural form, perhaps a hybrid. Also known as S. hybridum Hendersonii, but not related to the plant known in Old-World gardens as S. hybridum.

16. Capsicástrum, Link. Fig. 3631. A small shrub resembling the last but only 1–2 ft. high: st. more or less pubescent, with stellate hairs or glabrate; lvs. simple, oval, oblong, or sometimes slightly ovate, narrowed toward the petiolo, obtuse at the apex, the margins entire or slightly undulate, the upper surface green and somewhat pubescent, the lower more strongly so: fls. small, white: fr. ½ in. diam., orange-red or scarlet. Peru, Chile, and Uruguay. F.S. 12:1242. G.W. 3:529.—Frequent greenhouse and window-plant. Var. Melévinii, Hort., a compact form 12–15 in. high with ovoid berries. Var. variegatum, Hort., has variegated lvs.

E. Fls. usually ¾ in. or more diam., violet or rarely white in No. 22.

17. Rantonnetii, Carr. (incorrectly spelled S. Ranton­netii, Rantonii, etc.) (S. míticum, N. E. Br. S. japóni­cus, Hort.) An erect bushy grayish green half-shrub, growing 3–5 ft. high, the st. marked with raised lines decurrent from the petiolo; lvs. entire, lanceolate or ovate-lanceolate, narrowed to the petiolo, mostly acute at the apex, glabrescent or inconspicuously pubescent on the upper surface, pubescent with short hairs below: fls. 2–5, together in the axils, 1 in. or more diam.; calyx-lobes with an abrupt linear point, corolla violet with a light yellow center: the red fls. nearly or quite 1 in. diam., heart-shaped, drooping, and very ornamental. Margins of woods in Paraguay and Argentina. Cult. in warm temperate regions of Amer. and Eu. R.H. 1859, p. 135. Cl. 43:1401. —An excellent plant for blooming in the open in summer. Easily prop. by means of cuttings.

18. crispmum, Ruiz & Pav. An unarmed shrub, or sometimes attaining the size of a small tree, with rather long green flexuous branches puberulous when young, later becoming glabrous; lvs. 3–6 in. long, entire, thin, ovate to ovate-lanceolate, subacute at the base, acute at the apex, smooth above, the margins somewhat undulate and the nerves prominent on lower surface: corollas many-flled, corolla pale violet, about ¾ in. broad and twice as long as the calyx, the lobes ovate or ovato-lanceolate; fr. globose, pale yellow, about the size of a pea. In Chile from the central provinces to the Island of Chiloé, also in Peru. B.M. 3795. G.C. III. 30:424.

19. Xánti, Gray. A low shrub or at high elevations herbaceous from a woody base, the sts. slender, 1–2 or even 3 ft. high, the younger branches angled, somewhat vil­lous with many-celled usually gland-tipped simple hairs: lvs. membranous, ovate, ovate-oblong to oblong-lanceolate, ½–1½ in. long, wedge-shaped, rounded or subacute at the base, entire or lobed; fls. in umbel-like cymes, corolla ½–1 in. diam., rotate, angular or short-lobed, violet: fr. erect, berry-like, globose, light green or purplish in color. Throughout Calif., except in the desert region, ascending to 6,500 ft. altitude. B.M. 7821.

20. Wallacei, Parish. A shrubby plant often forming round masses and reaching a height of about 3 ft., the sts. slender, 1–2 or even 3 ft. high, the younger branches angled, somewhat vil­lous with many-celled usually gland-tipped simple hairs: lvs. membranous, ovate, ovate-oblong or oblong-lanceolate, ½–1½ in. long, wedge-shaped, rounded or subacute at the base, entire or lobed; fls. in umbel-like cymes, corolla 1–1½ in. diam., pale violet: fr. dark purple. Islands off the coast of Calif.
SOLANUM


21. umbelliferum, E. Sch. (S. californicum, Dun.). A densely villous rarely glabrate shrub: lvs. entire, usually obovate or oblong, rarely oval or ovate, ½–1 or 2 in. long: fls. in umbel-like terminal clusters; corolla pale violet or sometimes white, pubescent on the outer surface, ⅔ in. diam., showy and fragrant: berry large, purple. Calif.—The plant offered as S. umbellatum is very likely this species.

c. Plant more or less spiny, the lvs. sinuate or lobed.

d. Lvs. pinnately lobed.

E. Species perennial.

22. aculeatissimum, Jeaq. (S. cilatum, Lam. S. myriacanthum, Dun.). An undershrub 1–2 ft. high, st. branched, furnished with many long straight spines, interspersed in the younger parts with stiff bristles: lvs. solitary or geminate, broadly ovate or ovate-cordate, pinnately 5–7-lobed, 4 in. long, 3 in. wide, with rigid adpressed hairs on both surfaces, and spines on the upper surface of the principal nerves; petiole 1 in. long: cymes extra-axillary, few-fl.; calyx-lobes triangular, closely beset with spines; corolla rotate, 1 in. diam., snow-white, the lobes lanceolate: fr. globose, 1–2 in. diam. glabrous, orange or orange-yellow, flattened on the ends, corrugated. Widely distributed in tropical regions. F.S. 19: 1988. F.M. 1871: 521. RB. 20, p. 249. R.H. 1888, p. 78.

EE. Species annual.

23. citrullifolium, A. Br. (S. heterodoxum, Brit., not Dun.). An annual plant armed with straight prickles, glabrous pubescent with mostly simple hairs: lvs. 1–2-pinnatifid, the lobes obtuse and repand: inti. Dun.). An annual plant with many yellow- or orange-colored spines covering the st., both surfaces of the lvs., petioles, and sepalis, and the upper part usually somewhat villous with gland-tipped hairs: lvs. oblong or ovate, sinuately lobed or even deeply pinnatifid and the lobes sinuate or deeply cut: infl. terminal or soon lateral, racemose, the fls. rather numerous, light blue or white and 1 in. or more diam.: fr. globose, red, 1 in. or more diam., surrounded by the at length ovate-lanceolate calyx-lobes. Trop. Amer. and naturalized in waste grounds in the Gulf states. B.M. 2928; 3954. G.C. III. 43: 61.

25. cornutum, Lam. (S. Fontanesianum, Hort.). An annual herbaceous simple-stemmed spiny plant 1–4 ft. high: lvs. oval or ovate, pinnately lobed and the lobes again sometimes divided nearly to the center, the divisions oblong, acute, or rounded at the apex and tipped with an abrupt point, pubescent on all surfaces, that on the lower stellate: fls. terminal, in clusters of 3 or 4, corolla yellow, about 1–1¾ in. diam., villos on the outside, anthers uneven, the fifth ½–2½ in. long and twice the length of the other 4, enlarged at the base and shaped somewhat like a horn, hence the name: fr. small, spiny. Mex.

DD. Lvs. sinuately lobed.

26. Warscewiczii, Hort. (S. warscewiczodes, Hort.). Strong erect suffrutescent plant, reaching a height of about 6 ft., usually with a central st., densely rusty-tomentose and armed with many short stout hooked or straight greenish yellow spines: lvs. large, sometimes the blade a foot or more long, rather soft green and slightly pubescent at least along the veins above, grayish or rusty below and with dense stellate pubescence or tomentum, ovate, somewhat cordate at the base and rather deeply lobed with unequal lobes: infl. at first terminal, later lateral in 1-sided corymbiform racemes with numerous fls.; calyx deeply lobed, the segments oval and long-acuminate, spiny or unarmed, covered with numerous whitish hairs; corolla white, about 1½ in. diam., the lobes lanceolate and acute: fr. pale yellow, glabrous and shining. Probably S. American R.H. 1865, p. 430; 1896, p. 237.—A very striking plant for subtropical gardening and can easily be raised from seed in a single season; half-hardy perennial.

27. alatum, Seem. & Schmidt (S. robustum, Wendel.). Vigorous more or less spiny densely tomentose herb or shrub, the sts. winged, 3–5 ft. high: lvs. decurrent with the spiny petiole, sometimes 1 ft. long, broadly ovate or ovate-elliptic in outline, sinuately lobed, the lobes acute, upper surface green and tomentose-velvety, woolly with more or less rust-brown tomentum beneath: fls. in axillary racemes, calyx unarmed, corolla about 1 in. across, white, with ovate-lanceolate acute lobes; fr. globular, small, hairy, orange-colored. Brazil, R.H. 1863, p. 240; 1896, p. 236.—Bold species, useful for subtropical gardening.

EE. The lvs. with gray or whitish pubescence.

V. Fls. white

28. integrifolium, Poir. (S. cocineum, Hort. S. Loboba, Tenore) CHINESE SCARLET EGGPLANT. ORNAMENTAL EGG-PLANT. ETHIOPIAN EGG-PLANT. Fig.
3633. Solanum Wendlandii. (Much reduced.)

India and China, Malaya, and the Philippines. Doubtfully in the American trade.

36. Jasminoides, Paxt. Potato Vine (from the fls.). Fine greenhouse twining shrub, reaching several feet in height, glabrous; lvs. rather small, the upper ones lanceolate to lance-ovate and entire, the lower ones of about 3 narrow, ovate entire lfts.: fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. Amer. P.M. 8:5. B.R. 33:33. Ga. 43, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 53, p. 28. —A most useful deciduous climber for the greenhouse, and much grown. Half-hardy, and useful for the open in the S. Will grow 10-20 ft. if given a chance. Var. grandiflorum, Hort, has very large trusses of fls. and is a robust grower; excellent. Gng. 1:259. Var. variegatum, Hort., has variegated foliage.

36. Seaforthianum, Andr. (S. azureum, Hort., not Fern. S. tenatum, Kunth). Beautiful slender unarmed herbaceous or slightly woody climber or trailer, with st. 3-4 ft. long, glabrous throughout: lvs. with 3 lfts., these 1½-2 in. long, or the upper ones simple, lanceolate, or ovate-lanceolate with entire or undulate margins: fls. numerous, in long drooping axillary panicles, on pedicels swollen at the apex, the corolla light purple or blue, star-shaped and usually 1 in. or less diam.: fr. ovoid or nearly globose, glabrous, scarlet. Brazil. B.M. 1952; 5823. B.R. 969. R.H. 1893, p. 177; 1897:424. —A very beautiful plant for the greenhouse. Begins to bloom when very young. Var. album, Hort., a variety with white fls. recently intro.

37. Wéndlandií, Hook. f. (S. Wéndlandií magníficum, Hort., fig.). Fig. 3633. Tall-climbing, glabrous, with a few scattered prickles: lvs. various, sometimes 10 in. long, the uppermost simple and oblong-acute, the others lobed or trifoliolate and with the terminal lft. much the largest, all with entire margins: fls. in large cymes, pale lilac-blue, the corolla 2½ in. across and shallow-lobed fr. globose. Costa Rica. B.M. 6914. G.C. 111. 14:399.
SOLANUM

G.M. 39:610. A.F. 12:1147. F.E. 8:828.—A splendid greenhouse climber, perhaps the most showy of the cult. solanums. Blooms in summer and fall. Ernest Brunton writes: "S. Wendlandii is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbels 12 in. across. It is perhaps the showiest vine in Calif. when in bloom. It is generally hardy here, although some winters nip and even kill the vine in the colder and lower parts of this city. Cut up an old vine, any kind of wood, stick the pieces in sand or light soil, and wait. Every cutting will grow. When in a robust condition it is a good feeder. It should be in full sun, though it does well anywhere."

c.c. Foliage usually more or less pubescent, sometimes glabrous or glabrate.

38. Dulcamara, Linn. Bttrri-sweet. Fig. 3034. A more or less pubescent or sometimes glabrous shrubby climber with st. 4-6 ft. long: lvs. entire or sometimes 3-5 parted, 1-3 in. long, the entire ones corate, ovate-cordate, or the upper ones hastate: fls. many, drooping, in panicked corymb opposite the lvs.: corolla white or violet, 1/2 in. diam., the lobes reflexed, each segm. furnished with 2 greenish spots near the base: fr. ovoid, 1/2 in. diam., red or rarely yellowish green. Naturalized from Eu.—Berries poisonous.

39. jasminifolium, Sendt. St. round, unarmed, sparingly pubescent or glabrate: lvs. ovate to ovate-lanceolate, entire or very slightly undulate, usually subcordate at the otherwise truncate base, acute or obtuse at the apex, indurate to 1-2 in. long; fls. several in a paniculate cluster; calyx campanulate, the lobes about the length of the tube; corolla violet, about 1/2 in. across; berry globose, 1/2 in. diam., red or rarely yellowish green.

SOLDANELLA (Latin, a small coin, referring to the shape of the leaves). Primulaceci. Small glabrous perennial herbs with short rhizomes, hardy and useful in the border or rock-garden.

Leaves short-petioled, thick, cordate-ovate or reniform, entire, or scapes slenderer, solitary or few, 1-3 ft. or many-ft., umbellate: fls. blue, violet, or rose, rarely white, nodding, about 1/2-3/4 in. across; calyx 5-parted, segments lanceolate, persistent; corolla hypogynous, funnelform-campanulate, 5-lobed at the middle, the lobes linear-lanceate; ovary ovate, ovoid, conic-oblong, many-seeded.—Species, 6, mountains of Eu. For account of species and cult., see Gn. 61, pp. 126, 127; for monograph, Pxt. & Knuth in 2 Jas Pflanzenreich, hft. 22 (IV. 257).

3634. Solanum Dulcamara. (X 3/4)

41. Wörstei, Hort. An unarmed woody climbing plant reaching a height of about 9 ft.: lvs. soft-pubescent, oblong-lanceolate, drooping, 6-12 in. long, frs. the size of a hen’s egg, clear light red in color; is a native of the highlands near Rio de Janeiro, Brazil, where it is used for the decoration of dwellings. In the upright stage the frs. are said to be prepared and used as a vegetable.

S. arculatum, Ait., is allied to S. verbaefolium, and is sometimes mistaken for it. Lvs. 6-7 in. long, ovate-oblong, acuminate, entire, velvety-tomentose above with branched hairs, more densely so and glaucous below, axes furnished with small lvs.; corolla subterminal, many-ft., umbellate: fls. white, not 1/2 in. across; berry globose. Ait.—S. betaceum, Cav., is Cyphomandra, for which see Vol. I. This shrub is a small tree, with cyphomandra like lvs. and the young parts clothed with rusty hairs; fls. white; fr. globose, grey, in the calyx. S. Brazil. B.M. 7451.-S. hystrix, Cav., "Violet," which attracted much attention a few years ago, is S. tuberosum, being similar to, if not identical with the variety known as "Blue Giant.—S.arcuatum, Linn. A rather weak, unarmed, branched half-shrub: lvs. 2-5 in. long, glabrous except for the channeled marg. ovate or lanceolate, entire or slightly lobed, frs. about 1/2 in. diam., blue or violet: fr. reddish orange, 3-5 in. diam. Native of Peru.—S. erectum is Cyphomandra betaceum.—S. Pluto, Pers. En. & Hout. has fr. the size of a walnut and shaped like a tomato, scarlet.—S. stoloniferum, Schlch. & Bouët.—S. bovei, Pers. has fr. and burrs of panne, the interspersed ones very numerous; lvs. mostly subcordate at the base and acuminate at the apex, sparingly pubescent with scattered flattened hairs on the upper surface, usually only along the veins on the lower surface, but puberulent on both surfaces: calyx glabrous, the lobes about the length of the tube; corolla hypogynous, funnelform-campanulate, 5-lobed at the middle, the lobes linear-lanceate; ovary ovate, ovoid, conic-oblong, many-seeded.—Species, 6, mountains of Eu. For account of species and cult., see Gn. 61, pp. 126, 127; for monograph, Pxt. & Knuth in 2 Jas Pflanzenreich, hft. 22 (IV. 257).

S. tuberosum is amongst the most famous flowers of the Alps, though not the commonest. S. alpina ascends to the mountains to the line of perpetual snow. Grant Allen, in "Flashlights on Nature," declares that the flower of soldanella actually thaws its way up through a solid block of ice. Soldanellas are cultivated in this country only in a few rock-gardens. Those who have limited resources and dwell in the region of changeable winters might attempt to grow these plants in pots under a frame in lieu of nature’s winter covering. They are said to prefer a half-shady or shady position and are propagated by seed or division.

S. erectum

alpina, Linn. (S. Clarzi, F. W. Schmidt. S. occiden
talis, Vrieh.) Fig. 3335. Sts. 3-6 in. high: lvs. roundish; margin slightly and remotely crenate; fls. violet. May—July. Gn. 61, p. 127. G.W. 15, p. 794.

b. Pedicels pubescent.

S. erectum

penniset, Sendt. A woody climber, more tender than S. Wendlandii; lvs. simple and entire, 2-4 in. long, somewhat glossy green and glabrous above, paler below, ovate or slightly cordate at the base, rarely narrowed toward the petiole; fls. in long panicles or racemes, the corolla purplish red changing to pale blue with white star-shaped center, rather deeply lobed and about 1 in. diam.: fr. globose, pale violet, about the size of a small cherry. British Guiana, the Amazon region and Surinam.

41. Wörstei, Hort. An unarmed woody climbing plant reaching a height of about 9 ft.: lvs. soft-pubescent, oblong-lanceolate, drooping, 6-12 in. long, frs. the size of a hen’s egg, clear light red in color; is a native of the highlands near Rio de Janeiro, Brazil, where it is used for the decoration of dwellings. In the upright stage the frs. are said to be prepared and used as a vegetable.


3635. Soldanella alpina. (X 3/4)
CV. Solidago ulmifolia, one of the common goldenrods.
SOLENANTHUS (Greek, tubus and floer, referring to the form of the corolla). Boraginaceae. Gray-villous hirsute or rarely glabrous perennial herbs, hardy and suitable for border planting: lvs. alternate; racemes sometimes elongated and simple, sometimes short, scorpioid, densely-fl., and numerous in terminal panicles: fls. blue or rose; calyx 5-parted, segms. narrow; corolla tubular or funnel-shaped, 5-lobed, the lobes small, obtuse; ovary 4-lobed, distinct: nutlets 4, depressed.—About 20 species, S. Eu., W. Asia, and Russia.

S. apenninus, Hohen. (Cynoglossum apenninum, Linn.). Plant hardy, 2½-3 ft. high: lvs. rather coarse, the radical ovate-oblong, those of the st. long-lanceolate: fls. blue, forget-me-not-like, in dense, axillary, paniced racemes. May, June. S. Eu.—A useful plant amongst shrubbery or in the back part of borders. Prop. by division or seed.

SOLENANTHUS (Greek, tube and flower, referring to the form of the corolla). Boraginaceae. Gray-villous hirsute or rarely glabrous perennial herbs, hardy and suitable for border planting: lvs. alternate; racemes sometimes elongated and simple, sometimes short, scorpioid, densely-fl., and numerous in terminal panicles: fls. blue or rose; calyx 5-parted, segms. narrow; corolla tubular or funnel-shaped, 5-lobed, the lobes small, obtuse; ovary 4-lobed, distinct: nutlets 4, depressed.—About 20 species, S. Eu., W. Asia, and Russia.

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SOLENIDION (Greek, tube and thread, referring to the fact that the filaments are grown together, at their base, into a tube). Labiatae. Erect herbs allied to Coleus, probably similarly used: lvs. ovate, crenate, long-petioled: whorls of fls. laxly 6- to many-fl., arranged in long racemes or panicles: fls. small; calyx ovate-campanulate, upper tooth ovate with decurrent edges, lateral small, lower oblong, as long as the upper; corolla-tube exerted, slender, dilated and oblique at the throat, the limb 2-lobed, upper shorter, lower long, oblong, slightly concave; stamens 4, the filaments united at their base into a tube; disk glandular: nutlets ovoid, smooth.—Eight species, W. Trop. Afr.; one also occurs in Brazil.

Godefraye, N. E. Br. (Coleus Godefrayae, Godef.-Leb.). Herb, up to 2 ft. high, branches 4-angled: lvs. opposite, green, paler beneath, ¾-1¼ in. long, very wide-ovate or deltoid-ovate, base truncate or cuneate-truncate, slightly crenulate: racemes terminal, spike-like; fls. blue; calyx subequally 2-lobed; corolla, basal portion of tube, abruptly upcurved, upper portion abruptly deflexed, flattened-dilated, upper lip very short, crenately 4-toothed, lower lip compressed sideways. Trop. Afr. B.M. 8511. F. Tracy Hubbard.

SOLIDAGO (according to Gray, from solidus and ago, to make solid or draw together, in allusion to reputed vulnerary properties”). Compositae. Goldenrod. Perennial herbs very useful for borders and for colonizing, but little known in the trade.

Erect, of various habit, with simple alternate lvs. and many small yellow (rarely white) heads in spikes, thyrses, compound panicles, or racemes; heads oblong or narrow-campanulate, with small mostly appressed scales, containing few florets, the disk-florets all perfect and the ray-florets in one series and pistillate: pappus of 1 or 2 rows of roughish capillary bristles.—The genus is characteristic of E. N. Amer., where about 60 species occur. There are several species on the Pacific coast, a few in Mex. and S. Amer., and 2 or 3
Amongst the glories of the American autumn are the asters and goldenrods. They complement each other. The asters run in cyanic colors, goldenrods in xanthic, —the blue and blush on the one hand and the yellow and golden on the other. Because the goldenrods are so common, they have not been appreciated for planting. They improve in the garden, however, the plants becoming larger and the bloom fuller and richer. Some of them become weedy if the soil is very rich. The solidagos are variable, even within the same species. Therefore it is well to mark fine individual clumps when in bloom, for removal in late autumn or early spring. The observation of a single season should result in a fine collection of individual plants. A very attractive grouping of asters and goldenrods can be made entirely of native species:

**SOLIDAGO**

### S. canadensis, Linn. WREATH GOLDENROD.

A smooth slender perennial, often glaucous, simple or sometimes branched: lvs. stalkless, acuminate, the base narrowed, sharply toothed, 2⅓–3½ in. long; fls. in axillary racemes or head-like clusters, yellow or sometimes whitish; involucral bracts obtuse. E. N. Amer. Aug.–Oct.—Useful as a partial shade plant or in the open border.

### S. nemoralis.

A. Heads in small axillary clusters, not usually in large terminal inf.

### S. rugosa.

A. Heads in a terminal inf., usually a panicle, which is composed of 1-sided branches or clusters (secund).

b. Foliage fragrant; lvs. pinnately veined.

c. Lower lvs. lanceolate, sharply serrate.

d. Heads in a terminal inf., usually a panicle, which is composed of 1-sided clusters of fls. (secund).

### S. Virgaurea, Linn. EUROPEAN GOLDENROD.

A rough simple-stemmed but stout perennial 1–3 ft. high: basal lvs. 4–7 in. long, 2–2½ in. wide, obtuse or acute; upper lvs. sessile or narrowed into margined petioles; fls. in a dense terminal, rather narrow and often interrupted thyrsus which is often 8–10 in. long: bracts of the involucre acute or acutish. E. N. Amer. Aug.–Oct.—One of the best garden plants of the group. A prostrate form is offered. S. virgaurea, Hupe., is a compact and dwarf form, 6 in. or less high, with larger heads. S. Virgaurea is represented in the U. S. by S. Cutleri, Fern. (S. Virgaurea var. alpina, Bigel.), in the highest alpine districts of N. New England and N. Y.; this American species appears not to be in the trade.

### S. virgaurea, Linn. WREATH GOLDENROD.

A smooth slender perennial, often glaucous, simple or sometimes branched: lvs. stalkless, acuminate, the base narrowed, sharply toothed, 2⅓–3½ in. long; fls. in axillary racemes or head-like clusters, yellow or sometimes whitish; involucral bracts obtuse. E. N. Amer. Aug.–Oct.—Useful as a partial shade plant or in the open border.

### S. virgaurea var. alpina, Bigel.

A. Heads in a terminal inf., usually a panicle, which is composed of 1-sided branches or clusters (secund).

b. Foliage fragrant; lvs. pinnately veined.

c. Lower lvs. lanceolate, sharply serrate.

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A. Heads in a terminal inf., usually a panicle, which is composed of 1-sided branches or clusters (secund).

b. Foliage fragrant; lvs. pinnately veined.

c. Lower lvs. lanceolate, sharply serrate.
**SOLIDAGO** (the Greek name). *Composita*. Mostly weedy plants, but some of the Canary Island species are good foliage subjects.

Annual or perennial, usually more or less succulent, sometimes frutescent, leafy-stemmed, mostly smooth and glaucous, summer-flowering: lvs. usually clasping entire, toothed or runcinate-lobed or even pinnatifid and laciniate, more or less prickly-margined: heads homogamous and ligulate, yellow-fld., with more or less imbricated involucral bracts, beaked or tumid at base, corymbose or paniculate: achenes ribbed or costate, not beaked, with fine white pappus. —Species 40 or more, in the Old World, some of them intro. in N. Amer. as weeds.

Certain bold foliage plants of this genus are more or less listed and mentioned abroad, the botanical identity of which is to be determined. *S. arborescens* laciniat us described as a "magnificent foliage plant with laciniated lvs." is probably a form of *S. pasquale*, which grows 3 ft. or so high, bearing glabrous pinnately parted lvs. with narrow entire or toothed lobes, native of Madeira. What is mentioned abroad and also in *S. Calii. as S. Jactauris, is probably S. compositus*. Wild, described as a beautiful foliage plant with long and broad crowded recurved oblong-lanceolate more or less pinnatifid lvs. (1 ft. or less long and 2-3 in. broad) and showy panicles of yellow flowers. *S. aureus*, in Canar. —is known as pastor’s lettuce (lachua de pastor), perhaps in allusion to availability of the foliage for salad. The lvs. of other species of *Sonicus* are said sometimes to be similarly used. The names *S. humifusa* and *S. laciniatus* sometimes appear in horticultural literature, representing ornamental plants 2-4 ft. high with divided lvs., the segments, very narrow; they are probably forms of *Canary or Madeira species*. L. H. B.

**SOLERILA** (adapted from a native name). *Syn., Cassebeira*. Herbs or small shrubs of various habits, with ornamental foliage, suitable for the greenhouse. Leaves similar or dimorphous, entire or serrulate, 3-5-nerved: lvs. in scorpionid racemes or spikes, frequently rose, rather large or some small; calyx glabrous or setose, tube turbinate, oblong or campanulate, 3-lobed, the lobes short; petals 3, ovate, obovate, or oblong; stamens 3 (rarely 6), the alternate ones smaller; ovary adherent or almost so to the tube of the calyx, 3-celled: caps. included in the turbinate, cylindrical, ribbed or 3-angled tube of the calyx, 3-valved.—About 75 species, India and the Malay Archipelago. This includes a number of dwarf tender foliage plants which must be grown in the greenhouse all the year round. The plants belong to the same cultural group with Bertolonia, Gravesia, and Monolena, and are distinguished by having their floral parts in 3s. The lvs. are usually rose-colored, glabrous, or less, and generally disposed in scorpionid racemes or spikes. The species described here are all caulescent plants with lvs. distinctly petioled, those of each pair being of equal size (except in *S. maculata*): lvs. 3-merous; stamens 3, long-acuminate.

It was long thought impossible to grow sonerila and its allies outside of a bell-jar or Wardian case. Gardeners now dispense with the “double glass” and...
grow these plants in tropical or even temperate greenhouses. For potting material they use a compost of fibrous peat and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaying. A temperature of not less than 75° suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70° to 80°. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use fine-screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time in early spring) they start into new growth again. These plants make choice decorative plants in pans or even in wire baskets and can be used for choice table or mantel decorations. (H. A. Siebrelcht.)

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Sonerila mar­

KEY TO THE SPECIES.

1. speciosa. Zender. This is practically the only species for its fls.: height 1 ft.; fls. opposite, cor­
date-ovate, green above, sometimes crimson beneath, mostly 7-9-nerved: fls. purple or rose, 4-14 in a cluster, 1 in. across. India. B.M. 4978 (as S. elegans); 5023. F.S. 29:2442.  
2. maculata. Roxtg. This differs from the other species by being described in having lvs. of unequal sizes. The larger one of each pair may be 3-5 m. long; the smaller a half or third as long: lvs. ovate or oblong, unequal at the base. mutuelv denticulate, 9-11-nerfed: lvs. violet.

India. R.H. 1865, p. 91, is too poor to determine.—Probably not in cult.

3. lêta, Stapf. Erect herb, 6 in. high: st. terete, glandular-puberulent: lvs. petioled, ovate or elliptic­

ovate, symmetrical or a little asymmetrical, not ciliate­
margined, the larger lvs. up to 4 x 2 in., green but white­
spotted above, purple and green-spotted beneath: cyme termini, contracted, 7-did; calyx oblong, spiri
drical, purple; petals oblong, subacuminate. China.—Closely related to S. maculata.  
4. picta, Korth. Erect or ascending, with scurfy or puberulous branches: lvs. short-petioled, broadly lance­
olate, wedge-shaped at the base, minutely serrate, 7-nerfed, lined with white along the primary nerves: fls. rosy. Sumatra.—S. picta of the trade is probably S. orientalis var. picta.  
5. orientalis, Lind. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1891, and remarkable for two novel features: some of the varieties have dark purple or brassy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. G.W. 6, p. 327. In I.H. 7:118 the lvs. are described as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire; color of fls. not recorded. Habitat not stated. The typical form is said to have bronzv lvs. with an amaranth reverse. Var. guttulata, Hort., has green lvs. peppered with small white dots and is pale green below. Var. punctata, Hort., is much like the preceding variety but has paler lvs. Var. picta, Hort., has purple lvs. of the type, with an irregular lanceolate strip of silvery gray down the middle. Var. Robert Saller, R.H. 20:61, has dark green lvs. peppered white and with a lanceolate figure of silver down the middle. Said to be a hybrid of vars. picta and punctata. It has the stripe of one and the dots of the other.

6. margaritacea, Lindl. This is the most important species. The name “margaritacea” means “pearly,” referring to the regular rows of pearly spots between the nerves and parallel with them, which are characteristic of the typical form. Lvs. ovate-lanceolate, acutely ser­rate, 7-9-nerved, glabrous, purplish brown, acute at the base: fls. rosy. B.M. 5104. F.S. 11:1126 (nerves too parallel). I.H. 2:40. G.W. 6, p. 326. H.F. 11: 4:72. Lowe 14.—Supposed to be native of Java. In Vol. II, edition 1, page 684, Gronowia guttata var. margaritacea is erroneously referred to Sonerila mar­
garitacea. It is readily told from Sonerila mar­
garitacea by its 5-nerved lvs. and floral parts in 5’s.

7. Hendersonii, Hort. (S. margaritacea var. Henderson­
sonii, Hort.). This is referred to Cogniaux to S. margaritacea, of which it is perhaps merely a horticultural variety. For trade purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotched foliage. It differs from the type in having a broader leaf, with a shorter acumen and rounded base, and especially in being covered with irregular blotches, which, however, do not cross the nerves. F.S. 1875: 159. I.H. 23:230. G.W. 2, p. 265. G.Z. 19:161.—The blotches are all about the same size. S. Mamei, Lind., has more regular and roundish blotches, which are nearer white and on a darker ground, the under side netted with rosy purple. I.H. 23:254.

8. argentea, Hort. (S. Hendersonii var. argentea, Fourmir). For horticultural purposes this may be treated as a distinct species, characterized by its silvery foliage, resembling that of certain begonias, with no dark green except on the nerves. This is the parent of most of the forms that have a silvery cast of foliage, just as S. Hendersonii is responsible for the irregular blotches. G.W. 6, p. 325.
A very handsome hybrid between the orientalis and margaritae groups is called Mme. Paul du Toit. It has the serrate leaf and some of the silveriness of S. argentea, with the minute points of the S. orientalis group. It is much like Robert Sallier, but the central coloring is bronze as well as silver and more broken up by the green.

S. matronalis and S. picta of the trade are not accounted for botanically.

Wilhelm Miller.

F. Tracy Hubbard.

SOPHORA (Sophora, Arabian name of a tree with pea-shaped flowers). Including Styphnolobium and Edvardia. Leguminosae. Ornamental woody or rarely herbaceous plants grown chiefly for their attractive flowers and handsome foliage.

Deciduous or evergreen useful ornamental plants: Ivs. alternate, odd-pinnate with opposite usually small entire Ivs.: fls. pea-like, in racemes or terminal leafy panicles; calyx with 5 short teeth; standard orbicular or broadly obovate; stamens 10, free or connate only at the base; pod stalked, almost terete or 4-winged, rarely compressed, few- to many-seeded, moniliform, inedible or tardily dehiscent.

About 25 species in the temperate and subtropical regions of both hemispheres. The fls. and frs. of S. japonica yield a yellow dye, S. tomentosa has medicinal properties, and the seeds of S. secundiflora contain sophorine, a poisonous alkaloid.

S. tetraptera is a valuable timber tree in its native country.

The sophoras are handsome trees, rarely shrubs or herbs with graceful foliage, evergreen in some species, and with papilionaceous whitish, violet or pink, or yellow flowers in terminal panicles or in racemes, followed by long and narrow moniliform pods. Sophora japonica and the shrubby S. vicifolia are hardy as far north as Massachusetts, while S. affinis is less hardy. The evergreen species are tender and can be grown only in the southern states and California; they are usually showy in spring when they are in bloom; in England they are often planted against a wall, where they can be easily protected against light frost. S. japonica is especially valuable for its late-appearing flowers, which are white and disposed in simple panicles; the foliage is dark green and graceful and the tree is conspicuous in winter on account of its dark green branches. It is sometimes planted as a street tree, as it stands heat and drought well. The sophoras thrive best in well-drained sandy loam but grow fairly well in rather dry soil. Propagation is by seeds and the varieties by grafting on the typical form; some species are also increased by greenwood cuttings and by layers.

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A. Fis. white, violet, or pink.

B. Ivs. 3½ in. long, or less; spineless shrub.

1. vicifolia, Hance (S. Davidi, Komarov, S. Mohlerothümü var. Davidi, Franck.). Fig. 3642. Spineless shrub, to 6 ft., with slender spreading pubescent branches; Ivs. 1-1½ in. long, short-petioled; fls. 11-15, sessile, elliptic, obtuse, and mucronulate, pubescent beneath, ¾-1½ in. long; fls. bluish violet or nearly white, about ¾ in. long, in short, 6-12-fld. racemes terminal on short branches; calyx shortly 5-toothed, violet; petals of nearly equal length; standard spatulate-obovate, reflexed; pod about 2 in. long, slender, long-beaked, glabrous. June. July. Cent. and W. China. B.M. 7883. A.F. 29: 155. G.C. III. 36: 3. Gn. 87; 78, p. 469. G.W. 16: 3. G.W. 11, p. 139. —Graceful shrub; has proved quite hardy at the Arnold Arboretum.

bb. Ivs. larger: unarmed trees.

c. Fls. in large terminal panicles.

2. japonica, Linn. (Styphnolobium japonicum, Schott). JAPAN PAGODA TREE. Figs. 3643, 3644. Tree, attaining 60 ft., with spreading branches, forming a dense round head: Ivs. 7-9 in. long; fls. 7-17, distinctly stalked, ovate to ovate-lanceolate, acute, rounded at base, dark green and glossy above, more or less pubescent, 1-2 in. long; fls. yellowish white, ¾ in. long, in loose panicles 15 in. long; pod distinctly stalked glabrous, terete, 2-3 in. long, ¾ in. broad. July—Sept. China; cult. in Japan. Gn. 24, pp. 210, 211, 214; 29, p. 222-27, p. 43. G.M. 58: 665. Gn. 6, p. 247. M.D.G. 1898: 12. F.E. 12: 1174. G.W. 8, p. 615; 12, p. 200; 13, p. 243. Var. pendula, Loud. Figs. 3645, 3646. With long and slender pendulous branches. R.H. 1876: 194; 195 (adapted in Figs. 3645, 3646). Gn. 9, pp. 600, 601; 24, pp. 202, 203, 211; 28, p. 27. M.D.G. 1898: 182. G. 6: 257. Gn. 9. p. 2: 106. G.C. III. 38: 479. F.E. 14: 1430, pl. 43. Var. columnaris, Schwerin. Of narrow pyramidal habit. Var. violacea, Carr. (S. violacea, Dipp., not Thwaites). Ivs. 15-17, sparsely pubescent above, densely so beneath, acute; fls. with pinkish lilac wings and keel, standard white.—The plants cult. as S. tomentosa, S. sinensis, and S. Korolkowii also belong to this species. The first, which is not to be confused with S. tomentosa, Linn. (see supp. list), has 15-19, smaller and broader, elliptic Ivs. densely pubescent beneath, less so above; the second has pale pink fls. and 11-17
ovate or obovate-oblong: fls. soft-pubescent beneath; the third has larger lanceolate fls. broadly cuneate at the base and slightly pubescent beneath. There is also a form with variegated lvs.

cc. Fls. in racemes.

d. Foliage deciduous; racemes axillary.

3. aflatris, Torr. & Gray. Small round-headed tree, with slender branches, to 20 ft.: lfts. 13-19, elliptic, obtusish or emarginate, broadly cuneate at the base, glabrous or with scattered hairs below, conspicuously veined, 1-1 1/2 in. long; fls. 1/2 in. long, white tinged with rose, with the lvs. in axillary nodding racemes 2-3 in. long: pod terete, moniliform, more or less pubescent, 1/2-3 in. long, black. Spring. Ark., Texas. S.S. 3:122.

4. secundiflora, Lag. Small tree, 35 ft.: Ifts. 7-9, elliptic or obovate-oblong to oblong, rounded or emarginate at the apex, cuneate at the base, silky-pubescent while young, dark yellowish green above, 1-2 1/2 in. long; fls. violet-blue, the standard marked on the midrib, 1/2-In. long: fls. about 1 1/2 in. long; standard about as long as wings. B.M. 1442; 3793. G. 34:503, 505. Gn. 24, p. 211. Gn. 12:87 also seems to belong here.

5. tetraepetala, Ait. (Edwardsia tetrapetala, Poir.). Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches: lfts. very numerous, almost sessile, elliptic or obovate-oblong to oblong, rounded or emarginate, broadly cuneate at the base, silvery-pubescent while young, dark yellowish green above, 1-2 in. long; fls. 1/2-1 in. long, in 6-12-seeded W. ASIa to Himalayas. Half-hardy.-S. grandiflora x S. microphylla, Cattleya. Orchidaceae. A name to designate the hybrids between the genera Sophronitis, Cattleya, and Lelia.

6. macrocarpa, Smith (Edwardsia chilensis, Miers.). Shrub or small tree, with the young branchlets densely tomentose: lfts. in 10-20 pairs, elliptic or obovate, obtuse, silky-pubescent beneath, 3-4 in. long: fls. 1/4-1 in. long, in short racemes; pod terete, not winged, 1-4-seeded. Chile. L.B.C. 12:1125. B.R. 2798.


ALFRED REEDER.

SOPHROCATTLEYA (compounded from Sophronitis and Cattleya). Orchidaceae. A name to designate the hybrids between the genera Sophronitis, Cattleya, and Lelia.

SOPHROCATTLEYA

S. Nigida—S. grandiflora × C. columnata.—
S. Szaka—S. grandiflora × C. Trianae.—S. schoenbrunn
nänse—S. cernua × C. Bowringiana.—S. Thuuela—S.
grandiflora × C. Mendelii. J.H. III. 88:206.—S.
verwienen—S. grandiflora × C. amethystoglossa. G.M.
49:547.—S. Willeleayan—S. grandiflora × C.
labiata. G.M. 57:207.—S. westfieldeæ—Sc. eximia
× C. labiata. GEORGE V. NASH.

—S. Mæriæiana—following.—S. Mæriæittæ—L. flavæ
× S. grandiflora. G.C. III. 27:36.—S. Òpætæ—L.
pumila × S. grandiflora. —S. Ornithæææ—L. Diana × S.
grandiflora. GEORGE V. NASH.

SOPHRONITIS (Greek, modest). Orchideæae. Dwarf
epiphytic orchids, cultivated on account of their neat
habit and brilliantly colored flowers.

Pseudobulbs small, with 1 or rarely 2 small flat lvs.;
fls. from the top of the pseudobulbs, brightly colored;
sepals and petals nearly equal, spreading; labellum with
a broad middle lobe and small erect side lobes, the base
leading into a cavity in the wall of the ovary; column
short, the stigmatic surface covering 2 wing-like pro
jections at its summit; pollinia 8.—About 6 species,
closely related to Leilia. Cattleya, and the like; Brazil.

These plants, and also Sophrocattleyas and sophro
kilies, thrive in the temperature of the cattleya house.
In growing season, give a moderate supply of water and
plenty of fresh air. Rest them at a temperature of 55°,
and water scantily. Give a moderate supply of water and
plenty of drainage, and a thin layer of tepid sawdust
should be spread on top of the pot and finished with a
covering of Sphagnum. (Wm. Mathews.)

grandiflora, Lindl. (S. acuinea, Rechb. f.)
Pseudobulbs clustered: lvs. about 2 in. long,
inclive: fls. solitary, on short peduncles, 17-24
in. across, brilliant scarlet, often with a shade
of orange, with an orange lip; sepals and petals ovate;


S. grandiflora (S. grandiflora, Lindl.).—L. grandiflora.

S. grandiflora (S. grandiflora, Lindl.).—L. grandiflora.

S. Syn. Basliama. Rosálæae. Ornamental woody plants chiefly grown for their large panicles of white flowers and the handsome
pinnate foliage.

Pseudowurfs: lvs. alternate, odd-pinnate, with
serrate lfts., stipulate: fls. in terminal panicles; sepals
and petals 5; stamine 20-50: carpels 5, opposite to
the calyx-lobes, partly connate, dehiscent at the
ventral suture, with several seeds.—Eight species in B.

Asia. Formerly usually united with Spiræa but easily
distinguished by the stipulate, pinnate lvs. and the 5
carpels being opposite to the sepals.

Stamine are very handsome upright shrubs with
rather large, bright green pinnate leaves and small white
flowers in large and showy panicles appearing in sum
mer and followed by small capsular fruits; the panicles,
however, after the flowers have faded and dried up,
become rather unsightly and should be removed. S.
sorbi folia is hardly North and S. stelliptæa, and S.
Sorbaria—S. arborea have proved hardy at least as far north
as Massachusetts, while S. Açchiæomii is somewhat
more tender and S. Lindleyana still more so. They are well
adapted for borders of shrubberies and woods or for
planting on banks of brooks or rivers, but should not
be brought together with slow-growing and delicate
shrubs, as they spread in suitable soil rather rapidly by
means of suckers and are likely to overcrowd other
plants. The handsome bright green foliage appears
very early in spring. They are all much alike in habit,
but flower at different times from June to September,
beginning with S. sorbi folia, followed in order by S.
stelliptæa, S. assur gæns, S. arborea, and S. Açchiiæomii which usually
continues flowering until September.

On the whole they are much more hardy than the
S. arborea, a shrub, to S ft., with upright or
ascending sts.: lvs. 11-19, oblong-lanceolate, long-acuminate,
stellate-pubescent beneath when young or glabrous, 3-4 in.
long: panicles 6-12 in. long, puberulous; stamens longer than

S. assurgæns, Rehd. Shrub, to S ft., with upright or
ascending sts.: lvs. 11-19, oblong-lanceolate, long-acuminate,
stellate-pubescent beneath when young or glabrous, 3-4 in.
long: panicles 6-12 in. long, puberulous; stamens longer than

S. stelliptæa, Schneid. (S. sorbifolia var. stelliptæa, Maxim.)—L. stelliptæa, Schneid. (S. sorbifolia var. stelliptæa, Maxim.)—Shrub, to 5 ft.: branchlets pubescent: lfts.
11-19, oblong-lanceolate to lanceolate, long-acuminate,
stellate-pubescent beneath, 2-3½ in. long: infl. puberulous,
6-8 in. long; calyx pubescent: carpels and frs.
561. cc. Stamine about 20: lfts. with 20 or more pairs of veins.

S. sorbi folia, A. Braun (Spiræa sorbi folia, Linn.)—L. sorbi folia, A. Braun (Spiræa sorbi folia, Linn.)—Fig. 3647. Up
right shrub, 3-5 ft. high, much branched: lfts.
_doubly and sharply serrate, 3/4 in. or more wide.

S. Lindleyana.—S. Lindleyana. Wall. Basliama Lindleyana, Kunz.)—Fig. 3647. Up
right shrub, 3-5 ft. high, much branched: lfts.
doubly and sharply serrate, 3/4 in. or more wide.

S. Lindleyana.—S. Lindleyana. Wall. Basliama Lindleyana, Kunz.)—Fig. 3647. Up


AA. Lfs. simply or indistinctly doubly serrate, ½ in. or less wide.


ALFRED RINDER.

SORBUS (ancient Latin name of S. domestica). Including Aria, Córnum, Micromése, and Tomninária. Rosáceae. Ornamental woody plants grown for their handsome foliage, attractive white flowers and ornamental usually red fruit.

Deciduous trees or shrubs: lvs. alternate, stipulate, simple and serrate or odd-pinnate, folded or rarely convolute in the bud; fls. in compound corymbs; sepals 3-5; stamens 15-20, with red or yellow anthers; petals or shorter. July, Aug. Himalayas and New Mex., in Asia south to the Himalayas. The close-grained wood of S. domestica is used for handles of tools and for similar small articles.

The sorbus are handsome trees or shrubs with graceful pinnate or with simple foliage sometimes silvery white beneath, and with showy clusters of small white raceme pumkin flowers in spring, followed by red or rarely whitish or brown fruits usually berry-like, rarely larger and apple- or pear-shaped. Most of the pinnate-leaved kinds are hardy North except some Asiatic species and S. domestica, which seem tender north of Massachusetts; many of the others are chiefly inhabitants of mountainous regions, and the northern species, as S. americana and S. decora, do not thrive well in warmer and drier climates, while the simple-leaved species, as S. alnifo­lia, S. intermedia, S. Aria, and S. terminalis, endure drought and heat and are hardy at least as far north as Massachusetts. The trees are often attacked by borers. Propagation is by seeds sown in fall or stratified, also by layers. Varieties and rarer kinds are usually budded or grafted on allied species, but most kinds will grow on S. Aucuparia or S. americana and on hawthorn. They all have handsome foliage, which usually turns orange-red in fall; their fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillsides.

Those of the Aucuparia group are more adapted for cool and moist mountain regions; those of the Aria and Tomninária group, which grow especially well on lime­stone soil, are suited to warmer and drier climates.

S. hybrids is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit.

INDEX.

A. Foliage pinnate.

b. Lvs. regularly pinnate, with the lfts. of almost equal size.

c. Frs. small, ¼-½ in. across, or slightly larger or broader.

D. Lfts. 9-17, ¼-½ in. long.

e. Winter buds plump, glabrous or sparingly ap­pressed, rusty-pubescent.

f. Frs. ¼-½ in. in.:

FF. Frs. ¼-½ in. across: lfts. acute or obtuse: fr. about ½ in. across:

BB. Winter buds covered with white villousomentum.

f. Young branchlets and lfts. pubescent.

g. Var. decora, Focke.

h. Young branchlets and lfts. glabrous.

d. Lfts. 10-20, ½-3 in. long.

cc. Frs. ½ in. or more across, apple- or pear-shaped, with grit-cells: style 5.

BB. Little, only pinnate toward the base, lobed or only serrate on the upper part, bearing much thorn on the same plant and occasionally only lobed.

Hybrids.
c. Habit tree-like .................................. 7. hybrida
cc. Habit shrub-like ................................ 8. spuria

AA. Foliation simple.
B. Fr. with persistent calyx.
C. Under side of leaf glabrous at length, green; leaf lobed; ovary inferior: fr. brown, with fr. cells .................. 9. terminalis
CC. Under side of leaf grayish or whitish tomentose; ovary half-superior.
D. Leaf lobed or sharply serrate.
E. Shape of leaf ovate to oblong, usually acute.
F. Margin of leaf lobed.
  G. Base of the leaf broadly ovate, leaf mostly rounded .................. 10. latifolia
GG. Base of the leaf obovate-ovate, broadly cuneate ............ 11. intermedia
FF. Margin of leaf sharply and doubly serrate ............ 12. Aria
EE. Shape of leaf suborbicular to broadly oblong ............ 13. umbellata
DD. Leaves serrulate, grayish-tomentose or sometimes glabrescent beneath ............ 14. alpina
BB. Fr. with deciduous calyx bearing a circular scar; leaf quite acute.
c. Under side of leaf glabrous or slightly pubescent.
D. Styles usually 5: leaf ovate to elliptic-ovate ............ 15. alnifolia
DD. Styles usually 5: leaf elliptic-ovate to obovate-ovate ......... 16. caloneura
CC. Under side of leaf white-tomentose. 17. Popoli

Group 1. Aucuparia.

2. A. decora, Schneid. (S. americana var. decora, Sarg. Pyrus sambucifolia, Gray, not Cham. & Schlecht. Pyrus sitchensis, Rob. & Fern., not Piper S. scopulina, Brit., not Greene). Small tree or shrub, closely allied to the preceding; leaf 7-15, oval to ovate-lanceolate, or oblong, obtuse to short-acuminate, serrate, glabrous and dark green above, rather pale and usually pubescent beneath when young, or glabrous, 1½-3 in. long; fr. ½-1½ in. across, in 2-4-in.-broad and rather loose corymbs, sometimes few-fl.: fr. globose, aroid when young, about ½ in. across, with more or less upright calyx-lobes. May. Labrador to Minn., south to N. Y. and Va. S.S. 4: 173, 174.—Often confused with the preceding species; intermediate forms are not uncommon in regions where the two meet. Both are very handsome in autumn with their large clusters of bright red fr. and particularly S. decora is often planted for its showy fr.

3. A. Aucuparia, Linn. (Pyrus Aucuparia, Gaertn.). European Mountain-ash. Rowan Tree. Fig. 3649. Round-headed tree, 20-40, occasionally 60 ft. high: young branchlets pubescent, grayish brown when older: petioles more or less tomentose; leaf 9-15, oblong to oblong-lanceolate, serrate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, ½-2 in. long: fr. white, ½ in. across, in flat, 4-6-in.-broad, tomentose or sometimes almost glabrous corymbs; stamens about as long as petals: fr. globose, about ½ in. across, bright red. May, June. Eu. to W. Asia and Siberia. F.E. 3: 1-44, pp. 78, 79. Var. dulcis, Kästel (var. moravica, Zengerling). Almost glabrous: petioles purplish: leaf oblong-lanceolate, 2-3 in. long, glabrescent beneath, usually serrate only above the middle. The frs. are of an agreeable acid flavor and recommended for preserves. The tree thrives well in cold northern climates where hardly any other fr-tree will grow. G.F. 152: 887. Var. róssica, Spaeth, is similar and also bears edible fr., but the frs. are larger and broader and more serrate. Var. Beissneri, Rehd. (var. dulcis lactiflora, Beiss., not var. lactiflora, Hert.), is a handsome and graceful form of var. dulcis with the frs. pinately lobed and the fr-stalks and young branchlets bright red. G.W. 3: 267. Var. fastigiata, Loud., forms a narrow pyramidal tree, with upright branches. Var. péndula, Hort., has long and slender pendulous branches. M.D. 1911, p. 246. Var. integerrima, Lange. Frs. entire or nearly so. Var. Fífeána, Dipp. (var. fructí-biteo, Hort.). Fr. yellow. There are also varieties with
variegated foliage.—This species is often planted as a street tree in mountain regions of Eu.

4. tianschanica, Rupr. (Pyrus tianschanica, Regel.) Small tree or shrub, similar to the preceding: young branches glabrous, red-brown and glossy when older; petals and lvs. glabrous; lfts. 11-15, lanceolate, acuminate, serrate, entire toward the base, dark green and glossy above, light green beneath, about 2 in. long; corymbs glabrous; stamens half as long as petals; styles 2-5: fr. globose, bright red. May, June. Cent. Asia. Gl. 40, p. 5. B. M. 7755.—Very handsome on account of the contrast of its dark green foliage and red-brown branches.

5. villosa, Schneid. (Cerasus foetida, French.) Shrub or small tree, to 20 ft.; lvs. slender; rachis slightly winged; lfts. 11-19, opposite or nearly so, oblong-elliptic, serrate above the middle, glabrous, 3/4-3 in. long; mid. loose, 1-3 in. wide, rusty-pubescent; fls. 3-5 in. across; stamens about 20; styles 5, nearly glabrous; fr. globose, red, ½ in. across. June; fr. in Sept. W. China. B.M. 5241.—A very graceful shrub.

Group 2. CORMUS.

6. domestica, Linn. (Pyrus Sorbus, Gaertn. P. doméstica, Smith. Cerasus domesticus, Spach.) Sauraves Trew. Fig. 3650. Round-headed tree, 30-60 ft. high; winter buds glutinous; petioles tomentose; lfts. 11-17, obovate-oblong to oblong, sharply and rather coarsely serrate, with acuminate teeth, usually entire near the base, green and glabrous above, floccose-tomentose beneath, at least when young, 1-2½ in. long; fls. white, ½ in. across, in broadly pyramidal rather loose, tomentose corymbs: fr. ½-1½ in. across, usually yellowish, with red or orange cheek, apple-shaped in var. malifera, Smith. Service Arb. 1:283; 6:649. M.D. 1897:376—S. H.W. 3, p. 86. S.L.F. 3:485.—A handsome in gardens as S. quercifolia hiberna nana. Var. decurrens, Koehne (S. decurrens, Hedd. S. lanuginosa, Hort., not Kit.), is a transition to S. aucuparia; only the 3 or 5 upper lfts. are connate into a terminal ft., which, like the upper separate lfts., is deciduous at the base, under side less densely tomentose. In some nurseries under the name of S. sambucifolia.

8. spuria, Pers. (Pyrus heterophylla, Dur. S. aucuparia × A. arbutifolia.) Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches; lvs. ovate to oblong-ovate, obtuse, with 2-6 lobes or lfts. near the base, simply crenate-serrate toward the apex, 1½-3½ in. long, pubescent beneath: fls. white or pinkish white, in pubescent or glabrous corymbs 1-1½ in. broad: fr. subglobose or pear-shaped, dark purple. May, June. Of garden origin. B.R. 119.—Sometimes cult. under the name S. quercifolia floribunda nana. Hybrids of different origin are usually united under S. spuria; the more pubescent forms with dark purple fr. are probably the offspring of S. aucuparia and A. arbutifolia and represent typical S. spuria, while the more glabrous forms with usually blackish fr. have S. aucuparia and A. melanocarpa as their parents and may be called S. falkiae, Schneid. (S. heterophylla, Dipp.). A similar form with quite glabrous and more pointed lvs., is probably a hybrid of S. americana and A. melanocarpa, and is named S. sibirsifolia, Hedd. (S. Sargentii, Dipp.).

Group 3. TORMINARIA.

9. torrinensis, Crantz (Pyrus torrinensis, Ehrh. Torminaria torrinensis, Dipp. T. Clusi, Roem.) Wild Service Tree. Round-headed tree, with spreading branches, 40-60 ft. high: lvs. broadly ovate, slightly cordate to broadly cuneate at the base, with several triangular-ovate, serrate lobes on each side, the lower sinuses reaching about half-way to the middle, floccose-tomentose when young, finally glabrous, rarely with persistent tomentum, 2-4 in. long; petals 1½-3½ in. long: fls. white, ½ in. across, in broad, rather loose tomentose corymbs: fr. oval, ½-3½ in. high, brown, dotted. May, June. S. and Cent. Eu. H.W. 3:53, pp. 82-83.—The foliage turns bright red in autumn.

Group 4. ARIA.

10. latifolia, Pers. (Pyrus rostrijolia, Bechst. P. intermedia var. latifolia, Ser. P. Aria var. latifolia, Hort. Torminaria latifolia, Dipp. S. Aria × S. torrinensis.) Tree, attaining 30 ft., similar to the preceding: lvs. broadly ovate to ovate, usu-
11. intermedia, Pers. (Pyrus intermedia, Ehrh. Sorbus odoratissima, Fries. Aria suetica, Koch. Hahnia suetica, Dipp.). Tree, 20-40 ft. high, with oval head: lvs. oval to oblong-ovate, broadly cuneate at the base, pinnae lobed with broad and short, irregularly serrate lobes, and 3-5 pairs of veins, white-tomentose beneath, 2-3 in. long; petioles ½-¾ in. long; fls. about ½ in. across, in broad, tomentose corymbs: fr. globose or subglobose, about 1 in. high. May. Cent. Eu. to Himalayas and Sibera. G.M.44:291. Wenzig. H.W. 3: 52.-Desirable tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and under sides of the lvs. Var. decaisneana, Rehd. (Aria decaisneana, Lav. Pyrus decaisnei, Nichols. Pyrus Aria var. majestica, Prain. S. Aria var. majestica, Zabel). Lvs. elliptic or ovate, irregularly doubly serrate, 3-7 in. long; inf. 3-4 in. across; fls. ½-¾ in. across; stamens longer than styles; fr. oval, ½ in. across; B.M. 8184. Origin unknown, probably from the Himalayas. Var. edulis, Wenzig (Pyrus edulis, Willd. S. longifolia, Heil). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2-5 in. long; fr. oval, ⅔-¾ in. high. There are some garden forms, as var. aurea, chrysophylla, and var. pendula, Rehd., with more or less yellow foliage. Aria. 13. umbellata, Fritsch (S. meridionalis, Guss. S. stellabilis, Schau. S. Aria var. stellabilis, Wenzig. S. glabella, Hort.). Small tree, attaining 20 ft.; lvs. orbicular to broadly oval, obtuse, usually broadly cuneate at the base, incised lobes above the middle, with the short lobes truncate or rounded and coarsely toothed, with 5-7 pairs of veins, white or yellow beneath, 1½-2½ in. long; fls. scarcely ½ in. across, in dense, white-tomentose corymbs: fr. depressed-globose, orange-red. S. E. Eu., W. Asia.—Cult. in some nurseries as Pyrus aures strigula. Var. crista, Schneid. (S. Aria var. crista, Rehd. Aria græca, Roem. S. Aria var. graeca, Koch.). Lvs. orbicular-ovate, doubly serrate, scarcely lobed, with 6-11 pairs of veins, 1½-3 in. long. S. E. Eu., W. Asia. 14. alpina, Eeyhn. (Aronia densiflora, Spach. A. Wildenowii, Zabel. S. Aria x Aronia arbutiformis). Shrub, similar to S. Aria, but lvs. smaller, densely serrulate, with fewer and less straight veins: infl. and fls. smaller; styles 3-4: fr. red or brownish red, ½ in. across. Of garden origin.—From Aronia arbutiformis it may be distinguished by usually larger lvs. with more numerous veins and with a less close and less glandular serration and by larger fls. with only 3-4 styles. A hybrid of similar origin, but it is certainly a good species. Var. pendula, Rehd. (Pyrus folgeri var. pendula, Veitch). Branches pendulous. —This is a very handsome and graceful species.
SORBUS


SOUTHERNWOOD (Artemisia Abrotanum, which see for botanical account) is a European herb, aromatic, much branched, woody-stemmed, rather tender, perennial, 3 to 5 feet tall, with pale green or grayish often-variegated leaves, small yellowish flowers and minute seeds. (Fig. 3653.) It is occasionally found in family gardens from seed, or more often, from its easily rooted cuttings, which are most readily obtained in early summer for its pleasant taste and tonic properties, which resemble those of wormwood. It is seldom offered by seedsmen in this country because of its slight importance.

M. G. Kains.

SOWBUGS. There are two common species, Armadillidium vulgare and Porcellio levus, known respectively as the greenhouse pillbug and the dooryard sowbug. These are small oval grayish terrestrial crustaceans (not insects) that live in damp situations. They feed, mostly at night, on decaying vegetable matter and sometimes attack germinating seeds and the roots, crown, and occasionally the leaves and blossoms of greenhouse plants, such as primulas, petunias, saxifrages, violets, geraniums, roses, and wisteria. Orchids, especially cattleyas, are liable to injury. Head lettuce is often infested, and sowbugs sometimes become a veritable pest in mushroom cellars. Sowbugs reproduce by means of eggs which are carried by the female in a pouch on the under side of the body. The young are similar in form to the adults and are carried by the female until they attain a considerable size. There is probably but one brood annually.

Sowbugs are destroyed in greenhouses and similar situations by the use of freshly sliced potatoes or beets dusted lightly with paris green or some other arsenical. There baits should be placed on the soil near the plants to be protected in the evening, since sowbugs are nocturnal in their habits. Another excellent bait is made as follows: To a quart of cornmeal add enough brown sugar to sweeten it, then add two tablespoonfuls of black pepper, and stir until it thoroughly mixed. Moisten the mixture with just enough water so that it will hold together. This bait is to be distributed around the plants as recommended above.

Water-cress sowbugs (Manacaulus brachyurus).—In the eastern United States water-cress is often seriously injured by an aquatic species of sowbug that attacks the submerged portions of the plant, cuts off the roots and stems, and causes large masses of the cress to float on top of the water. This form differs from the species found in greenhouses by having longer legs and antennae and being shrimp-like in form when viewed from the side. It is about ½ inch in length and gray in color. It often occurs in immense numbers so as practically to destroy the whole crop. Where cress is grown in natural streams or ponds no practical method of controlling the sowbugs has been devised. Some growers, however, have been able to overcome the difficulty by growing the plants in broad shallow beds sloping toward the center, where a trough 10 inches square, lined with boards, extends the whole length of the bed. When the sowbugs become abundant, the water is shut off for twelve to twenty-four hours, allowing the beds to drain. Water is retained in the trough in which the sowbugs become crowded. They may be destroyed by the addition of a liberal quantity of copper sulfate solution. Loss injury will result to the plants if the water is drained off soon after the cress has been gathered.

C. R. Crosby.


SOW THISTLE: A name for the prickly weedy species of Sonchus.

SOYBEAN (Glycine Soja, formerly called G. hispida) is a legume, long a staple crop in Japan, but somewhat recently cultivated more or less extensively in the United States. (Figs. 479, 483.) In its native country, Japan, the seed is an important human food product, but in the United States its principal use at present is as a forage plant for farm livestock and as a soil-renovator. It is an upright leafy branching plant, growing 3 to 4 feet high. Two distinct plants have been called soybean: the smaller one (Phaseolus aureus) is grown principally in southern Asia; the larger species, the true soybean, is Glycine Soja. This latter species has become popular in some sections of the United States because of its power of resisting drought and for the further reason that it may supply a large amount of forage rich in protein. In the northern states it is probable that the soybean will be acclimated and that it will serve as an adjunct to the maize crop as a food for stock, although it is coarse in leaf and stalk. It thrives best upon a warm well-drained loamy soil, and seed should not be planted until all danger from frost is over. The land should be prepared by plowing and harrowing in the early spring, and the harrow should be used two or three times before the seeds are planted. Best success is attained by planting in drills, rows to be from 2½ to 3 feet apart and the hills in the row 18 to 20 inches apart. During the early periods of growth, cultivation should be frequent, preferably with a fine-toothed implement. After the plants have grown so that the ground is well shaded, the tillage may be discontinued. It is doubtful whether the curing of the plants for hay will ever come into general practice, but the crop may be largely grown for green soil ing and for ensilage purposes. It may be cut into the silo with corn and serves to improve the quality of the food.

To the horticulturist the soybean is valuable chiefly as a soil-renovator. The soil of the orchard can be given clean culture during the early summer and the soybeans may be sown broadcast about July 1 and harrowed in. One bushel of seed to the acre will be required. One bushel of rye to the acre should be sown at the same time, for when the beans are killed down by the frost in the fall the rye will then serve as a cover-crop for the winter. When the soil is too hard and forbidding that clover will not thrive, the soybean may be made to serve as a nitrogen-gatherer. See Glycin.

L. A. CLINTON.
SPARAXIS

SPARAXIS (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Tritonia). *Iridaceae*. **Wand-flower.** Bulbs or corms with fibrous coating, the plants suitable for outdoor planting but grown mostly under glass.

Stems simple or slightly branched: lvs. few, flat, sword-like or broadly linear, erect or falcate; spathes spiny, often with bulbils in the axils: fis. solitary or few in a spike, yellow; perianth-tube Yzin. long. B:M.545 (as *Ixia grandiflora*; fis. rich purple, margined lighter); 779 (fis. primrose inside, furred purple outside).—The principal named forms are: Var. *atropurpurea*, Hort., dark purple; var. *anemoneflora*, Hort., pale yellow; var. *Lilägo*, Baker, white, flushed with claret-purple outside; and var. *stelläris*, Baker, dark purple, the segms. narrower than the type, obovate and acute rather than obtuse.

AA. *Throat of fl. bright yellow, often with a dark blotch on the lower part of each segm.*

tricolor, Ker. Fig. 3654. Differs from _S. grandiflora_ only in the color of the fis., which are very variable but always have a bright yellow throat and often a dark blotch at the base of each segm. B:M. 381 (as *Ixia tricolor*); 1482. F:S. 2:124. F. 1843:213 (as *S. picius*, *S. purpurea*, *S. pulchella*).—According to Baker, this is the favorite species among cultivators. It certainly has the greatest variety of colors and markings. In the works cited the floral segms. range from nearly white through rose, brick-red, carmine, crimson, and light purple to dark purple, red, or yellow, which latter color usually appears in the throat.

WILHELM MILLER.

SPARGANIUM (Greek, filled, referring to the ribbon-like leaves). *Sparganivæces*. **Bur-reed.** Marsh or aquatic herbs which may be used in the bog-garden or along the pond-edge. *Phanzenreich*, IV, S. 1900.

Leaves alternate, sessile, linear-longate, erect or floating, entire: fis. monocious, in globular, sessile, or pedunculate heads, the upper bearing 3-androus, naked fis. and minute scales, the lower consisting of numerous sessile or shortly pedicellate pistillate fis.; ovary 1-2-celled: fruit ovoid or spindle-shaped, 1-2-seeded.—About 15 species, temperate and subfrigid regions of the northern hemisphere and in Austral. Bur-reeds are marsh herbs closely allied to cat-tails but with fis. in globular heads instead of oblong spikes. A few hardy perennial kinds are advertised by collectors of native plants and one or two are procurable from specialists in aquatics. Bur-reeds are desirable only in bog-gardens or in wild-gardening operations. The beauty of these plants often lies in each species being massed alone, as well as in the mixing with other plants.

AA. *Infl. unbranched.*

*b. Infl. branched.*

*b. Height 3-8 ft.*

euryçærum, Engelm. Sts. stout, 3-8 ft. high, branching: fis. linear, flat, slightly keeled beneath: pistillate heads numerous, pistillate 2-4 on a st. or branch, 10-16 lines in diam.: fr. sessile, angeld, depressed at the sumit. May-Aug. N. Amer.

*b. Height 2-4 ft.*

rambsum, Huds. Lvs. 3-angled at the base, long and linear; heads 5-9, disposed in axillary and terminal, interrupted spikes, the lowest one larger and pistillate, the others wholly staminate; pistillate heads 8-10 lines in diam. July. Old World. WILHELM MILLER.

SPARMANNIA (named for Andreas Sparmann, 1747-1787). *Tilliaceæ*. Shrubs or trees, with soft stellate pubescence, grown in the greenhouse and also out-of-doors in the southern United States.

Leaves coriaceous, dentate or lobed: fis. white, in terminal, umbelliform little cymes; sepalis 4, petals 4, naked at the base; stamens numerous, free; ovary nearly 4-celled: caps. globose, spiny.—About 5 species, Afr.
SPAROMANIA

Sparmanlia africana is of easy treatment under glass in a moderate temperature with plenty of air and light. The plants are benefited by being plunged in the garden in the summer and syringed during dry weather. Plants should be potted early in spring. The tips of young shoots root readily with 60° of heat. A. Les. deeply 5-7 lobed.

	Palmata, E. Mey. A slender shrub much smaller in all its parts than S. africana: branches half-herbaceous: lvs. on long petioles, the lobes long-acuminate, incisely sinuate and unequally toothed, prominently 5-7-nerved below: fls. white or purplish, densely arranged on the subterminal peduncles: caps. 4-celled. S. Afr.—Sparingly cult. in S. Calif.; A. Les. not lobed.

SPARTINA (Greek, spartos, a cord, referring to the tough leaves). Grominea. Perennial marsh-plants of various parts of the world, most or all of which are found in the U.S.: culms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inward: spikelets 1-flowered, strongly flattened, sessile, closely imbricated in 2 rows on a narrow rachis: spikes 2 to several in a raceeme.—Species about 10, most of them found in saline marshes of the seas.

MICHANIIANA, Hitchc. (S. eugamodes, Amer. Auth., not Roth). Fresh-water Coro.-Grass. Fig. 3655. Culms 6-18 ft. in. blades narrow, 2-4 ft. tapering to a long slender point, flat but soon involute in drying, the margins searobus: spikes 5-20., scattered, spreading, 2-4 in. long.—In the West known as "slough-grass." A common coarse fresh-water marsh grass, occurring across the continent in the northern states. Recommended for cult. along the margins of ponds and artificial lakes. Procurable from collectors.

S. eugamodes, Roth (S. pellitica, Wild.), on the Atlantic and S. johnson, Trim., on the Pacific coast act as mud-binders and are important factors in the natural reclamation of salt-marshes. In England, S. ericta, Roth, and S. Terna, Roth, Groves, perform the same service. G. C. III. 43 33. S. alterniflorus, Lodd., is common to the British Isles and the St. Lawrence and New England coasts.—A yellow-marginated form (S. eugamodes var. aureo-marginata) is shown in G. 31, 171.

A. S. HITCHCOCK.

SPARTOCYTISUS FILIPES, Webb. : Cytisus filipes.

SPATHELIA (from the Greek for a staff). Richard. Odd evergreen trees without branches, grown in the warehouse and the American tropics. Trunk simple, the lvs. aggregated at its extremity, so the plant has the look of a tree-fern or palm: lvs. alternate, odd-pinnate; lfts. many-paired, alternate, linear-oblong or sickle-shaped, subentire or serrate, the margin glandular: fls. polygamous, rather large, short-pedellated, in large panicles, which are terminal, elongated and branched, the ultimate branches somewhat cymose; calyx 5-parted, the segments spreading, valvate or subvalvate; petals 5, imbricate; disk none; stamens 5, ovary 3-angled, 5-celled: drupe without juice, elliptical-oblong, 3-edged, 3-winged, the shell stony.—About 5 species, W. Indies.

Simples, Linn. St. slender, usually leaning, resembling a palm, 20-50 ft. high: the lvs. and panicles are frequently several feet long: lfts. 20-50 pairs, very variable, opposite or alternate, sessile or petiolulate, cordate or obliquely rounded at the base, oblong- or linear-lanceolate, crenate or entire: panicle powdery. Sometimes planted in the W. Indies. B. R. 679.

A. F. Tracy Hubbard.
SPATHIPHYLLUM [Greek word, referring to the leaf-like spathes]. Araceae. Stemless or short-stemmed herbs, used as warmhouse foliage plants.

Leaves large, oblong or lanceolate, acuminate or cuspidate, midrib strong: spathe if-like, membranaceous, oblong or lanceolate; spadix shorter than the spathe, sessile or stipitate, cylindrical, densely fidd.; fls. hermaphrodite, all fertile; perianth-segments 4, 6, or 8, connate or coherent in a truncate or lobed cup; stamens 4, 6, or 8; ovary oblong, 3-4-celled: berry globose or oblong-cylindrical, 3-celled, cells 1-2-seeded. About 27 species, mostly from Trop. Amer., one or two Malayans. Monographed by Engler and Krauss in Engler’s Pflanzenreich, Teil 57 (IV. 253B), 1908. Gardeners recommend as soil for their cult., a mixture of leaf-mold, peat, and fibrous loam, together with some sand and charcoal.

A. Petals free, 6-8, in 2 rows, sometimes stuck together, never connate; stamens 6-8, rarely 4 or 6; ovary 3-4-celled, oblong, style pyramidal, more or less exserted, corona.

Section EUSPATHIPHYLLUM.

B. Ovary-cells 6, 8, or 4-celled.

cochlearispitum, Engler (S. heliconisfolium, Schott). Caudex short, lvs. thin, membranaceous, broadly oblong, margin usually slightly undulate, base rotundate or subcordate, 20-30 x 8-10 in.: spathe oblong, 6-12 in. long, base more or less acute, apex gradually narrowed to a cusp, somewhat decurrent on the peduncle. Dutch Guiana.

A.A. Petals free; ovary shortly obovatepyramidal, hexagonal, top truncate, style not at all distinct.

Section AMOPHYLLUM.

B. Petaloid about equaling or slightly shorter than blade.

floribundum, N. E. Br. Lvs. oblong-elliptic or oblong-lanceolate, base obtuse finally abruptly contracted to a knee or acute, apex acute, about 6 x 3 in., upper surface rich green, lower paler, minutely pubescent, obtuse, 3 in. long, long-cuspidate; spadix yellow-green or whitish. Colombia. I.H. 21:189.

AA. Petals almost twice as long as blade.


B.B. Petaloid twice as long as blade.


A.AA. Petals connate in a 6-angled cup which is truncate or 6-lobeled; stamens 6; ovary abovoid or cordate and 3-celled, top rather flat; cells 2, 4, 6, or 8-ovuled.

Section Massowia.

cannasfolium, Schott; also spelled kannasfolium (Pódoa kannasfolia, Dry. S. cannasform, Poepp.). Lvs. membranaceous, ovate-oblong or elliptic-oblong, base rather gradually running down to a knee, apex short-acuminate, slightly unequally so, 12-32 x 4-6 in., upper surface dark green, shining, lower paler and dull: spathe stiffly membranaceous, outside green, inside white, lanceolate, or elliptic-oblong, 4 1/2-8 in. long, base suddenly narrowed, scarcely decurrent, apex short-cuspidate; spadix greenish or yellowish. W. Indies. Colombia. B.M. 603.

SPATHOGLOTTIS

Hybrid, unclassified.

hybridum, N. E. Br. A hybrid between S. cannasform and S. Pattnii. Petioles 6-8 in. long; if-blades broadly lanceolate to oblong-lanceolate, acuminate, 8-9 in. long: spathe white on both sides, lanceolate, acuminate, 4-5 in. long; spadix 2 in. long. I.H. 29:450. G.C. II. 19:500.

S. Ehlersiana, Hort., as offered in the trade, but is unknown botanically. — S. platicephala, pl. Lind. =Rhodesia platya.

F. THOMAS HUBBARD.

SPATHODEA (Greek, spatho-like, referring to the shape of the calyx). Bignoniaceae. Small to large evergreen trees native of Trop. Afr. with large odd-pinnate compound leaves or sometimes ternate lvs., the lfts. entire, and with large fis. in terminal panicles or racemes: calyx large, split on one side and recurved, exposing the corolla to the base; corolla large, broadly campanulate and ven­tricose; stamens 4, exserted but shorter than the corolla, with spreading and pendulous anther-cells; disk large, cup-shaped; ovary oblong, with the ovules in several rows: caps. oblong-lanceolate, acuminate at the ends, loculicidal with woody valves; seeds elliptic. In England: -The spathodeas are handsome evergreen trees with large pinnate foliage and large and very showy orange-red or scarlet fis. They can be grown only in sub-tropical or tropical countries and demand rich and well-drained soil with sufficient moisture during the growing period; they are rarely grown in greenhouses, as they need much space and do not bloom until they have attained a large size. Prop. is by seeds or by cuttings. See also Radermachera for cult.

campanulata, Beauv. Tree, to 70 ft., glassescent: lvs. 1-1 1/2 ft. long; lfts. 9-10, short-stalked, ovate-lanceolate, abruptly short-acuminate, entire at the base with 2 or 3 fleshy glands, glabrous or somewhat pubescent beneath while young; 2-4 in. long; fis. scarlet, in many-flowered racemes or panicles; calyx coriaceous, broadly ovate-oblong, recurved, 2 1/2 in. long; corolla about 4 in. long, with ovate, plicate, and somewhat undulate lobes; ovary papilllose: caps. 8 in. long, glabrous. Trop. Afr. B.M. 5901. F.S. 8:380. J.F. 4:388. G.C. III. 50:458.

niitica, Seem. Shrubby tree, to 20 ft.; branchlets pubescent: lvs. 1/4-1 1/2 ft. long; rachis pubescent; lfts. 9-15, oblong-oblong, short-acuminate, entire, glabrous above, densely pubescent or tomentose beneath, 1 1/4-1 1/2 in. long; fis. almost like those of the preceding species, in short dense racemes; calyx densely tomentose, 1 1/2-2 in. long. Cont. Trop. Afr. H. Johnst. (Nothobractea annua). — S. speciosa, H. Johnst., pro­tectorate, 1:68. — In its smaller size this tree has an advantage over the preceding species the fis. of which are usually borne so high on the tree as to be almost out of sight.

S. divers, Beauv. is now referred to Newbouldia which differs from Spathodea chiefly in the shape of the calyx which encloses the base of the corolla and is split on one side and 2-lobed at the apex and in its funnel-form-campanulate corolla, the inserted stamens with parallel anther-cells: caps. elongated-linear with leafy tubes, seeds with the wing emarginate on one side. N. bent, Seem. (Spathodes speciosa, Brongn.). Shrub or tree, to 40 ft., nearly glabrous; lvs. opposite or ternate, 1-2 ft. long; lfts. 7-13, oblong-oblong, obtusely acuminate, serrate, glabrous or nearly so, 3-8 in. long; fis. white with purple spots or pink or purple, in dense terminal panicles; calyx oblong, 2-lobed at the apex; val­ves: caps. 2-2 1/2 in. long, limb slightly 2-lobed with spatulate-obovate lobes. Trop. W. Afr. B.M. 4292. J.F. 1:51. F. 8:634. H.U. 5:357. The bark has medicinal properties. — S. pentandra, Hook. (B.M. 3981), is apparently a form of N. levii with 6-lobed fis., whose purple corolla and 3 stamens.—S. speciosa, Brongn. =New­bouldia laxa.

ALFRED REHDER.

SPATHOGLOTTIS (Greek, spatha and tongue; said to refer to the shape of the lip). Orchidaeae. Plants agreeing with Bletia in habit and form of inflorescence; terrestrial orchids of the Old-World tropics, mostly with numerous flowers. Pseudobulbs broadly conic, 1-3-lvs.: lvs. elongate, long-petioled, narrow, plicate, articulated: scape lateral, bearing large fis. in a terminal raceme; sepals 3ve, subequal; petals similar or broader and longer;
SPATHOGLOTTIS

Labellum not spurred, lateral lobes somewhat convolute, middle lobe clawed; column slender; pollinia 8.—About 40 species in Asia, Austral., and the Malay Isls.

Spathoglottis grow best at the warm end of the culture, in a moist shady location. Pot culture suits them best, and the compost should consist principally of equal parts peat fiber and sphagnum moss with a little chopped sod added; about half of the pot should be devoted to drainage. They all require a liberal amount of water when growing, but only enough to keep them in sound condition when at rest. They are rather hard to increase by division and the supply depends upon new importations.

(ROBERT M. GREY)

PLICATA, Blume. Lvs. 2–4 ft. long, finely acuminate; scape 2–3 ft. high, with a raceme 6–12 in. long; fls. 1 in. across, lilac, sepals and petals broad, acute; middle lobe of the labellum long and narrow, cuneately dilated at the tip; calli yellow, villous. Malay Penins. 1911:48.

AUREA, Lindl. (S. plicata, Griff.). Lvs. 12–18 in. high, narrowly lanceolate; scape tall and stout, 2 ft. high; raceme 6–8 in. long; fls. 1½ in. across, golden yellow; sepals broad, obtuse; middle lobe of the labellum equaling the falcate lateral lobes, narrowly lanceolate. Malay Penins. G.C. III. 4:93.—The lip varies, being sometimes broad and reflexed at the apex.

VIELLARDII, Reichb. f. (S. Augustinii, Reichb. f.). Fig. 3656. Lvs. long-lanceolate, acuminate, 1–2 ft. long; scape 12–18 in. high; robust; raceme 6 in. long, broad, corby-like at first; fls. 2 in. across, very pale lilac, nearly white; sepals and petals ovate-oblong, subacute; labellum as long as the sepals, lateral lobes orange-brown, with orangy calli speckled with red, middle lobe at or near the base.

SPEGLULIS

S. Speculum, Hort., is a pretty little hardy annual herb with five-lobed blue flowers not quite an inch across. The plants grow about 9 inches high, bloom in spring and summer and are desirable for edging flower-beds. They are of easy culture. See Annuals.

A. Peduncles about 2-ft.

SPELTO (from Spergula, meaning rattling.) Spergula. Spergulaceae. Annuals and winter and summer and are desirable for edging flower-beds. They are of easy culture. See Annuals.

A. Peduncles 1–2-ft.

PENTAGONIA, DC. Calyx pilose, lobes spreading. Asia Minor. B.R. 56.—This species is not now advertised in Amer. Some specimens have narrow lvs. and longer calyx-tube than S. Speculum. An interesting feature of this species (and perhaps others) is the 5-angled fl-buds. TRACY J. HUBBARD.

SPEWELL: Veronica.

SPEWELL: Veronica.


SPECTRUM (from Spectum, meaning Venus' looking-glass). Campanulaeae. Venus' Looking-glass. Erect or decumbent, bipedal or glabrous annual herbs, suitable for outdoor garden planting.

Leaves alternate, entire or dentate: fls. blue, violet, or white, sessile or short-pedicelled, axillary; calyx-tube adnate, oblong or linear, limb 5-parted; corolla subrotate, or broad-campanulate, 5-lobed; stamens free; ovary inferior, 3-celled; caps. oblong or linear. —About 10 species, northern hemisphere. 1 also occurs in S. Austral. Closely allied to Campanula but differing by the very long calyx-tube, ovary, and caps. "The long calyx-tube is one of the most conspicuous features of the plant and has perhaps served to suggest the handle of the mirror. There is one North American species, S. perfoliata, which differs from all the rest in having perfoliate lvs. and the caps. dehiscing laterally near the middle instead of near the calyx-lubes. It is a weed. S. Speculum is a pretty little hardy annual herb with five-lobed blue flowers not quite an inch across. The plants grow about 9 inches high, bloom in spring and summer and are desirable for edging flower-beds. They are of easy culture. See Annuals.

A. Peduncles about 3-ft.

SPECTRUM VENUS: Speculum Veneris, DC. (Campanula Speculum, Linn.). Venus' Looking-glass. Fig. 3657. Erect, 9 in. high; calyx glabrous or pubescent, the tube constricted at the apex; lobes finally reflexed, according to Decandolle. B. M. 102. Var. Alba, Hort., is a white-flowered form. G. N. 72, p. 253. Var. procumbens, Hort., is offered abroad in addition to lilac and double forms. R. H. 1897, p. 254.

SPEWELL: Veronica.

SPEWELL: Veronica.

SPEWELL: Veronica.

SPEWELL: Veronica.

SPEWELL: Veronica.
Sphærolea (old Greek name). Labiatae. A score or more of shrubs or subshrubs, in Calif., Hawaii, and S. Amer., one or more of which has been listed for ornament, but apparently little known in cult. Fls. white or red, in the axils of small bracts and forming verticillate racemes or spikes which may be simple or branched; calyx campanulate, about 10-nerved, enlarging in fr.; corolla-limb 4-parted, scarcely labiate; stamens 4, didynamous or nearly equal; style 2-lobed: nutlets ovoid, smooth. S. chamissonis, Briquet (S. campanulata, Benth.), from Chile, is mentioned abroad: 2-3 ft., shrubby: Ivs. oblong- lanceolate or short-stalked, wrinkled; fls. pale blue, ½-1½ in. long, about 2 in a whorl. B.R. 1832. Coolhouse plant.

Sphærolea (Greek for globe, and Alcea, the generic name of the marshmallow). Malvaceae. Globe Mallow. Shrubs, subshrubs, or herbs, adapted to the warmer regions of N. and S. Amer. Several species have been mentioned in horticultural literature and occur occasionally in cult. One species has been intro. into Calif. Closely allied to Alceo. Leaves frequently angled or lobed: fls. short-pedicelled, solitary, or arranged in axillary fascicles or in terminal racemes or spikes, violet or flesh-colored, rarely long-peduncled or red; bracteoles 3, free or united at base; calyx 5-cleft; staminal column divided at the base of the corolla; anthers without appendages; fr. scarlet or rose, 1 in. across: peduncles axillary and terminal, numerous. Dry plains, Brit. Col. to Idaho and south. B.M. 3537 and B.R. 1306 (both as Alcea Mingana). A.G. 11:539. G. 25:453.—Advertised in 1890 as the "sunset plant." The same plant is said to be offered in some catalogues as Malva minitata.

**Sphærostema**: Tooea. Sphærostema: Schwend.

CXL. Spinach.—Above, a plant of Long Season variety. Below, spinach field near Norfolk, Virginia.
larger growth of sphagnum (which is often a foot or more in height), its soft appearance, pale green color, and the absence of root-hairs. The stems and leaves are enclosed or encircled by one, two, and often four strata of transparent cells connected with each other by small holes, which have the capacity of sucking up and retaining a large amount of water. These cells therefore perform the function of root-hairs, and it is this abundant water-storage tissue that makes sphagnum moss of so much use to gardeners in the cultivation of orchids, anthuriums, nepenthes, and sarraceniads, such as sarracenia and darlingtonia. Sphagnum often forms at least one-third of the compost in which pitcher-plants and epiphytes are grown. The fresh green tips of sphagnum are also most useful for surfacing pots of orchids and other plants. Besides giving them a better appearance, the moss acts as an index to the moisture condition of the pot. Sphagnum is also useful in the propagation of many stave plants, such as corydalis, nemophila, and the like; for starting tropical tuberous-rooted plants, such as fancy caladiums; for sowing seeds of orchids, anthuriums, nepenthes, and sarraceniads when fresh and chopped fine, as a mulch; as a non-conducting material for plants in pots in exposed positions in summer; and in packing plants for transportation, for which purpose it is an ideal material. Owing to its sponge-like character it may be used wet or dry, according to the character of the material being transplanted.

Unless one has an ideal position in which to keep sphagnum moss after gathering it from its native place, or unless one has conditions very similar to its native habitat, it is difficult to keep it living for any length of time. This does not greatly matter, except that sphagnum used for surfacing pots should always be living for the sake of appearance. That which is used in potting and propagating need not necessarily be living as long as it is fresh and not already decayed; slightly decayed moss may be used for mulching and packing.

**Edward J. Canning.**

### SPHAGNUM

**Sphagnocarpus** (derivation unknown). *Malvagiaceae*. Scendent or erect shrubs or subshrubs: lvs. opposite, entire, petiolate, without stipules, the petiole glabrous: fls. rather large, in 3-4-fld. umbels, collected in terminal panicles; calyx 5-parted, not glanular; petals unequal, short-clawed, the lobes dentate or nearly entire; stamens 10; ovary 3-celled: samaras 3, with a vertical dorsal wing.—About 5 species, Trop. and S. Afr. *S. mayeri*, *S. calicistylus* (*Acridocarpus mayeri*, *Juss.*).—A slender climbing shrub of its parts: lvs. opposite, ovate-oblong, 1-4 in. long: fls. subcorymbosely clustered at the ends of the branches, 1-1½ in. in diam., golden yellow; petals short-clawed, orbicular, margins crisped: samaras silky-pubescent. S. Afr. B.M. 7894.

**Sphenopholis** (Greek, sphen, a wedge, and pholis, a scale, referring to the broadly obovate second glume). Syn., *Eulobiæ*, *Eulobus*. S. Amer. Scendent or erect shrubs with rather delicate panicles: spikelets 2-3-fld., articulate below the glumes; glumes dissimilar in shape, the first narrow, the second obovate.—Species about 5. N. Amer. Three kinds have been catalogued among native plants offered for sale.

#### A. Panicide dense, spike-like, strict.


#### A. Panicile more loose and slender.

**Pallens**, Scribn. (Eulobiæ pennsylvanica, Gray). Lvs. 3-8 in. long; panicle-branches lax, nodding, glumes unequal, the first shorter. Moist woods and meadows. Maine to Texas. Ibid. 257.

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**Spicile Bush**: *Benzoëm.*

**Spider Flower**: *Cleome*. S. Lilies: *Hymenocallis* and *Pan-cretum*. S. Plant: *Cleome*. Spiderwort: *Tradescantia*.

**Spigélia** (named for Adrian von der Spigel, physician, 1558–1625). *Loganiiaceae*. Annual or perennial herbs, some hardy, the others either greenhouse or greenhouse plants, rarely somewhat woody, with opposite membranous leather-leaved rarely 3–5-nerved lvs., and long or small, red, yellow, or purplish fls. with by-born or by-side somewhat curved spikes: calyx 5-lobed; segms. narrow; corolla tubular; lobes 5, valvate; stamens 5, attached to the corolla-tube; ovary 2-loculed; style articulate, simple, obtuse or somewhat capitulate and stigmatose at the summit: caps. flattened, circumscissile above the persistent base.—About 50 species, Amer.


**Splintlthes** (Greek, meaning spot-flower, in reference to the markings on the disk in some of the species). *Compositae*. Herbs, mainly weeds, some of them desirable for outdoor plantings, while others are grown as house-plants: lvs.: rays yellow or whitish, or none: achenes nearly always flattened, biauritate or without bristles, glabrous or strongly ciliate, in the latter case quite distinct in appearance. There are about 40 species of Splinthetes, widely distributed in both hemispheres, mostly confined to warmer countries, or, in the New World, also occurring in the South Temperate zone; one variety native to Amer. Good technical characters for distinguishing the different forms are found in but few cases. The latest monograph is in the Proceedings of the American Academy of Arts and Sciences, vol. 42, pp. 521–69. S. oleracea, Linn. (Tropics), is cult. for the pungent flavor of its lvs., used in salada; also, to a slight extent, as an ornamental, on account of its odd cylinder-like heads, in which the ratio of length to breadth is the greatest in the genus. Two types of it are named in the trade, Parà cress and Brazil cress, the latter said more commonly to have a brownish cast to sts. and lvs. Gt. 22, p. 295. Gt. 2, p. 36. While most of the species are of inferior appearance, several are distinctly worth cultivating or possibly hybridizing for ornament. The principal ones are enumerated below; all but S. callimorpho belonging in the radiate section, Acanthella, D.C.

**S. americana**, Hieron., var. répans, A. H. Moore. One of the best of the showy members of the genus. Erect or weak, ascending, decumbent, or rarely prostrate; lvs. large for the genus: rays bright yellow. By selection the erect type could probably be made to dominate. A hybrid combining with this the handsome lvs. and red at the base would be most desirable. Pair and S. callimorpho, Sept. Mo., Ark., La. to Fla. and Texas.—S. callimorpho, A. H. Moore. Decumbent or prostrate; lvs. long-nemiliniminate; flowers yellow; summer flowering. Moomian Prov., China.—S. charitops, A. H. Moore. One of the dainty species; a fair companion-plant to *S. indigéala*, but not so large. Dec. arb., with long internodes; small attractive heads. Yucatan, Mex.—S. glabella, A. H. Moore. Lvs. densely tomentose; rays large, red: in good packed bed.—S. hookeriana, A. H. Moore. A dainty little plant, with delicately green foliage: dark violet, the tiny rays cream colored. Porto Rico. Though not quite so charming, S. charitops would be a pretty good companion.—S. phanerentia, A. H. Moore. Decumbent or
SPINACH (Spinacia oleracea, which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 3659. It is a cool-season plant, and therefore it is grown in fall to spring. It is a plant of easy culture, thriving in any good garden or field soil, although for quick results and for tender succulent foliage, land that has an abundance of available plant-food, and particularly of nitrogen, is most desirable. The plant is hardy, and when the land is well drained, it will ordinarily stand the winter climate as far north as the city of New York, and still farther in somewhat protected places.

Spinach is grown both as a fall and spring crop. The fall crop is raised from seed that is sown in August; in eight weeks the leaves may be large enough for eating. A fertilizer that is very rich in nitrogen gives best results; two or three sowings may be made in the home-garden for spring use, but after the middle of June spinach is likely to become tough and is in little demand. If spinach is wanted during the summer, it is better to use the New Zealand spinach, which is a warm-weather plant. This plant has no relationship with the ordinary spinach (see Tetragonia). It is usually best to sow spinach where the plants are to stand, although it is sometimes transplanted into frames for home use. Care must be taken that the plants do not become checked or stunted, else they will tend to run to seed. If the seed is sown too late in spring, when hot weather is approaching, the root-leaves will be very few and the plant will quickly throw up flower-stalks. Spinach is always grown as a succession or companion crop, as it occupies the land for a small part of the year. There are very few insects and diseases that are generally troublesome.

Spinach is usually transported to market in barrels or crates. Plants are usually cut so that an inch or so of the root is left with them. All dirt is removed, as also all broken and dead leaves. The plants are packed tight. It is essential that the plants be dry before they are shipped.

There are several important varieties of spinach. The large broad-leaved varieties are most popular in the market, such as the Viroflay and the Round-leaved. The prickly spinach is considered to be the most hardy and is chiefly recommended for fall sowing.

SPINACIA (from spina; alluding to the spiny fruit). Chenopodiaceae. Spinach. Spinage. According to Volkmann (in Engler & Prantl’s “Pflanzenfamilien”), there are only two species of Spinacia, S. oleracea, the common spinach, and S. tetrandra, Stev., although Bentham & Hooker had made the genus to include four species. S. tetrandra is an annual herb of the Asia Minor-Persian region, and is not in cultivation. The spinach is probably native to southwestern Asia, and it is now widely cultivated. It is an annual herb, developing rather large arrow-shaped root-leaves, and these leaves are eaten for “greens.” Later in the season it sends up a branching flower-stem 2 to 3 feet high, bearing axillary clusters of seed-like fruits. In one type these fruits are spiny: this is the form once described as S. spinosa, Moench, but which is not now considered to be specifically distinct. Whether the round-seeded or the prickly-seeded type is the original form of the spinach is not known, but as a matter of nomenclature, Linnaeus’ S. oleracea, which is the oldest name, is held to include all.

Spinacia belongs to the Atriplex tribe. The genus is distinguished from Atriplex in the fact that the pistillate flowers are bractless when inclosed in a pair of enlarging calyx-like bracts. Spinacia is dioecious, bearing the flowers in small axillary clusters; stamens 4 or 5, in a 4- to 5-toothed calyx; ovary 1, with 4 to 5 styles or stigmas, in a 2- to 4-toothed calyx, this calyx hardening and inclosing the achene and often becoming horned on the sides and giving rise to “prickly-seeded” spinach. The cultivated forms have developed much thicker and broader radical leaves, which are used for greens, often showing little of the halberd-pointedinate shape. See Spinach.
SPIREA

SPIREA (ancient Greek name of a plant used for garlands, derived from spirea, band, wreath; probably first used for the present genus by Clusius). Rosaceae, subfamily Spiraeoideae. Spirea. Ornamental woody plants grown for their profuse handsome white, pink, or carmine flowers.

Decidious shrubs: i.e. simple, short-petioled, dentate or serrate, sometimes lobed, rarely entire, without stipules, in umbel-like racemes, racemes perfect, rarely polygamous; calyx cup-shaped or campanulate, 5-lobed; petals 5, rounded; stamens 15-60, inserted between calyx and disk; pistils usually 5, distinct, developing into follicles delinquent along the inner sutures, with several minute oblong seeds. About 70 species in the temperate regions of the northern hemisphere, in Amer. south to Mex., in Asiat. south to the Himalayas. Many species formerly included under Spiraea are now referred to other genera; see Physocarpus, Helodictus, Sorbaria, also Chamaebatia, Leucodela, Petrophylleum, and Sibiraea for shrubby species, and Aruncus, Filipendula, and also Aster for the herbaceous ones. There is a monograph of Spiraea and the allied genera by Maximowicz in Acta Horti Petropolitani, vol. 6, pp. 105-261 (1879) and a monograph of the cult, species, with their numerous hybrids fully described by H. Zabel, Die strauchigen Spirien der deutschen Gärten (1898). There is much horticultural literature on spireas, for the plants are popular and about two-thirds of the known species and numerous hybrids mostly originated in gardens are in cult.

The spireas are very ornamental, usually low or medium-sized shrubs with rather small deciduous foliage and with small white or pink or sometimes nearly crimson flowers in showy corymbs or panicles followed by small inconspicuous capsule-like fruits. Many are hardy North; some of the best of them are S. arguta, S. Thunbergii, S. Vanhouthei, S. pubescens, S. triloba, S. nipponica, S. media, S. ulmifolia, S. alba, S. Douglasii, S. Menziesii, S. tomentosa. The recently introduced S. Henry, S. Velechi, S. Wilsonii, S. Rosthormii and S. Sarpentiana have proved hardy at the Arnold Arboretum, while S. blanda, S. Japonica, and S. abifolila require a sheltered position or protection during the winter, though S. Japonica and its allies, even if killed almost to the ground, will produce flowers on shoots of the same season. S. cantoniensis, S. Blume, S. canescens, and S. bella are more tender and not to be recommended for the North, but are hardy or nearly hardy in the middle states. S. prunifolia is hard as far north as Boston.

In regard to the flowering season, the spireas can be divided into two groups. The first one contains the species of the section Chaemadryon, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calospira and Spiraria, with white or pink flowers in corymbs or panicles appearing from June to autumn. Of the most important species, arranged according to their relative flowering-time, are the following: Early-flowering spireas—S. Thunbergii, S. arguta, S. hypericifolia, S. prunifolia, S. media, S. pubescens, S. chamadryoides, S. triloba, S. Vanhouthei, S. cantoniensis, S. nipponica. Late-flowering spireas—S. bella, S. Rosthormii, S. Wilsonii, S. Henry, S. Sarpentiana, S. Velechi, S. corymbosa, S. densiflora, S. canescens, S. japonica, S. abifolila, S. alba, S. Menziesii, S. Douglasii, S. tomentosa. Many species of the second group do not produce their flowers all at once like those of the first group, but continue blooming for a longer time.

The spireas are all medium-sized or low shrubs and well adapted for borders of shrubberies, as single specimens on the lawn, or for rockeries. Especially the species of the early-flowering group possess a graceful habit and make effective single specimens, except perhaps S. chamadryoides and S. media, which are sometimes what stiffer and less handsome and produce suckers. S. canescens, S. Henry, and its allies have the graceful habit of the first group. S. japonica and its numerous hybrids form very low, round bushes and are usually used as single specimens or in the border. S. alba, S. Doug- lassii, and S. Menziesii, and their hybrids should be planted in shrubberies only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockeries S. decumbens, S. betulifolia, S. corymbosa, S. densiflora, S. bullata, and some dwarf hybrids of S. japonica are to be recommended.

The species of the section Chamaedryon, and also S. canescens and S. bella, should be pruned as little as possible—only thinned out and the weak wood removed—while those of the sections Calospira and Calospora can be pruned more severely if necessary, since they produce their flowers at the ends of the young shoots. Some

3600. Spirea Thunbergii. (X1/2)

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KEY TO THE SECTIONS.

a. Inf. a simple umbel-like raceme: fls. white.
   Section I. CHAMAEDRYON. Species Nos. 1–20.

AA. Inf. compound: fls. white or pink.
   a. Fls. in corymbs.
   Section II. CALOSPIRA. Species Nos. 21–42.

BB. Fls. in panicules.
   Section III. SPIRÆA. Species Nos. 43–55.

Section I. CHAMAEDRYON. Species Nos. 1–20.

A. Fls. in sessile umbels with none or very small lvs. at the base or only the lower
   umbels on leafy stalks.
   B. Foliage entire or crenate mostly with small lvs. at the base; pedicels glabrous;
      petals broadly obovate, almost twice as long as stamens. 
      Var. trunciLta, Zabel Fig. 3661. Shrub, 5 ft. high, with slender arching
      or upright branches: lvs. almost sessile, cuneate-obovate to obovate-lanceolate, 3-
      nerved or with few lateral veins, almost glabrous, 1½ in. long: lvs. small, white, in sessile umbels; pedicels usually pubescent; petals almost orbicular, usually longer than stamens. April, May. S. E. Eu. to Siberia.
      —Variable species. Var. acuta, Ser. (S. acutifolia, Willd.). Lvs. narrower, obovate-lanceolate: fls. smaller, yellowish white; pedicels glabrous; petals obovate, shorter than stamens: lvs. somewhat earlier; but less showy.

2. Thunbergii, Sieb. Fig. 3660. Shrub, 5 ft. high, with spreading or arching branches: lvs. linear-lanceolate, sharply serrulate, 1–1½ in. long: lvs. pure white, about ½ in. across, in 3–5-fld. naked umbels; petals obovate, much longer than stamens: follicles with the spreading styles below the apex. April, May. China. Japan. S.Z. 1:69. G.F. 8:84, 85. J.H. III. 47:337.—A very graceful early-flowering shrub, the slender arching branches clothed with feathery bright green foliage, turning later in fall to orange or scarlet. Almost hardy, but tips of branches sometimes killed by severe frost; valuable for seaside planting.

found wild in Podolia, Poland."


6. **china**, Waldst. & Kit. Dense, bushy shrub, 3 ft. high: lvs. elliptic to oblong, acute at both ends, usually entire, grayish pubescent on both sides, more densely beneath, ½–1 in. long: fls. ¼ in. across, in dense head-like umbels; petals about as long as stamens; sepals reflexed in fr.; follicles curving outward. May. June. N. E. Asia. G.O.H. 10. nippouia, Maxim.


9. **pikoviensis**, Bess. (S. crenata × S. media, S. Nicosidtěriti, Hort.). Shrub, 4 ft. high, with terete upright branches; lvs. oblong, cuneate at base, with few sharp teeth at the apex or sometimes entire, peninnerved to 3-nerved, almost glabrous, 1–2 in. long: fls. white or greenish white, in many-fl. almost glabrous umbels; petals orbicular, shorter than stamens; sepals upright in fr.; follicles with the upright style somewhat below the apex. May. G.M. 53:157. —Supposed natural hybrid, found wild in Podolia, Poland.

10. **nipponica**, Maxim. (S. bracteata, Zabel, not Raf.). Fig. 3662. Shrub, 8 ft. high, with upright or spreading branches, quite glabrous; lvs. ovate, usually crenate at the apex; dark green above, bluish green beneath, of firm texture: lvs. ¼ in. across, in umbel-like racemes, sometimes compound at the base; petals orbicular, longer than stamens; sepals spreading in fr. June. Japan. Var. rotundifölia, Makino (S. media var. rotundifölia, Nichols.). —Lvs. broadly obovate or roundish obovate, ¼–1⅔ in. in long: fls. somewhat larger. G.C. H. 23:283; III. 37:149; 43:399. J.H.S. 33, p. 349. G. 29:663. G.M. 43:95. B.M. 7429. G.F. 7:305 (adapted in Fig. 3662).-Desirable hardy shrub of vigorous growth with showy umbels of pure white fls. and dark green handsome foliage remaining green until late in fall.

11. **Blumei**, Don (S. rupestria, Sieb.). Shrub, 4 ft. high, with spreading and arching branches: lvs. ovate to rhombic-ovate, incised-crenate-serrate, pale bluish green beneath and rather prominently veined, ¾–1¾ in. long: fls. polygamous, white, in many-fl. umbels, petals roundish-ovate, about as long as stamens: follicles with spreading or reflexed styles. June. Japan. B.H. 8:36.—Not hardy N., rare in cult.; often the following or other species are met with under its names.

12. **triloba**, Linn. (S. triloba, Linn.). Fig. 3663. Shrub, 4 ft. high, with slender spreading branches; lvs. almost orbicular, incised-dentate and often 3-lobed, obtuse, pale bluish green beneath, ½–1⅔ in. long: fls. pure white, in many-fl. umbels; sepals upright in fr.; follicles with ascending styles. May. June. N. China to Tibet. F.S. 2:317. G.M. 13:1271. G.F. 1:452. F.E. 30:45 (as *S. crataegifölia*).—Handsome bushy shrub, quite hardy; cult. under many different names as *S. aquilegifölia*, *S. adiantifölia*, *S. crataegifölia*, *S. Blumei*.


14. **canoniensis**, Lour. (S. Reevesiana, Sieb.). Shrub, 4 ft. high, with slender, arching branches; lvs. rhombic-ovate, incised doubly serrate, dark green above,
pale bluish green beneath, 1–2 1/2 in. long; fls. over 1/2 in. across, in rather dense umbels; sepals upright in fr.; follicles with spreading styles. May, June. China. B.R. 30:10. A.G. 18:356. G. 34:441. — Very handsome shrub, with large pure white fls., but only half-hardy N. Var. lanceata, Zabel (S. Rosescens flore-pleno, Hort.), with double fls. and narrower lvs. is still more tender. H.F. 1855:11. This species and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.


16. **chinensis**, Maxim. (S. pubescens, Lindl.). Upright shrub, 5 ft. high, with arching branches, tomentose when young; lvs. long-petioled, ovate, incisedly serrate only at the middle, 1–2 in. long; fls. pure white, about 3/4 in. across, in pubescent umbels; sepals upright in fr., ovate-lanceolate, tomentose like the follicles styles terminal, spreading. May, China. B.R. 33:36. — Handsome, but not hardy North.

17. **pubescens**, Turez. Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but more grayish tomentose beneath and somewhat smaller, petioles shorter: fls. 3/4–3/4 in. across, in glabrous umbels; sepals triangular-ovate, upright in fr.: follicles glabrous, with the spreading styles below the apex. May, N. China. G.F. 1:331. — Hardy N., and the large-fid. form as handsome as the foregoing species.

18. **media**, Schmidt (S. confusa, Regel & Koern.). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young; lvs. ovate to oblong, eu anate at the base, incisedly serrate above the middle, almost glabrous or pubescent, 1–2 1/2 in. long; fls. in many-fid. rather long-stalked, umbel-like racemes: follicles with the spreading or reflexed styles somewhat below the apex. May. S. E. Eu. to Japan. J.H. III. 46:533. G. 30:45. G. M. 49:504. R.F.G. 24:149. Var. glabrascens, Simonkai. Almost glabrous. Var. subintegerrima, Zabel (S. oblongifolia, Waldst. & Kitz.). Lvs. elliptic-oblong to oblong-lanceolate, narrowed at both ends, entire or with 1–3 teeth at the apex, nearly glabrous. Var. serrata, Regel (S. sericea, Turcz.). Lvs. pubescent on both sides.

19. **chamaedryfolia**, Linn. Shrub, to 6 ft., with angular glabrous branchlets: lvs. slender-petioled, ovate, incisedly or doubly serrate from below the middle, almost glabrous, bluish green beneath, 1 1/2–3 in. long; umbels many-fid., the lower ones on branchlets about 2 in. long, the upper ones often almost sessile; fls. about 3/4 in. across, follicles with the style upright and terminal. May, June. S. E. Eu. to Japan. G. W. H. 83. Var. ulmifolia, Maxim. (S. ulmifolia, Scop.). Lvs. more rounded at the base: umbels more elongated-hemispherical, S. E. Eu. R.F.G. 24:150. Var. transiens, Zabel. Lvs. narrower, oblong-ovate.—This and the preceding species spread by suckers.

20. **flexuosa**, Fisch. (S. chamaedryf6lia var. flexuosa, Maxim.). Similar to the preceding species, but lower and more spreading: branchlets slender, strongly angled, distinctly zigzag: lvs. oblong-ovate to lance-oblong, cuneate at the base, usually serrate above the middle only, 1–2 in. long; umbels few-fid., short-stalked. May, June. N. E. Asia. Var. stenophylla, Schneid. (S. chamaedryf6lia var. stenophylla, Zabel). Lvs. smaller and narrower, usually less than 1 in. long.

Section II. **CALOSPIRA.** Species Nos. 21-42.

A. Corymb on usually short lateral branchlets along the mostly arching branchlets of the previous year.

B. Lvs. 1/2–1 in. long, crenate-serrate, or serrate only at the apex; corymb in very short branchlets.

C. Branchlets angular: lvs. generally ovate, obtuse; winter buds with 3 outer scales

D. Lvs. pubescent on the upper surface of the lvs. glabrous; margin entire; flower-bud scaly

E. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

F. Fls. perfect, white. lvs. 3/4–3 in. long.

G. Fls. perfect, white. lvs. 3/4–3 in. long.

H. Winter buds short, acute, with several outer scales: lvs. entire or dentate only above the middle. lvs. 1/2–1 in. long, crenate-serrate, or serrate only above the middle.

I. Upper surface of lvs. glabrous; margin entire; flowering branchlets 2–3 in. long. 23. Veitchii

J. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

K. Fls. perfect, white. lvs. 3/4–3 in. long.

L. Fls. perfect, white. lvs. 3/4–3 in. long.

M. Winter buds short, acute, with several outer scales: lvs. entire or dentate only above the middle.

N. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

O. Fls. perfect, white. lvs. 3/4–3 in. long.

P. Fls. perfect, white. lvs. 3/4–3 in. long.

Q. Winter buds short, acute, with several outer scales: lvs. entire or dentate only above the middle.

R. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

S. Fls. perfect, white. lvs. 3/4–3 in. long.

T. Fls. perfect, white. lvs. 3/4–3 in. long.

U. Winter buds short, acute, with several outer scales: lvs. entire or dentate only above the middle.

V. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

W. Fls. perfect, white. lvs. 3/4–3 in. long.

X. Fls. perfect, white. lvs. 3/4–3 in. long.

Y. Winter buds short, acute, with several outer scales: lvs. entire or dentate only above the middle.

Z. Upper surface of lvs. more or less pubescent, margin usually dentate below the apex.

AA. Corymb on usually short lateral branchlets of the previous year.
SPIRAEA

21. canescens, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches; branchlets angled; leaves broadly oval to oblong, very short-petioled, cuneate at the base, acute, finely puberulous beneath and glaucous, glabrous above, ¼-½ in. long; corymbs ½-2 in. across, puberulous; flowers ¼ in. across; white; calyx puberulous; stamens longer than petals; carpels glabrous, upright. June. July. B.M. 5838. J.H.S. 35, p. 152, fig. 98. G.M. 52:598.—Like the two following closely allied species very handsome and hardy as far north as Mass.

24. Wilsonii, Duthie. Shrub, to 8 ft., with arching branches; branchlets dull purplish, pubescent while young; leaves short-petioled, oval to oblong or oblongate, obtuse or acutish, cuneate at the base, entire or with a few coarse teeth at the apex, dull green and pubescent above, grayish green and villous beneath, particularly on the veins, ¾-2¼ in. long; corymbs dense, 1¼-2 in. across, glabrous or nearly so; flowers ¼ in. across, pure white; calyx glabrous; foliages sparingly pilose, slightly spreading. June. Cent. and W. China. B.M. 8390. G. 35:851.

25. Henryi, Hemsl. Fig. 3655. Shrub, to 8 ft., with spreading branches; branchlets sparingly pilose or nearly glabrous; leaves obovate or oblong to oblongate, cuneate at the base, acute or rounded at the apex, usually coarsely dentate toward the apex, slightly hairy above, villous beneath particularly on the veins, ¾-3 in. long; petals ½-¾ in. long; corymbs 2 in. across, rather loose, pilose; flowers ¼ in. across; stamens shorter than petals; foliages hairy, slightly spreading. June. Cent. and W. China. B.M. 8270. G. 85, p. 44. J.H.S. 28:62, fig. 20. G. 37:35. Var. notabilis, Parquhar. Corymbs larger.

26. Rösthornii, Pritzel (S. Frutti, Schneid.). Shrub, to 6 ft., with spreading branches; branchlets yellowish brown, sparingly hairy while young; winter buds elongated, long-pointed, often as long as petals; leaves ovate to ovate-oblong, acuminate, cuneate at the base, rarely nearly rounded, serrate, hairy; leaves green, hairy on the veins beneath, 1¼-2¾ in. long; petals ¾-1¾ in. long; corymbs rather loose, 2-3 in. across, pilose, on elongated branchlets; flowers ¼ in. across, white, stamens longer than petals. June. W. China.—A graceful shrub with handsome bright green foliage.

29. expansa, Koch (S. béllá var. expansa, Regel S. fastigiata, Wall.). Closely allied to the foregoing; more vigorous and upright, 6 ft. high, with terete branches tomentose when young: lvs. ovate to ovate-oblong, acute at both ends, sharply serrate from the middle, usually pubescent on the veins beneath, 1½-3 in. long: fls. white, ⅙ in. across, in 1-4-in.-broad corymbs terminal on upright, often very long branches: follicles pubescent, diverging. July. Himalayas.-S. pulchella, Kunze (S. kumaonensis, Hort.), is supposed to be a hybrid of this and the foregoing species; it combines the broader corymbs of the latter with the brighter color of the first species, therefore handsomer than either parent; sometimes cult. as S. expansa rubra, but there is also another hybrid of the same name. See S. rubra in suppl. list.


31. japónica, Lind. (S. collèsa, Thunb.). Shrub, 4 ft. high, with upright branches glabrous or puberulous when young: lvs. ovate to oblong-lanceolate, acute at both ends or acuminate, doubly and incisedly serrate, pale bluish green and usually glabrous beneath, 1-4 in. long: fls. small, pale to deep pink, in usually much-compound and rather loose corymbs; sepals reflexed in fr.: follicles glabrous, diverging with ascending styles. June, July. Japan. China.-A very variable species. The variety most common in cult. usually under the name S. collesa is var. Fortunae, Regel. (S. Fortunae, Planch. S. collèsa, Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2-4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurved, calloso-tipped teeth, rugose above, bluish white beneath: corymbs very compound, rather loose; disk less developed, sometimes wanting. E. and Cent. China. F. S. 9:871. B. M. 5164. B.H. 8:129.-Handsome shrub with the young unfolding lvs. of a pretty purplish color and very large much-compound corymbs. The Japanese forms grow less high, have smaller and broader, coarsely doubly dentate-serrate lvs., not rugose and less whitish beneath; the sts. are slightly striped by the decurrent petioles and the fls. are less compound. Other varieties of Chinese origin are the two following recently intro. varieties. Var. acuminata, Franck. Fls. ovate-oblong to lanceolate, acuminate, green and pubescent beneath, at least on the veins, 2-3½ in. long: fls. pink, in terminal corymbs 4-6 in. across. Cent. and W. China. Var. ovatifolia, Franck. Fls. oval to elliptic, acute, glabrous and glaucous beneath, 1½-3 in. long: fls. white, in corymbs 3-5 in. across. W. China.-Japanese forms little known in cult. are var. pubescens, Regel, with the lvs. pubescent beneath and the corymbs pubescent, and var. glabrata, Nichols. (S. glabrata, Lange), with ovate glabrous lvs. and bright pink fls. in glabrous corymbs. The following are garden forms: Var. astrosanguinea, Zabel. Fls. deep pink, in tomentose corymbs. Var. rubérrima, Zabel. Fls. deep pink, in puberulous corymbs. Var. macrophylla, Simon-Louis. Lvs. becoming 6 in. long, bullate: corymbs small. Var. variegata, Hort. Lvs. variegated with yellowish white. Most of the other forms enumerated as varieties under this species are hybrids.


33. Fórqué, Zabel (S. corymbosa × S. japonica). Similar to the preceding; branches more or less striped, almost glabrous: lvs. elliptic, doubly serrate, glabrous; fls. whitish or pinkish, in large, puberulous corymbs; styles spreading in fr. June, July. R. H. 1900, p. 117. Of garden origin.—Less desirable than the preceding hybrid.

35. albitifôra, Miq. (S. japónica alba, Regel. S. leucodermis, Lange). Fig. 3667. Low shrub, 1½ ft. high, with stiff, upright branches: lvs. lanceolate, coarsely serrate at base, entire or with a few teeth above the middle, pale or glaucous beneath, 1½-2 in. long: fls. white, in dense glabrous corymbs, about 1½ in. across. June, Va. to N. C. and Tenn. B.B. (ed. 2) 2:246.


39. virginiânsa, Brit. Much-branched shrub, to 4 ft., glabrous: lvs. lance-oblanceolate, acute, cuneate or rounded at the base, entire or with a few teeth above the middle, pale or glaucous beneath, ½-2 in. long: fls. white, in dense glabrous corymbs, about 2 in. across. June. Va. to N. C. and Tenn. B.B. (ed. 2) 2:246.

40. ficida, Douglas (S. corymbosa var. ficida, Zabel). Closely allied to S. corymbosa: branches yellowish brown or brown; lvs. more incisely serrate, oval or obovate: corolla glabrous, usually looser and more flat, broader. June, July. Brit. Col. to Sask., Wyo. and Ore.

41. betulifolis, Pall. Low, much-branched shrub: lvs. oval to obovate-oblong, usually cuneate at base and very short-petioled, ovate or crenately serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ½-1½ in. long: corymbs usually glabrous, 1-2 in. across. June, July. Siberia to Manchuria, Kamchatka and Japan.—The three preceding species except S. virginiana are all closely allied and considered by some botanists varieties of S. betulifolia.

42. decumbens, W. Koch (S. procumbens, Hort.). Dwarf, procumbent shrub, about ½ ft. high, with ascending branches, glabrous: lvs. elliptic to oblong, acute at both ends, crenately serrate above the middle, glabrous, ½-1½ in. long: fls. white, in small corymbs, about 2 in. across; follicles glabrous, with upright terminal styles. June-Aug. Brit. Col. to Ore., Wyo., and Mont. G.F. 10:413.

Section III. Spiræa. Species Nos. 43-55.

A. Infl. a broad panicle, about as broad as high. (Hybrid of species of this and the preceding section.)

B. Panicles rather small, on lateral branches at the end of last year's branches. 43. Fontenaysii

BB. Panicles large, terminal on long, upright branches.

C. Lvs. glabrous or nearly so.

D. Apex of lvs. acute. 44. conspicua

DD. A petiole of lvs. obtuse or acute.

E. Shape of lvs. broadly ovate or oblong. 45. notba

EE. Shape of lvs. oblong or oval-oblong. 46. pyramidalta

GG. Lvs. pubescent or tomentose beneath.

H. Base of lvs. acute. 47. sanssouciens.

HH. Base of lvs. rounded. 48. Watsoniana

AA. Infl. an elongated panicle, longer than broad. (Spiræa proper.)

B. Foliage glabrous or nearly so.

C. Lvs. sharply serrate, except at the very base.

D. Panicles lomentulose. 49. salicifolia

EE. Fls. light pink. 50. alba

GG. Lvs. crenately serrate above the middle; fls. pink. 52. Menziesii

BB. Foliage pubescent or tomentose beneath.

C. Foliages glabrous: lvs. grayish or whitish tomentose beneath.
43. **Fontenayssii**, Billiard (S. fontenaysiiensis, Dipp. & S. cantescens × S. salicifolia). Shrub, 6 ft. high, with slender, upright branches; lvs. ovate or oblong-oval, rounded at both ends, crenately serrate above the middle, pale bluish-green beneath, almost glabrous, 1–2½ in. long: fls. white or pink, in 1½–3½ in.-long panicles; petals orbicular, about as long as stamens; sepals spreading in fr. June, July. Of garden origin.—Not quite hardy N. Var. alba, Zabel, is the white-flowered form. S. pruinosa, Zabel, is a similar form, but the lvs. are tomentose beneath and the fls. pink.

44. **conspicua**, Zabel (S. albiflora × S. alba). Upright shrub, 3 ft. high, with dark brown puberulous branches; lvs. elliptic-oblong, acute at both ends, usually or doubly serrate, almost glabrous, 1½–2½ in. long: fls. pinkish white, in broad finely pubescent panicles; petals shorter than stamens. July—Sept. Handsome form. A similar hybrid is S. syringaeflora, Lem. (L. albiflora × S. salicifolia), with oblong-lanceolate or lanceolate lvs., serrate above the middle, and pink fls. Closely allied is also S. semperflorens, Zabel (S. japonica × S. salicifolia, S. japonica or S. Fortunei var. paniculata, Hort.). Higher than the former: lvs. oblong-lanceolate, usually doubly serrate; fls. pink. R.H. 1890, pp. 496, 497. Gn. 45, p. 49. G. 3:191.

45. **nubia**, Zabel (S. corymbosa × S. latifolia). Shrub, 3½ ft. high, with brown, glabrous branches; lvs. broadly ovate to ovate-oblong, short-petioled, coarsely and doubly serrate, almost glabrous, 1–2½ in. long: fls. white to pinkish white, in broad, glabrous panicles; stamens almost twice as long as the orbicular petals. July, Aug.—Of garden origin.


50. **alba**, Dur. (S. salicifolia var. paniculata, Ait. S. lanceolata, Borkh.). QUEEN OF THE MEADOW. MEADOW-SWEET. Attractive upright shrub, attaining 6 ft., with reddish brown branches puberulous when young; lvs. narrow, oblong to oblong-lanceolate, acute, usually regularly simply serrate, 1½–2½ in. long: fls. white, in leafy pyramidal tomentulous panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens with petals nearly as long as petals; follicles quite glabrous. June—Aug. From N. Y. west to Mo., south to Ga. and Miss. B.B. (ed. 2) 2:245. Also known as S. salicifolia.

51. **latifolia**, Borkh. (S. salicifolia var. latifolia, Ait. S. carpinsfolia, Willd. S. canadensis, Engelm. S. bethlehemensis, Hort.). QUEEN OF THE MEADOW. MEADOW-SWEET. Fig. 3668. Branching shrub, 2½—5 ft. high, with bright or dark red-brown glabrous twigs: lvs. broadly ovate to oblong or oblong, usually coarsely and often doubly serrate, 1½–3 in. long: fls. white, larger than those of S. alba, sometimes slightly blushed and with the stamens and disk more or less pinkish; panicles quite glabrous, broadly pyramidal, with spreading and elongated ramifications; stamens longer than petals. June—Aug. Newfoundland and Canada to N. C. Em. 2:485. G.C. III. 43:417.—This and the preceding species have been referred by most American botanists to S. salicifolia. S. alba is chiefly found west, S. latifolia east of and on the Alleghanies, while the true S. salicifolia is an Old-World species.

52. **Menziesii**, Hook. (S. Douglasii var. Menziesii, Preal.). Upright shrub, 4 ft. high, with brown, at first puberulous, branches: lvs. oblong-obovate to oblong, coarsely and unequally serrate above the middle, pale green beneath, 1½–3 in. long: fls. small, pink, in narrow, 5–8-in.-long panicles; stamens more than twice as long as the roundish petals; sepals reflexed in fr. June—Aug. Alaska to Ore.
53. Bliéridi, Herneq (S. Douglasii x S. salicifolia), Shrubs, 6 ft. high, with brown pubescent branches; lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, especially in the lower third, usually grayish-tomentose beneath, at least when young, sometimes almost glabrous at length, 2-3 in. long; fls. bright pink, in 5-8 in. long, tomentose or tomentulose panicles usually rather narrow and dense. July-Aug. Of garden origin. F.H. 5:24. F.E. 18:631. = S. Lando, S. biflora, S. triuncheus, S. extensa, S. Contra, S. californica, Hort., are very similar and probably of the same parentage.

54. Douglasii, Hook. Fig. 3669. Shrubs, 6 ft. high, with reddish brown, tomentose branches; lvs. oblong to oblong-lanceolate, rounded or acutish at both ends, unequally serrate above the middle, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink, in dense, rather narrow or sometimes broad panicles, 4-8 in. long; lvs. twice as long as the obovate petals; sepals reflexed. Plants of this species are very similar, with reddish-brown branches. July-Aug. Of garden origin. H.F.5:24.

55. tomentosa, Linn. HARDHACK. STEEPLEBUSH. Shrubs, 4 ft. high, with upright, brown, tomentose branches; lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink or purplish purple, in narrow dense panicles, brownish tomentose and 5-8 in. long; lvs. somewhat longer than the obovate petals; sepals reflexed. Garden hybrid. July-Sep. Nova Scotia to Ga., west to the same parentage.

S. Aitchisonii, onii, Hook. Fig. 3669. Medum-sized shrub with slender, arching branches; lvs. small, ovate, obtuse, entire or crenate above the middle, quite glabrous, fls. white, in hemispherical, mostly corymbose heads. Chinese. = S. gregata, S. Springfrid, S. gregata, S. nevada. F.H. 5:24.

S. Adoxa, Herneq. (S. Douglasii x S. salicifolia), Shrubs, 6 ft. high, with brown pubescent branches; lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, especially in the lower third, usually grayish-tomentose beneath, at least when young, sometimes almost glabrous at length, 2-3 in. long; fls. bright pink, in 5-8 in. long, tomentose or tomentulose panicles usually rather narrow and dense. July-Aug. Of garden origin. H.F. 5:24. F.E. 18:631. = S. Lando, S. biflora, S. triuncheus, S. extensa, S. Contra, S. californica, Hort., are very similar and probably of the same parentage.

54. Douglasii, Hook. Fig. 3669. Shrubs, 6 ft. high, with reddish brown, tomentose branches; lvs. oblong to oblong-lanceolate, rounded or acutish at both ends, unequally serrate above the middle, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink, in dense, rather narrow or sometimes broad panicles, 4-8 in. long; lvs. twice as long as the obovate petals; sepals reflexed. Plants of this species are very similar, with reddish-brown branches. July-Aug. Of garden origin. H.F.5:24.

55. tomentosa, Linn. HARDHACK. STEEPLEBUSH. Shrubs, 4 ft. high, with upright, brown, tomentose branches; lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink or purplish purple, in narrow dense panicles, brownish tomentose and 5-8 in. long; lvs. somewhat longer than the obovate petals; sepals reflexed. Garden hybrid. July-Sep. Nova Scotia to Ga., west to the same parentage.

S. Aitchisonii, onii, Hook. Fig. 3669. Medum-sized shrub with slender, arching branches; lvs. small, ovate, obtuse, entire or crenate above the middle, quite glabrous, fls. white, in hemispherical, mostly corymbose heads. Chinese. = S. gregata, S. Springfrid, S. gregata, S. nevada. F.H. 5:24.

S. Adoxa, Herneq. (S. Douglasii x S. salicifolia), Shrubs, 6 ft. high, with brown pubescent branches; lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, especially in the lower third, usually grayish-tomentose beneath, at least when young, sometimes almost glabrous at length, 2-3 in. long; fls. bright pink, in 5-8 in. long, tomentose or tomentulose panicles usually rather narrow and dense. July-Aug. Of garden origin. H.F. 5:24. F.E. 18:631. = S. Lando, S. biflora, S. triuncheus, S. extensa, S. Contra, S. californica, Hort., are very similar and probably of the same parentage.

54. Douglasii, Hook. Fig. 3669. Shrubs, 6 ft. high, with reddish brown, tomentose branches; lvs. oblong to oblong-lanceolate, rounded or acutish at both ends, unequally serrate above the middle, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink, in dense, rather narrow or sometimes broad panicles, 4-8 in. long; lvs. twice as long as the obovate petals; sepals reflexed. Plants of this species are very similar, with reddish-brown branches. July-Aug. Of garden origin. H.F.5:24.

55. tomentosa, Linn. HARDHACK. STEEPLEBUSH. Shrubs, 4 ft. high, with upright, brown, tomentose branches; lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely white-tomentose beneath, 1-2½ in. long; fls. deep pink or purplish purple, in narrow dense panicles, brownish tomentose and 5-8 in. long; lvs. somewhat longer than the obovate petals; sepals reflexed. Garden hybrid. July-Sep. Nova Scotia to Ga., west to the same parentage.

S. Aitchisonii, onii, Hook. Fig. 3669. Medum-sized shrub with slender, arching branches; lvs. small, ovate, obtuse, entire or crenate above the middle, quite glabrous, fls. white, in hemispherical, mostly corymbose heads. Chinese. = S. gregata, S. Springfrid, S. gregata, S. nevada. F.H. 5:24.
and V&.

what unitecl With the petals; bbellum quadrate-oblong, sepals free, r,arrowly lanceolate, the upper one some­
crisp, obtuse or yellowish above. n0t contracted in the middle, wavy­

cent, bearing 4-5 lanceolate or oblanceolate lvs. near

leafy belo'v: spike 2--4 in. long: fIs. white or greerJsh, the base: fis. small; sepals and petals 'white, lateral

below and dilated at the apex, crisp. July, Aug. N. Y. to Fla. and La.

bb. Lvs. mostly withered at the flowering-time.

simplex, Gray. Root a solitary oblong tuber: lvs.
basal, ovate to oblong, short, absent at the flowering­time: st. very slender, 5-9 in. high: spike about 1 in. long: fis. white; labellum obovate-oblong, eroded and crisp.


gräulis, Beck. Roots clustered: lvs.
basal,obovate to ovate-lanceolate, petioled, mostly dying before the flowering-time: st. 8-18 in. high, bearing a slender, many­

fil., 1-sided or twisted spike: fis. white, fragrant; sepals longer than the labellum, the lateral ones free; labellum oblong, dilated in front, crenulate or wavy-crisp, thick and green in file middle. Aug.–Oct.


S. obertas, N.E. Br. (Neottia speciosa, Jacq.)= Stenorrhyzachus. HEINRICH HASSELBRING.

SPIRODÉLÀ: treated under Lemna.

SPIRONÉMA (name means spiral thread, alluding to structure of the filaments). Commelíaceae. One species, S. fragrans, Lindl., is sometimes listed abroad for hothouse culture, an odd herb from Mex. Sometimes raised under glass for the delicious fragrance and for the trans­

parency of its parts: st. fleshy, 2 ft. and more high: lvs. oblong-lanceolate, sheath­
ing, parallel-veined: fis. white, clustered and nearly sessile in a terminal branched panicle, small, the petals paleaceous and diaphanous, the 3 sepals greenish; stamens 6, B.R. 20-47, where it is written that the plant will be cherished “because its thin and delicate tissue allows the hidden motion of its fluids and the subtle texture of its fracturing organs to be watched with ease and pleasure.” It is very little known as a horticultural subject.

SPONDIAS (from a Greek word used by Theo­

phrastus). Anacardiaceae. A small genus of tropical trees, allied to the mango (Mangifera indica) and the cashew (Anacardium occidentale), cultivated for their fruits and often used for hedges because of the reach­

ness with which large branches, when cut and used as posts, take root and grow.

Leaves usually clustered toward the ends of the branchlets, alternate, imparipinnate, with opposite lts.: fis. polygamous, small, shortly pedicellate, dis­
poped in racemes or panicles; calyx small, deciduous, with 4 or 5 valvate segms.; petals 4 or 5, valvate; stamens 8-10, inserted at the base of the disk; styles 3-5, free at the apex; ovary sessile, 3-5-loculed, with 1 ovule in each locale: fr. a fleshy drupe, with a 1-5-loculed woody endocarp.—Species about 12, several of which are common in the W. Indies, Mex., and elsewhere in Trop. Amer.; one species comes from the Society Isls., another from India.

cytherea, Sonn. (S. dulcis, Forst.). OAHAEITHE-APPLE.
POMME-CYthereE. CAAJA MANGA. VI or EVI in Tahiti.

Fig. 3670. Erect, stately tree, with rather stiff branches. up to 60 ft. in height: lvs. 8-12 in. long; lfts. 11-13, oval­

long, 2½-3 in. long. 1½-2 in. broad, acuminate, serr­
rate: panicle 8-12 in. long; fis. white: fr. oval or oblo­
void, golden yellow, up to 3 in. long, the seed about 1½ in. long, oval, echinate. Society Icas, but widely spread in the tropics.

**Mombin, Linn. (S. pitiparna, Linn.).** *Spouand Plnm.* Paraguay--Paraguana. Curiously, Small tree, sometimes spreading, but with up to 25 ft. in height; lvs. 5-8 in. long; lfts. 16-21, oblong-elliptic, 1-1½ in. long, ½ in. broad, usually somewhat symmetrical, acute or blunt, subacute or serrulate; panicle ½-1 ft. long, the lvs. yellowish white: fr. ovoid, yellow, 1-1½ in. long, the seed oblong-ovate, ½-5 in. long, smoothish, Cosmopolitan in the tropics.

**Pitanga, Linn. (S. Monimis, Jacq., not Linn.).** *Hooq Plum. Msmbin.* Joso. Caia. Tall, handsome tree, up to about 60 ft. in height: lvs. 8-12 in. long; lfts. 7-17, ovate-lanceolate or lanceolate, 2½-4 in. long, 1-1½ in. broad, subacute or serrulate; panicle ½-1 ft. long, the lvs. yellowish white: fr. ovoid, yellow, 1-1½ in. long, the seed oblong-ovate, ½-5 in. long, smoothish. Cosmopolitan in the tropics.

**Pitanga, Linn. (S. monimis, Jacq., not Linn.).** *Hooq Plum. Mombin.* Joso. Caia. Tall, handsome tree, up to about 60 ft. in height: lvs. 8-12 in. long; lfts. 7-17, ovate-lanceolate or lanceolate, 2½-4 in. long, 1-1½ in. broad, subacute or serrulate; panicle ½-1 ft. long, the lvs. yellowish white: fr. ovoid, yellow, 1-1½ in. long, the seed oblong-ovate, ½-5 in. long, smoothish. Cosmopolitan in the tropics.

**Pitanga, Linn. (S. Monimis, Jacq., not Linn.).** *Hooq Plum. Mombin.* Joso. Caia. Tall, handsome tree, up to about 60 ft. in height: lvs. 8-12 in. long; lfts. 7-17, ovate-lanceolate or lanceolate, 2½-4 in. long, 1-1½ in. broad, subacute or serrulate; panicle ½-1 ft. long, the lvs. yellowish white: fr. ovoid, yellow, 1-1½ in. long, the seed oblong-ovate, ½-5 in. long, smoothish. Cosmopolitan in the tropics.

**Pitanga, Linn. (S. Monimis, Jacq., not Linn.).** *Hooq Plum. Mombin.* Joso. Caia. Tall, handsome tree, up to about 60 ft. in height: lvs. 8-12 in. long; lfts. 7-17, ovate-lanceolate or lanceolate, 2½-4 in. long, 1-1½ in. broad, subacute or serrulate; panicle ½-1 ft. long, the lvs. yellowish white: fr. ovoid, yellow, 1-1½ in. long, the seed oblong-ovate, ½-5 in. long, smoothish. Cosmopolitan in the tropics.

**Tuberose, Arruda. Linn. Unm. Linn. Low, spreading tree, 25 ft. in height, with crooked roots: lvs. 4-6 in. long; lfts. 5-9, ovate-ovate, 1-1½ in. long, ½-1 in. broad, sharply acute to acuminate, cordate at base, entire: panicle 4-6 in. long, lfts. whitish: fr. ovate, light yellow, 1½ in. long, the seed oblong-ovate, slightly flattened, ½-5 in. long, smoothish. Brasil.**

*Cultivation and uses.*

The Otahatic-apple, *S. clyerea,* is said to have been introduced to Jamaica in 1782, and again in 1782 by the famous Captain Bligh, who brought the broad-fruit from Tahiti to the West Indies. It has not become popular in Cuba, nor is it very extensively grown on the mainlands of tropical America. In South Florida it succeeds well, and fine specimens can be seen at Miami and other points. In California it has not yet thrived, so far as known, and seems to be too tender for successful culture in any but the most favored locations. Some of the early travelers who visited Polynesia spoke of it in very high terms, and more recently it has been recommended as a worthy of cultivation by numerous writers. Firminger, however, likens it to a "very bad mango." Probably a great deal depends on the variety. At its best the fruit is the size of a lemon; it is of deep golden yellow color when ripe, aromatic, with a thin but tough skin surrounding the soft, juicy, yellow pulp. The seed is large and oval, furnished with long woody spines over its entire surface. The flavor is sprightly, subacid, aromatic, suggesting the pineapple, but sometimes resinous and disagreeable. It is eaten out of hand, and also used to prepare jams and preserves.

The Spanish plum, *S. Mombin,* is much more common in tropical America, and occurs in a large number of varieties, some of which are of excellent flavor and quality. In Cuba, where this fruit is cultivated, the different varieties are distinguished by the addition of such words as rota (red), amarilla (yellow), and the like. In Brazil the species seems to be a little known, but in Mexico and Central America it is widely grown. It is successfully cultivated in South Florida, but so far as known has never thrived in California, though it may be possible to grow it successfully in favored locations. The tree, which is much smaller than the Otahatie-apple, is deciduous during a portion of the year, as are the other species.

The fruit is oval, about an inch long, usually purplish red in color, with a bright yellow, very juicy pulp of aromatic, subacid flavor. It is used like the Otaheite-apple.

The hog-plum, *S. lutea,* is one of the least esteemed of the genus. Its fruits are slightly larger than those of *S. Mombin,* but of a rank, pungent flavor which is not especially agreeable. Jumelle says that it makes an excellent refreshing drink. The tree is handsome, and handsome, and is a conspicuous feature of many Cuban landscapes. *S. panama,* the hog-plum or amra of India, is scarcely known in America. Indian writers, who do not usually speak highly of it, state that it is used for pickles, preserves, and tarts. Firminger advises using it as a stock for *S. clyerea.*

The imbú of Brazil, *S. tuberosa,* is a little-known species introduced to the United States in 1914 by the Bureau of Plant Industry. Previous to this time it seems to have been unknown outside of its native home, but on the dry lands of interior northeastern Brazil (states of Bahia, Pernambuco, and so on) it is exceedingly abundant and the fruits are highly esteemed by the natives. Its tuberous roots are an adaptation to arid regions. The fruits are the size of large plums, with a pale yellow skin, soft, juicy pulp and a large, nearly smooth seed. The flavor slightly resembles that of a sweet orange, and is very agreeable. An excellent jelly is made from this species, and also a sweet custard called imbuzada, prepared by mixing the strained and sweetened pulp with boiled milk. For eating out of hand it is probably superior to the other species, with the exception of the best varieties of the Spanish plum.

This genus is of very simple culture. All the species are easily propagated by cuttings of large wood, which may be set in permanent locations immediately upon removal from the parent tree. Seeds can easily be grown in flats of light soil, covering them to the depth of an inch. They usually germinate within four to six weeks. Most of the species seem adapted to a variety of soils. They can readily be transplanted, but this is not often practised in this country because of the ease with which cuttings can be grown. Improvement of all the species should be carried on by means of selection.

F. W. Popenoe.

**Spore,** a reproductive detached cell of a cryptogamous or so-called flowerless plant, not containing an embryo as does a seed. Spores are the reproductive bodies of ferns, mosses, club-mosses, liverworts, fungi, and similar plants. They are of interest to the plant-grower mostly as the means of propagating ferns. For description, see *Ferns and Fungi:* also the articles on *Ferns,* in Vols. III, V, VI. For propagation by spores, see the discussion under *Ferns,* page 1221, Vol. III.

**Sporobolus** (Greek, *spora,* seed, and *ballein,* to cast forth, referring to the grain readily falling from the spikelet). *Gramineae.* *Dropsed.* Spikelets 1-fl., awnless, usually small, in narrow or open panicles. About 80 species, chiefly of Temp. and Trop. Amer., of little value. *S. cryptandrus,* Gray, a widely distributed annual, is considered a good forage grass; *S. Wrightii,* Munro, *Saccation,* of the alkali lands of the S. W. and of Mex., and *S. airoides,* Torr., an allied species. *S. Wrightii,* Link, a slender annual with minute spikelets in a delicate panicle, is offered as an ornamental by some seedsmen under the name of *Agrostis muniflora.* The species are little known horticulturally. A. S. Hirtencohn.

**Spraguea** (named for Isaac Sprague, of Cambridge, Mass., botanical artist, collaborator of Asa Gray). *Portulacaceae.* Dwarf half-hardy, perennial herbs, well adapted to the rockery: lvs. radical, spatulate, somewhat fleshy; the cauline minute, alternate.
stipules small and scarious: fls. ephemeral, in dense, scorioid spikes, umbellately clustered on scape-like peduncles; sepals 2, orbiculate-cordate, membranaceous-hyaline, persistent; petals 4; stamens 3; ovary free; caps. membranaceous, rounded-compressed, 2-valved; seeds black and shiny. — One, possibly 2 species, W. N. Amer.

UMBELLÀTÀ, Torr. Sts. several, simple, erect, 2-12 in. high: radical lvs. spatulate or ob lanceolate; the cauleine similar but smaller: fls. white, tinged rose, in a dense capitulate umbel of nearly sessile spikes; sepals connate; petals oblong-ovate. Late summer. Sierra Nevada, at 3,000-10,000 ft. altitude, from the Yosem ite valley to the British boundary, usually in sandy dry soils. B. M. 5143. May be treated as an annual. Var. caudicifera, Gray, is a subalpine form in which the caudex-like branches extend for a year or more (lvs. below dying away) and are at length terminated by scapes an inch or so in length. Desirable for rockwork and edgings.

F. TRACY HUBBARD.†

SPRING: Diseases and Insects, page 1057, Vol. II.

SPREKÈLIA (J. H. von Spreckelsen, of Hamburg, who sent the plants to Lindley). Amaryllidaceæ. JACOBÀN LILY. Half-hardy bulbous plants, generally grown in the greenhouse, often known as amaryllis: lvs. appearing late, strap-shaped-linear; scape hollow, cylindrical, 4-6 ft. long: fls. large, showy; perianth gaping, tube narrow, about 2 in. long, bifid at the tip; pedicel erect: perianth bright yellow to red, tubular, 3-valved.-One species, Mex. For cultivation, see Hippeastrum, with which these plants are sometimes confused.

F. TRACY HUBBARD.†

SPRING-GARDENING. The gardening instinct is at its height in spring. The turn of the season invites it, and the wealth of quick-growing plant-material is great. On the plant-growing side, nothing need be said here and the wealth of quick-growing plant-material is great.

SPRAYING: Diseases and Insects, page 2589, Vol. V.


SPURRY (Spergula sativa, which see) has long been grown in Germany, France, Holland, and Belgium, where it has been known as a soil-renovator and as a forage crop was early recognized. It is an annual, and when sown in the spring matures seed in ten to twelve weeks from time of sowing. This plant possesses special value as a renovator for sandy soils. It has long been used by the farmers of Holland to hold in place the shifting sands along the seashore. So well adapted is it to sand that it has been termed "the clover of sandy lands." It is not recommended for the American farmer except where the soil is so poor that other plants fail. In such circumstances it may be used as a cover-crop to plow under. The seed may be sown any time from April to August, but in orchards it would better be sown in July. Sow at the rate of six quarts to the acre. The seed being small, it should be lightly harrowed in upon a well-fitted soil. It is very persistent in the production of seed, and upon fertile soils it will maintain itself for several years unless thorough cultivation is given. Where soils are in fair condition and other crops will grow, it is doubtful whether spurry has any place. Sometimes written spurrey.

F. TRACY HUBBARD.†

STACHYS (from an old Greek name applied by Dios corides to another group of plants, coming from the word for spike). Labiatae. WOUNDWORT. Tall perennial herbs or diffuse annuals, rarely subshrubs or small shrubs, both greenhouse and hardy plants, little known to gardeners.

Leaves very entire or dentate, the floral lvs. similar or reduced to bracts: floral whorls 2- to many-fl., axillary or arranged in terminal spikes: fls. sessile or very short-pedicelled, purplish, scarlet, pale yellow, or white, small or sometimes showy; calyx tubular-campanulate, 5-10-nerved, 5-toothed; corolla-tube cylindrical included or exerted, limb 2-lipped, the posterior often villous outside; stamens 4: nutlets ovoid or oblong. — About 270 species, mainly in the temperate regions but a few in the tropical and colder regions, scattered all over the world. The arrangement followed in the sections and sequence of species is that of Briquet in Engler & Prantl, Pflanzenfamilien, IV. 4c: 260. Very few of the species are cult., although there are several with showy spikes. They are usually found in moist or even wet places when growing wild. A tuber-bearing species (S. sieboldii) has come into notice as a kitchen-garden plant.

F. TRACY HUBBARD.†
INDEX.

1. densiflora, Benth. (Betonica incana, Ait.). Perennial, 1 1/4 ft. high; sts. erect, hisrate; lvs. 2-3 in. long, petiolate, oblong-oblong, obtuse, crenate, base cordate, soft-pilose or more or less villous; floral lvs., lowest corolla-cordate, short-petioled: floral whorls approximate in a dense spike, lower whorls remote: calyx campanulate: corolla villos: white-lanate beneath; floral lvs. narrow lanceolate, obtuse, base cordate at the base, 3-6 in. long; upper lvs. distant, sessile, oblanceolate, acute: fls. purple, in a dense, terminal spike. July. Eu., Asia Minor. —Rarely found as an escape in this country, and once cult. for use in domestic medicine. Useful for ornament, and now advertised for that purpose. There are white-flld. forms of the species offered in the trade under the names of Stachys albitflora and S. Betonica albiflora and there is also a large-flld. form with soft rose-colored fls. known as S. Betonica grandiflora.

2. officinalis, Franch. (S. Betonica, Benth. Betonica officinalis, Linn.). Brevov. Fig. 3671. A hardy perennial herb 1-3 ft. high: lower lvs. long-petioled, ovate-oblong, obtuse, crenate, base cordate at the base, 3-6 in. long; upper lvs. distant, sessile, oblanceolate, acute: fls. purple, in a dense, terminal spike. July. Eu., Asia Minor. —Rarely found as an escape in this country, and once cult. for use in domestic medicine. Useful for ornament, and now advertised for that purpose. There are white-flld. forms of the species offered in the trade under the names of S. Betonica albitflora and S. Betonica grandiflora.

3. grandiflora, Benth. (Betonica rösca, Hort. B. speciosa, Hort. B. grandiflora, Willd.). A hardy perennial about 1 ft. high: lower lvs. broadly ovate, obtuse-crenate, long-petioled, base broadly heart-shaped: the upper gradually smaller, nearly similar and sessile, the uppermost bract-like: fls. violet, large and showy, the curving tube about 1 in. long and 3 or 4 times surpassing the calyx, in 2-3 distinct whorls of 10-20 fls. each. Asia Minor, etc. B.M. 700. G.M. 53:628. Var. robusta, Hort. (Betonica grandiflora robusta, Hort. B. speciosa robusta, Hort.), is said to have tufts of corrugated lvs., to grow 18 in. high and spikes 3 in. long of rosy pink fls.

290. Var. superba, Hort. (Betonica grandiflora superba, Hort. B. superba, Hort.), is said to have showy spikes of intense mauve or a rich shade of purple-violet fls. There is a white variant of this known in the trade as Betonica grandiflora alba.

4. longijflora, Benth. (Betonica orientalis, Linn.). A hardy perennial herb about 1 ft. high, densely villous: lower lvs. petiolate, oblong-lanceolate, obtuse, crenate, deeply cordate at the base, 4-6 in. long; the upper lvs. similar in shape but sessile, those of the infl. bract-like: fls. reddish purple to pink, in a cylindrical, somewhat interrupted spike about 1/2 ft. long. July. Caucasus.—Briot in Engler & Prantl’s Pflanzenfamilien has adopted macrostachys as the specific name, basing his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence his name on Betonica macrostachys, Wender.
9. **alpina**, Linn. Herbaceous, tall: st. erect, pilosely somewhat lanate; lvs. petioled, ovate, serrate-crenate, base cordate, both surfaces green or slightly canescent beneath; floral lvs. narrower, gradually smaller: floral whorls all remote, 10-15-fld.: calyx lanate, teeth ovate-lanceolate, very acute, spinose; corolla pink, spotted with purple, hairy; scarcely longer than the calyx. Himalaya region and N. Asia.—There is an older *S. sericea* (of Cavanilles), but its botanical status is unknown. It is a native of Chile.

**Section III. Eustachyos.**

**A. Species annual.**

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<tr>
<td>9. <strong>alpina</strong>, Linn.</td>
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<td><strong>B. Species perennial.</strong></td>
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<td>10. <strong>sericea</strong>, Wall. Herbaceous, tall: st. erect, very pilose: lvs. petioled, ovate or ovate-lanceolate, rather obtuse, crenate, base cordate, both surfaces villose, green above, pale or hoary beneath, the younger lvs. sericeous-lanate: floral whorls all distant, 10-15-fld.: calyx lanate, teeth ovate-lanceolate, very acute, spinose; corolla pink, spotted with purple, hairy; scarcely longer than the calyx. Eu.</td>
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<td><strong>C. Plant with a basal rosette, below which the flowering shoots arise.</strong></td>
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<td><strong>D. Angles of st. not retrose-hairy or prickly: annulus inside corolla, oblique, incomplete or even none.</strong></td>
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<td>12. <strong>Sieboldii</strong>, Miq.</td>
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<td><strong>E. Tubers lacking.</strong></td>
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<td>13. <strong>aspera</strong>, Mieh. Erect, usually strict, 3-4 ft. high, the st. retrose-hairy on the angles: lvs. oblanceolate to oblanceolate, mostly acuminate, serrate, petiolate; corolla small, glabrous, pale red or purple, in an interrupted spike. Wet places, Ont. and Minn. to the Gulf. L.B.C. 15:1412.—Has been offered by dealers in native plants.</td>
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<tr>
<td><strong>F. Lvs. ovate, deltoid-ovate or ovate-lanceolate, obtuse, cleft, nodose...</strong></td>
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<td>14. <strong>floridana</strong>, Shuttlew. Slender, erect, 1-2 ft. branching, glabrous: lvs. coriaceous-lanceolate, blunt-toothed, stalked: fls. small, light red, in an open interrupted spike: tubers cylindrical, uniformly nodose, 4-6 in. long. Fla.—Has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. No. 61), but practically unknown horticulturally. The tubers are as good for eating as those of <em>S. Sieboldii</em>.</td>
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**Subsection GENEROS.**

12. **Sieboldii**, Miq. *S. affinis*, Bunge, not Fresenius. *S. tuberifera*, Naudin. Chohog. Chinese or Japanese Artichoke. Known under the name *S. japonica* by the Chinese. Known as *S. sylvestris* in Europe. *S. Sieboldii*. (Fig. 3672) 2-3 in. long, slender, nodose, white, produced in great numbers just under the surface of the ground. China, Japan. G.C. III. 3:13.—Sent to France in 1882 from Pekin by Dr. Bretschneider, and about ten years ago intro. into this country. It iscult. for the crisp tubers, which may be eaten either raw or cooked. These tubers soon shrivel and lose their value if exposed to the air. The tubers withstand the winter in Cent. N. Y. without protection, so that a well-established plant takes care of itself and spreads. For history, chemical analyses, etc., see Cornell Bull. No. 37.

13. **aspera**, Mieh. Erect, usually strict, 3-4 ft. high, the st. retrose-hairy on the angles: lvs. oblanceolate to oblanceolate, mostly acuminate, serrate, petiolate; corolla small, glabrous, pale red or purple, in an interrupted spike. Caucasus and Asia Minor. Often grown as a bedding plant. Valuable for its very white herbage.

**Subsection RECtE.**

15. **recta**, Linn. *S. alyssoides*, Forsk.). Perennial: st. erect or ascending, about 2 ft. high; pilose: lvs. short-petioled, oblanceolate or lanceolate, obtuse, crenate, 1-1½ in. long, base rounded or narrowed, rugose, hairy: floral lvs. sessile: floral whorls about 10-fl., dist: calyx ovate-campanulate, hairy, teeth ovate, subspineous; corolla yellowish white, throat purplish, glabrous, twice as long as the calyx. S. Eu., Caucus. *Var. leucocarina*, Boiss. (S. leucocarina, Griseb.). Lvs. narrowly lanceolate, lower serrate, upper entire and linear: calyx somewhat seaboars, teeth as long as the tube. Caucus. **Subsection INFRACARLOES.**

16. **citrina**, Boiss. & Heldr. Subshrub, gray-canescence, pannose: lvs. 1-1½ in. long, all basal, long-petioled, elliptical, obtuse, base attenuate, entire or minutely crenulate; floral lvs. narrower: fls. in small terminal heads which are short-ovate, dense, the lower floral whors often subdistant and interrupted; calyx hirsute, campanulate; corolla sulfur-yellow, hirsute outside, included in the calyx. Greece, E.

**Subsection OILILE.**

17. **cirsica**, Pers. Fig. 3673. Slender prostrate pilose herb: lvs. about ½ in. long, petioled, ovate, very obtuse, broadly crenate, base rounded or subcordate; floral lvs. smaller: floral whors 2-4-fl., remote: calyx campanulate, hispid, teeth lanceolate, acute, subspiny; corolla pinkish white, twice as long as the calyx, the tube short-exserted. Medit. region.
STACHYS

STACHYS (Greek, spike and tail; in allusion to the form of the inflorescence). Stachydrus, formerly usually included in Thermophracta. Ornamental woodshrubs, not suited for their very early flowers and the handsome foliage.

Deciduous or evergreen shrubs or trees: Ivs. alternate, serrated, petioled; lfts. toothed; petals 4, imbricate; stamens 8 with slender filaments; ovary superior, incompletely 4-celled; style simple, with 4-lobed stigma: fr. a 4-angled capsule, containing small berry. - Five or possibly 6 species in Japan, China, and the Himalayas.

The species in cultivation are handsome shrubs with spreading branches, with medium-sized bright green, generally ovate to ovate-oblong leaves and pale greenish yellow flowerers in long pendulous spikes appearing early in spring before the leaves from the axils along last year's branches. They have proved hardy in sheltered positions as far north as Massachusetts, but the flower-buds which are formed in autumn and remain naked during the winter are killed by the frost, if not protected. They grow well in moderately moist well-drained soil. Propagation is by seeds or usually by softwood cuttings under glass and by layers.

praecox, Sieb. & Zucc. Fig. 3674. Shrub, to 12 ft.; young branchlets reddish brown or chestnut-brown and lustrous: Ivs. elliptic-ovate to ovate-lanceolate, acuminate, rounded at the base, serrate with somewhat spreading teeth, glabrous and lustrous beneath or slightly pubescent on the veins, 3-6 in. long; racemes 2-3 in. long: fls. campanulate, ½ in. long; style shorter than petals: fr. globose, ½ in. across, greenish yellow with red cheek. - Stachys praecox, Sieb. & Zucc. is offered in the trade, probably a hybrid form of S. grandiflora.

F. TRACY HUBBARD.

STANDARDS OF COLOR 3221

STACHYURUS (Greek, spike and tail; in allusion to the form of the inflorescence). Stachydrus, formerly usually included in Thermophracta. Ornamental woodshrubs, not suited for their very early flowers and the handsome foliage.

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F. TRACY HUBBARD.
STANHOPEA

STANHOPEA (named for the Earl of Stanhope, president of the Medico-Botanical Society, London). Orchidaceae. Epiphytic orchids easily grown and very interesting, but the fugacious character of their flowers has been unfavorable to their extensive cultivation.

Pseudobulbs clustered on the short rhizome, sheathed with scales and each bearing a single large plaited leaf. The flowers are produced on the thick scapes, which bore their way through the material in which they are planted and emerge from the bottom of the basket, large, fragrant, and curiously formed; sepals and petals usually reflexed, subequal or the petals narrower; labellum remarkably transformed, basal part or hypochil boat-shaped or saccate, often with two horns on the upper margin, passing gradually into the mesochil, usually fleshy and keeled but not saccate, base of the labellum continuous with the long-winged column.—About 50 species inhabiting Trop. Amer. from Mex. to Brazil. The flowers expand with a perceptible sound early in the morning.

Stanhopeas enjoy a shady, moist location. A temperature of 60 to 80°F. at night and 70 to 75°F. during the day should be maintained in winter, with a gradual advance of 10°F. toward midsummer. They should be grown suspended from the roof in orchid cubicles or terracotta baskets with large openings at the bottom, and adequate drainage is used it should be placed in such a manner that it will not interfere with the exit of the pendulous flower-scapes. Equal parts chopped sphagnum and peat fiber forms a good compost. By severing the rhizome here and there between the old pseudobulbs, new growths will be sent up and thus the stock may be increased. (R. M. Grey.)
INDEX.

S. Bucephalus, 5.

**KEY TO THE SPECIES.**

A. Labellum with an excavated or saccate base and a terminal lobe.

B. Mesochilus and pleuridia wanting: 1. aurea

BB. Mesochilus and pleuridia present: 2. Bucephalus

CC. Hypochil boat-shaped, short and sessile: 3. oculata

DD. Fls. pale yellow: 4. platyceras

EE. The hypochil purple or crimson: 5. Bucephalus

FF. Not purple; middle lobe triangular: 6. insignis

GG. The hypochil not spotted; purple ple; middle lobe ovate: 7. Shuttleworthii

HH. The hypochil with an excavated or saccate base and a plane terminal lobe: 8. devoniensis

II. Saccata, 11.

AA. Labelum reduced to a saccate pouch: 12. eburneia

1. *eburnea*, Lindl. (*S. grandiflora*, Lindl *S. calcicola*, Hort.). Pseudobulbs conical, 1½ in. long; Ivs. leathery, 8–12 in. long; scape pendulous, with small bracts 2–3-fld.: fls. 5 in. across, ivory-white; sepals broadly ovate, 3 in. long, solid, fleshy, excavated at the base and bearing 2 hooked horns over the mouth, spotted above with reddish purple; column pale green, with broad wings toward the apex; Guiana. B.M. 3359. B.R. 1529. I.H. 14: 531 (as var. aurea, Lindl.). Fls. golden yellow, with 2 dark purple; middle lobe orange; sepals Apted-marked with large crimson spots; lateral sepals round-oblong, concave, acute; petals lanceolate, revolute, the cavity in the base of the labellum deep velvety purple. Aug. Mex. and S. B.M. 5289. Gn. 51, p. 28. C.O. 2. Var. *aurea*, Hort. (*S. aurea*, Lodd.). Fls. golden yellow, with 2 dark spots on the hypochil. *Fragrant.*

2. *Wardii*, Lodd. Pseudobulbs 2 in. long; Ivs. large, broad, and leathery; fl.-st. 9 in. long. Bearing 3–9 fls., which are bright yellow to golden orange, spotted with crimson; upper part of the labellum colored like the sepals. B.M. 3359. B.R. 1529. I.H. 14: 531 (as var. calcicola, Lindl.). L.B.C. 15:1414 (as Ceratochilus grandiflorus).

3. *oculata*, Lindl. (*S. guttulata*, C. Koch). Fig. 3676. Lvs. ovate, with a blade 1½ ft. long; scape 1 ft. long, clothed with scarios yellow brown sheaths, 3–6-fl.; fls. 5 in. across, very fragrant, pale yellow, thickly spotted with purple; sepals 3 in. long, reflexed; petals half as large; hypochil narrow, white, spotted with crimson and having 2 large dark brown spots near the base. Mex. B.M. 5300. B.R. 1800. L.B.C. 18:1764 (as Ceratostilus oculatus). S.H. 2, p. 435. G.C. III. 19:264; 43: 19; 44:115; 52:121. J.F. 3:369–10. C.O. 6.—There are several varieties, differing in color and markings. Fig. 3676 is from an article by Safford on "Sacred Flowers of the Aztecs," named "the serpent-head orchid," in The Volta Review.

4. *platyceras*, Reichb. f. Pseudobulbs and Ivs. as in *S. Bucephalus* but stouter: scape 2-fl., with ovate acute bracts half as long as the ovary; fls. 7 in. across, pale yellow, with numerous ring-shaped spots and blotches of purple; sepals triangular-oblong; petals broadly linear, acute; hypochil boat-shaped, 2½ in. long; horns 1 in. long, broad, pointing forward, parallel with the tongue-shaped middle lobe; the hypochil is deep purplish crimson inside, paler and spotted outside, the upper part of the labellum colored like the sepals. Colombia. Gn. 33:534.

5. *Bucephalus*, Lindl. (*S. grandiflora*, Reichb. f.). Pseudobulbs crowded, rugose; Ivs. petioled, 9 in. long, pointed; the pendulous raceme bearing 4–6 large, tawny orange fls. marked with large crimson spots; sepals and petals reflexed, the former broad; lower part of the labellum curved, boat-shaped, bearing 2 curved horns and a broad fleshy middle lobe; column green and white, spotted with purple. Aug. Mex. Peru. B.M. 5278; 8517. B.R. 31:24.—Fls. very fragrant. Distinguished by its very short ovaries.

6. *insignis*, Frost. Figs. 3677, 3678. Pseudobulbs clustered; Ivs. broadly lanceolate; scape 6 in. long, covered with dark brown scales, 2–4-fl.: fls. 5 in. across, dull yellow, spotted with purple; sepals broad, concave; petals narrow, narrow; hypochil globose, almost wholly purple inside, heavily spotted outside, horns 1 in. long, falcate, middle lobe coruscate, keeled. July–Oct. Brazil. B.M. 2948, 2949. B.R. 1837. L.B.C. 20:1985. Gng. 2:117 (from which Fig. 3677 is adapted). G.W. 12, p. 283.—Marked by broad wings of column.

7. *Shuttleworthii*, Reichb. f. Pseudobulbs large, conical, sulcate: Ivs. broadly oblong, acute; raceme pendulous, loose; Ivs. petioled, with large brown spots near the base; the middle lobe concave; column white, crimson; horns flattened, suberect, terminal lobe triangular; column white, green along the middle and spotted with purple in the inside. Colombia.

8. *devoniensis*, Lindl. (*S. maculosa*, Knowles & Westc.). Lvs. about 9 in. long; scape pendulous, 2–3-
fd.: fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepals oblong to oval-oblong, obtuse; petals narrow; hypochil rounded, ovate, purple, horns incurved, middle lobe ovate, channelled, obscurely 3-toothed. Peru. F.S. 10:974. F.C. 3:121.


11. saccata, Batem. Fls. smaller than those of the other species, greenish yellow, changing to deeper yellow at the bases of the segments, regularly speckled with brown; lateral sepals ovate-oblong, the upper one oblong-lanceolate; petals narrower, oblong, all reflexed; hypochil deeply saccate; horns flat, a little twisted, epichil flat. Mexico. Gen. & J.H. 8:270 (as S. radiata). Sepals and petals yellow, with numerous small purple blotches, the sepals elliptic-oblong, acute, the petals linear-oblong, acute, undulate; lip yellowish white, purple-spotted at base and on epichil, the hypochil with a dark black-purple eye-like spot on each side; the inside the same color, the epichil ovate-orbicular. Origin unknown.—S. persoonii, Rolfe. Fls. golden yellow; sepals obtuse, the dorsal oval, the lateral obliquely and broadly ovate; petals linear-oblong, revolute; lip with the hypochil suffused dark purple on sides; epichil obscurely ovate, purple-spotted. Peru. B.M. 8417.—S. radiata, Rolfe. Fls. ivory-white, faintly shaded yellow on lip; sepals elliptic-oblong, acute; petals lanceolate-oblong, acute, up with the hypochil pubescent inside, the epichil triangular, acute. Brazil.—S. Redigipila, Casse. Fls. about 6 in. across; sepals spreading, oblong-ovate, purplish-mottled below, maroon-mottled above; petals triangular-lanceolate, attenuate above, pale green; lip very fleshy, the hypochil suffused with maroon-purple below; the remaining blotched; epichil reticulated, triangular, obtuse, spotted with dull purple. Colombia. B.M. 7702. F.S. 41:492. G.C. III. 24:51.—S. Ruckeri, Lindl. Resemblance to S. Wards in color, but paler; hypochil obtuse; epichil stained pink. Mex. A.P. 6:831.—S. stenochilus, F. G. Lohm. & Krau. Seeds purplish white; petals apricot-colored, with purplish blotches; lip ivory-white at base, middle and interior parts yellow. Colombia.—S. Wasseriana, Hort. Var. saccata, S. tigrida. Fls. dull straw-color or pale orange; sepals obscuredly marked with wine-red, the spots on the petals larger. G.C. III. 38:102.

STANLEYA (named for Edward Stanley, Earl of Derby, 1779–1849). Cruicifera. Glauous glabrous perennials, similar to arrakis in habit, suitable for the flower-garden; lvs. undivided or pinnatifid; racemes elongated, strict, many-fl.: fls. yellow, buds elongated, sepals short, spreading; petals narrow, distinctly clawed: siliqua long-elliptiptate, slender, 4-cornered or rather terete, compressed, valves carinately 1-nerved.—About 10 species, Calif.

pinnata, Brit. (S. pinnatifida, Nutt.). Sts. flexuous; sepals very variable, sometimes pinnatifid; sepals lanceolate-oblong or obovate-oblong, rarely linear, almost entire; terminal segment larger: fls. deep golden yellow, according to D. M. Andrews. May–July. W. Kans. and Neb. to Texas and S. Calif., in dry clay or alkaline soils, against the column; sepals extended horizontally. Trop. Amer.—S. Liliacea, Rolfe. Sepals and petals creamy buff, the latter banded; lip ivory-white, the hypochil striped with dull maroon. Colombia. G.M. 36:192. G.C. III. 24:153.—S. Madagascariensis, Cogn. Fls. fragrant, 5–7 in. across; sepals and petals cream-white, the sepals with purple edge, the petals linear-oval, obtuse, undulate; lip yellowish white, purple-spotted at base and on epichil, the hypochil with a dark black-purple eye-like spot on each side; the inside the same color, the epichil ovate-orbicular. Origin unknown.—S. persoonii, Rolfe. Fls. golden yellow; sepals obtuse, the dorsal oval, the lateral obliquely and broadly ovate; petals linear-oblong, revolute; lip with the hypochil suffused dark purple on sides; epichil obscurely ovate, purple-spotted. Peru. B.M. 8417.—S. radiata, Rolfe. Fls. ivory-white, faintly shaded yellow on lip; sepals elliptic-oblong, acute; petals lanceolate-oblong, acute, up with the hypochil pubescent inside, the epichil triangular, acute. Brazil.—S. Redigipila, Casse. Fls. about 6 in. across; sepals spreading, oblong-ovate, purplish-mottled below, maroon-mottled above; petals triangular-lanceolate, attenuate above, pale green; lip very fleshy, the hypochil suffused with maroon-purple below; the remaining blotched; epichil reticulated, triangular, obtuse, spotted with dull purple. Colombia. B.M. 7702. F.S. 41:492. G.C. III. 24:51.—S. Ruckeri, Lindl. Resemblance to S. Wards in color, but paler; hypochil obtuse; epichil stained pink. Mex. A.P. 6:831.—S. stenochilus, F. G. Lohm. & Krau. Seeds purplish white; petals apricot-colored, with purplish blotches; lip ivory-white at base, middle and interior parts yellow. Colombia.—S. Wasseriana, Hort. Var. saccata, S. tigrida. Fls. dull straw-color or pale orange; sepals obscuredly marked with wine-red, the spots on the petals larger. G.C. III. 38:102.

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Stapelia, also known as devil's Tongue, is a genus of about 60 species of mostly succulent flowering plants belonging to the family Asclepiadaceae. These plants are native to Southern Africa, where they grow in semi-arid environments.

**Key Features**
- **Flowers**: Typically large, brightly colored, and often fragrant. They are usually solitary and open during the day.
- **Leaves**: Absent or reduced, often spinescent or tubular, with a range of colors from green to deep purple.
- **Stems**: Stems are usually thick and fleshy, often with a network of white or yellowish tubercles and excrescences.
- **Flowering**: Flowers are often unusual and grotesque, with a variety of shapes and colors.
- **Propagation**: Propagated easily by cuttings.

**Species**
- **Stapelia hirsuta**: One of the most common species, with a foot-wide flower that is usually white or yellow with purple spots.
- **Stapelia nobilis**: A species with flowers that are generally yellow, white, or purple with a distinct raised ring on the disk.
- **Stapelia gigantea**: Characterized by a large flower, up to 12 inches in diameter, with petals that can be pink, purple, or white.
- **Stapelia variegata**: Known for its distinctive coloration and variegated appearance, often with yellow and orange hues.

**Flowering Season**
Most of the stapelia species demand the same treatment as cacti, with a dry position during the growing and blooming seasons. They prefer a soil made porous with rubble. They are mostly self-fertilizing, but they can be propagated easily by cuttings. Some of the species have fleshy stalks, while others are relatively small. In fact, the flowers of St. gigantea are a foot across.

**Flower Description**
- **Corolla**: The corolla of most species has a distinct raised ring, which is visible when the flower is in bloom. The corolla is often composed of 5 parts, with the center of the disk cup-shaped.
- **Stamens**: Stamens are usually whorled spirally, with the anthers often grooved or ridged.
- **Pedicels**: Pedicels are often short and thick, sometimes slightly humped at the base.

**Flower Colors**
Colors can vary widely among species, including yellow, white, pink, purple, and even orange. Some species have a unique color pattern, such as the mottled or barbed appearance of some species.

**Propagation**
- **Cuttings**: Cuttings are the most common method of propagation for stapelia. They should be taken from healthy, mature plants and inserted into a soil mixture that is well-drained and slightly alkaline.
- **Watering**: Watering should be done sparingly, especially during the winter months, to prevent the development of rot.

**Cultivation Tips**
- **Temperature**: Preferable temperatures range from 70°F to 90°F (21°C to 32°C) during the growing season.
- **Light**: Full sunlight is necessary for the best development of flowers.

**Uses**
- **Ornamental**: Stapelia are popular in both amateur and professional collections due to their unique and colorful flowers.
- **Medicinal**: Some species have been used traditionally for medicinal purposes, although scientific evidence is limited.
dull green, angles much compressed; fls. 1 or 2 together, near the base or toward the middle of the sts.; corolla 11-16 in. diam., disk-like, center shallowly depressed, inner surface transversely rugose, pale-purple-hairy, light ochre-yellow, everywhere marked with transverse crimson lines, lobes 0-3/4 in. long. Trop. and S. Afr. B.M. 7968. G.C. II. 7: 693; III. 4: 729. G.F. 8: 515. —"The requirements of S. gigantea," Watson writes, "are somewhat exceptional. It thrives only when grown in a hot, moist stove from April till September, with the glass roof and the flower-buds show it should then be hung up or placed upon a shelf near the roof-glass in a sunny dry position in the stove."

4. nóbiis, N. E. Br. Sts. erect, decumbent and branching at base, 3-5 in. high, sides concave, softly pubescent, green: fls. 1-5 together, near the base or middle of the young branches; corolla very large, with a distinct campanulate tube about 1 3/4 in. deep, lobes 2 3/4-4 in. long, light reddish purple on the back, inner face transversely rugose, light ochre-yellow everywhere marked with irregular transverse crimson lines. S. Afr. B.M. 7968.

5. tsoeménsis, N. E. Br. Sts. 4-6 in. high, angles compressed and somewhat repand-dentate, opaque green: fls. 4-9 together, near the base of the young sts.; corolla 2 1/2-3 in. diam., outside glabrous, light green, inside with a few raised transverse ridges on the upper half of the lobes, entirely dull smoky purple, darker at the tips of the lobes. S. Afr. B.M. 7968.


7. glabriofóra, N. E. Br. (S. glabriofóla, Bailey, error. S. grandiflora var. minor, Hort.). Sts. erect, 4-9 in. high, puberulous, green, angles much compressed: fls. 1-2 together at the middle or lower part of young sts.; corolla 3-4 1/4 in. diam., velvety on the back, transversely rugose and quite glabrous on the inner face, not ciliate, dull reddish purple, darker at tips of lobes, with surface transversely marked with very narrow linear, irregular yellowish white lines. S. Afr. G.C. II. 6: 809; III. 44: 186.

8. ñímilis, N. E. Br. Sts. erect, 3-6 in. high, 4-6 angled, minutely puberulent, dull purple or gray-green, pubescent; angles somewhat denticate: fls. 3-5, born on the older sts.; corolla rotate, less than 1/2 in. diam. outer surface minutely pubescent, inside transversely rugose, glabrous, not ciliate, dark purple, lobes ovate, acute. S. Afr.

9. bèlla, Berger. Sts. erect, branching at or above the base, 5-7 in. high, sides concave, minutely pubescent, dull green: fls. 3-4 together at the base of the young sts.; corolla 1 1/2-2 in. diam., glabrous inside and out, inner face deep purplish red, browner toward the tips of the lobes, paler at the center, the small tube white, length of tube not marked, ciliate on the lobes. A hybrid of European raising. G.C. III. 31: 138; 44: 108.

10. mutábatis, Jacq. Sts. 3-18 in. high, acutely 4-angled, with rather stout conical, spreading teeth, glabrous, green, sometimes tinged with purple, slightly glaucous: fls. 1-3 together, from near the base of the younger or higher up on the older sts.; corolla with lobes very much recurved and then about 1 3/4 in. diam., glabrous on both surfaces, inner face slightly rugose to nodose, outer surface of the tube flat, reddish purple, dark purple-brown, the remainder pale yellowish or greenish yellow, covered with transversely elongate spots or thick or narrow, irregular transverse purple-brown lines. S. Afr. Var. discolor, N. E. Br. (S. discolor, Tod.). Corolla dark purple-brown with inconspicuous yellowish transverse lines on parts of the disk; annulus yellow with irregular purple lines. S. Afr.


12. puclhélia, Mass. Sts. 2-4 in. high, erect or decumbent at base, obtusely 4-angled, glabrous, green: fls. usually 3 or more together, near the base of the sts.; corolla 1 1/4-2 1/4 in. diam., smooth on the back, minutely tuberculate-rugulose and glabrous inside, not ciliate, sulfur-yellow, covered with numerous purple-brown dots. Lobes sometimes narrowly edged with purple-brown. S. Afr.

13. namaquénisis, N. E. Br. Sts. procumbent or decumbent, 1 1/2-3 1/4 in. high, obtusely 4-angled, with very stout, acute, conical spreading teeth, glabrous, green, sometimes tinged with purple, marked with irregular transverse ridges on the back, minutely pubescent, near the base or toward the middle of the young sts.; corolla 3-4 in. diam., back smooth and glabrous, inner surface very much transverse with rose-purple papillate ridges on the lobes which are 1-1 1/4 in. long, yellow, dotted with purple-brown. S. Afr. Var. ciliolicáta, Ruest. (Not Tod.). Corolla shortly ciliate, with simple or subclavate white or yellow and dark purple hairs mixed, spotting variable.


S. dióaméns, Spranger. A hybrid with partly whithat sts.; corolla 2 1/2-3 in. diam., dark purple-brown at the tips of the lobes, otherwise yellow with purple-brown transverse lines.—S. asterénsis, Mass. Stanislaus Flower. Dwarf; sts. mostly curved; corolla 4 in. diam., with spreading star-like segms.; violet-purple with transverse yellow-brown bars. B. M. C. 453 — S. ástrosanguinea, N. E. Br., with intense blackish crimson fls. in reality a Calatúnuma. C. ástrosanguinèn, N. E. Br.—S. antáctary-inalis, Berger (S. hybrida c antiáctariae). Hybrid; corolla 6 1/4-8 lines across, broadly campanulate, glabrous, suffused with red outside, brown-red inside, rather densely covered with red-brown bars.—S. Cáriló-Schmidtii is offered in the German trade.—S. cíndrella, Hort.—Echinoopsis cíndrella.—S. disígena, N. E. Br. Hybr. corolla about 2 in. diam.; inner surface rather densely rugose, itlagen yellow, marked with brownish crimson lines.—S. Magliríás, Schlecht. Fls. subcory; corolla dark brown, inner surface with small transverse, purple-purple spots or short lines, narrowly edged with the same color.—S. Shlecht. f. S. erect from a decumbent base, 3-5 in. high, corolla large, campanulate, tube 2-2 1/2 in. long, 1 3/4-2 1/4 in. across, dull fuscous-purple. Trans-
STAPHYLIA (Greek, staphyle, cluster, referring to the inflorescence.) Staphyleaceae, formerly referred to the Celastraceae. **Bladder-Nut.** Ornamental woody plants chiefly grown for their attractive white flowers and for their handsome foliage, and also for the inflated pod-like fruit. 

Deciduous shrubs or small trees, with smooth striped bark: lvs. opposite, 3-7-foliolate; lfts. serrulate, like the lvs. stipulate: fls. perfect, 5-merous in terminal panicles; sepals and petals 5, of about the same length, upright; stamens 5; pistils 2, usually connate below: fr. a 3-seeded, inflated, multilocular capsule, with a few subglobose rather large, bony seeds in each cell. 

Eleven species in the temperate regions of the northern hemisphere. 

The bladder-nuts are upright shrubs or small trees with handsome bright or light green foliage and ornamental white or pinkish flowers in nodding clusters followed by bladder-like fruits conspicuous by their size and pale green color. The species are all inhabitants of temperate regions, and S. holocarpa and S. pinnata are hardy North, while S. colchica, S. Bolanderi, and S. holocarpa are hardy at least as far north as Massachusetts; S. emodi is more tender and seems not to be in cultivation in this country. They are all desirable shrubs and flowers in early summer after the leaves except S. holocarpa which blooms in spring before or with the leaves. They are well adapted for shrubbery, but all except S. Bumalda are liable to become bare and unsightly at the base and are therefore not to be recommended for single specimens. S. holocarpa is perhaps the most beautiful species in bloom; also S. elegans, S. colchica, and S. Bumalda have very handsome flowers. S. colchica blooms at an early age and is sometimes forced, but S. holocarpa is probably evergreen and adapted for that purpose. Staphyleas grow well in almost any kind of soil and position, but do best in a somewhat moist rich earth and partly shaded situation. They are always interesting although not showy. Propagation is by seeds, layers, and suckers. Greenwood cuttings from forced plants root readily. 

**A.** Lvs. 5-7-foliolate, only occasionally 3-foliolate: panicles stalked. 

**b.** Panicle raceme-like, oblong, pendulous: fls. buds subglobose. 


**b.** Panicle broad, upright or nodding: fls. buds obovate-oblong. 


**AA.** Lvs. 3-foliolate. 

**b.** Middle lft. short-stalked, stalk ½ in. or less long: panicles sessile. 

**Bumalda, DC.** Shrub, 6 ft. high, with upright and spreading slender branches: lfts. broadly oval to ovate, shortly acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1½-2½ in. long: fls. about ½ in. long, in loose, erect panicles 2-3 in. long; sepals yellowish white, little shorter than the white petals: caps. usually 2-lobed, somewhat compressed, ¾-1 in. long. June. Japan. S.Z. 1:95. 

**bb.** Middle lft. slender-stalked: panicles stalked. 

**c.** Pls. after the lvs. 

**trifolia, Linn.** American Bladder-Nut. Fig. 3680. Upright shrub, with rather stout branches, 6-15 ft. high: lfts. ovate to ovate-acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1½-3 in. long: fls. about ½ in. in long, nodding panicles or umbel-like racemes: sepals greenish white, petals white: caps. usually 2-3-lobed, 1½-2 in. long. April, May. Que. to Ont. and Minn., south to S. C. and Mo. Gn. 37, p. 529. Var. punctiflora, Zabel. Low and suckering: lfts. smaller, broader, glabrous at length: fls. in short, 3-8-fld. racemes: fr. often 2-lobed, 1½-1½ in. long. 

**Bolanderi, Gray.** Fig. 3681. Shrub: lfts. broadly oval or almost orbicular, acute, sharply serrulate, glabrous, 2-3 in. long: fls. in many-fld. nodding panicles; stamens and styles exserted: fr. 3-lobed, much inflated, 2-3½ in. long. Calif. in the Sierra Nevada region. G.F. 2:545 (adapted in Fig. 3681). R.H. 1910, p. 305.—A rare shrub, probably not regularly in cult. 

**cc.** Pls. before the lvs. 

**holocarpa, Hems.** Shrub: or small tree, to 25 ft.: lfts. 3, oval to ovate-oblong, short-accuminate, serrate, pale and reticulate and glabrous or nearly so beneath, 2½ in. long: fls. white or pinkish, nearly ½ in. long, in glaucous slender-stalked panicles 1-4 in. long, axillary on last year's branchlets: fr. pear-shaped or ellipsoidal, abruptly acuminate or sometimes lobed at the apex, 1½-2 in. long; seeds light grayish brown, lustrous, ¼ in. long. Cent. China.—Very floriferous and handsome. The name has been misspelled S. holocarpa. Var. rosea, Rehd. & Wilson. Lfts. whitish tomentose beneath while young, later villous along the midrib beneath only: fls. pink, ½ in. long. Cent. China. 

**s. elegans, Zabel.** Intermediate between and supposed to be a hybrid of S. pinnata and S. colchica: lfts. usually 5; panicles very
STAPHYLEA

large and nodding. A very free-flowering variety with pinkish tinged fls. in var. 'Rosea' Zabel.—S. cerasifera Wall. Shrub or small tree: Ht. 3, oval to oblong, 2-6 in. long; stalk of terminal fl. about 1 in. long; fls. in peduncled, pendulous, raceme-like panicles; fr. 2-3 in. long; Himalayas.

ALFRED REHDER


STÁTICE (Greek name meaning astringent, given by Pliny to some herb). Syn. Armeria, Auth., not Linn. (see Vol. I, p. 298). Plumbaginaceae. Sea-Pink. Thrift. Interesting hardy border perennials, biennials, and annuals useful for both the many-flowered bright inflorescences and the stiff more or less evergreen foliage; flowers blue, lilac, white, yellow.

The genus Statice as defined by Linnaeus, "Genera Plantarum," ed. 5 (1754), is based on Statice, Toum., the same as var. Leuconora, Rubb.

INDEX TO STATICE.

A. Calyx produced into a spur.
B. Buds between the fls. small, scarcely exceeding the fruiting pedicles...
C. Calyx not produced into a spur.
D. Tube of calyx usually pilose all over.
E. Inner lvs. of the calyx-tube.
F. Apex of lvs. rather acute...
G. Involucr. pale brown, showy...
H. Involucr. green...
I. Tube of calyx glabrous or pilose only on the ridges.
J. Spikes setitate inside the involucr.
K. Spikes sessile inside the involucr.
L. Exterior lvs. of the rosette diffrering from the others.
M. Involucr. pale brown...
N. Involucr. white, showy...
O. Exterior lvs. of the rosette the same as the others.
P. Involucr. green...
Q. Involucr. dull brown...
R. The lvs. 3-cornered in cross-section...
S. Cespitosa
T. The lvs. 5-cornered in cross-section...
U. semi-evergreen character; of the tufted foliage also adds much interest. The plants are easy to grow, remaining for some years when well established, rooting deep. Usually grown from seed.

KEY TO THE SPECIES OF STATICE.

A. Calyx produced into a spur.
B. Buds between the fls. small, scarcely exceeding the fruiting pedicles...
C. Calyx not produced into a spur.
D. Tube of calyx usually pilose all over.
E. Inner lvs. of the calyx-tube.
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Q. Involucr. dull brown...
R. The lvs. 3-cornered in cross-section...
S. Cespitosa
T. The lvs. 5-cornered in cross-section...
U. semi-evergreen character; of the tufted foliage also adds much interest. The plants are easy to grow, remaining for some years when well established, rooting deep. Usually grown from seed.

STÁTICE (Greek name meaning astringent, given by Pliny to some herb). Syn. Armeria, Auth., not Linn. (see Vol. I, p. 298). Plumbaginaceae. Sea-Pink. Thrift. Interesting hardy border perennials, biennials, and annuals useful for both the many-flowered bright inflorescences and the stiff more or less evergreen foliage; flowers blue, lilac, white, yellow.

The genus Statice as defined by Linnaeus, "Genera Plantarum," ed. 5 (1754), is based on Statice, Toum., the same as var. Leuconora, Rubb.

INDEX TO STATICE.

A. Calyx produced into a spur.
B. Buds between the fls. small, scarcely exceeding the fruiting pedicles...
C. Calyx not produced into a spur.
D. Tube of calyx usually pilose all over.
E. Inner lvs. of the calyx-tube.
F. Apex of lvs. rather acute...
G. Involucr. pale brown, showy...
H. Involucr. green...
I. Tube of calyx glabrous or pilose only on the ridges.
J. Spikes setitate inside the involucr.
K. Spikes sessile inside the involucr.
L. Exterior lvs. of the rosette differing from the others.
M. Involucr. pale brown...
N. Involucr. white, showy...
O. Exterior lvs. of the rosette the same as the others.
P. Involucr. green...
Q. Involucr. dull brown...
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StaTICATE

Hoff., not Hook.). The name pseudoarmeria has also been used for two other species, but the Murray definition applies to this species and his is the oldest use of the name.

14. S. undulata, Bory & Chaub. (Armeria undulata, Boiss. A. argyrocephala, Wallr.). The following species and varieties, all of which are in the trade, are not included under Armeria in Vol. 1. According to Otto Kuntze and others there is but one species of Statice, A. armeria, all the others being variants of this polymorphic species. The great confusion in synonymy seems to uphold this view to some extent and it is certainly questionable whether the varieties of S. armeria, S. plantaginea, and S. pseudoarmeria are all of them distinct.

1. S. fasciculata, Vent. (Armeria fasciculata, Willd.). Glabrous, subsucculent at base; lvs. glaucous, linear, camellate, thick, stiff and pointed; involucral lvs. in several rows, fuscous, triangular-ovate, the inner ones white-margined; fls. pale pink. Spain, Corsica, and Sardinia.—The lvs. are somewhat yucca-like.


3. S. armeria var. variegata, Hubb. (Armeria maritima var. variegata, Hort.), forms compound masses of bright golden foliage and has heads of rose fls.

4. S. labrad6rica, Hubb. Port., equals A. bella, Boiss.; consists of bright golden foliage and has heads of rose fls. Var. grandi­flora, Hart., has white fls. Var. grandijlora, Little- or an(Jled above, branch Ids aJtiC-date. About 180 species well scattered about the world, but mainly alpine species—with bright rosy crimson fls.


6. S. armeria var. alba, Hubb. (Armeria armeria var. alba, Hort.). Leaves usually radical and tufted especially, in the herbaaceous species, generally rather long, alternate along the st. in the shrubby species, linear, spathulate oblong or oblanceolate, sometimes punctate or dissected; fls. blue, lavender, white, red, or yellow, in little- or much-branched panicles, borne on a leafless peduncle or scape; bracts subtend the 1-cluster scale-like, somewhat clasping, usually coriaceous on the back, and with membranous margins, usually with 1 or 2 fls. in their axis, sometimes with dense brownish to several-fl. spikelets; calyx funnel-shaped, often colored, usually the showy part of the fl., and scarious or persisting.—About 180 species well scattered about the world, but mainly sequested plants of the northern hemisphere and especially numerous in Asia. Limonium is of many exact species, but many of them occurs in the trade-life and are probably not in it.

7. S. plantaginea var. alba, Hubb. (Armeria plantaginea var. álba, Hort.), grows 1 ft. high and has white prf~f~r

8. S. plantaginea var. alba, Hubb. (Armeria plantaginea var. álba, Hort.), has large heads of white fls., 1 ft. high. Var. gigantea, Hubb. (Armeria plantaginea var. gigantea, Hort.), grows 3 ft. high, has rigid sts. and large heads of glistening pink fls. Var. grandiflora, Hubb. (Armeria plantaginea var. grandiflora, Hort.), grows 1 ft. high and has large crimson fls. Var. rósea, Hubb. (Armeria plantaginea var. rósea, Hort.), grows 1 ft. high and has pink fls. Var. rúbra, Hubb. (Armeria plantaginea var. rúbra. Hort.), grows 1 ft. high and has red fls. Var. splendens, Hubb. (Armeria plantaginea var. splendens, Hort.), grows 1-1/2 ft. high and has brilliant rose-colored earlier fls. May, June.

9. S. pseudarmerias. var. álba, Hubb. (Armeria cephalotes var. álba, Hort.), has white fls. Var. grandiflora, Hubb. (Armeria cephalotes var. grandiflora, Hort.), grows 1½ ft. high and has large heads of rose-colored fls. Var. rúbra, Hubb. (Armeria cephalotes var. rúbra, Hort.), has rosy red fls. Var. splendens, Hubb. (Armeria cephalotes var. splendens, Hort.), grows about 1½ ft. high forming large tufts of foliage and has large heads of vivid rose fls.

10. S. majellénisis, Hubb. (Armeria majellénisis, Boiss.). Cespitose, glabrous, base hardened; sheaths persistent, spreading squarrose; lvs. spreading to somewhat recurved, short, stiff, rather broad-linear, margin cartilaginous, folded to channelled, obtuse, 3-nerved: scales medium height; heads large; involucres few­ered, pale. Italy.


12. A. armeria var. riibra, Boiss. (Armeria armeria var. riibra, Boiss. A. splendens, H. & A. Albuli, not Hook.). Cespitose, base hardened: sheaths withering: lvs. spreading to somewhat recurved, short, stiff, rather broad-linear, margin cartilaginous, folded to channelled, obtuse, 3-nerved: scales medium height; heads large; involucres few­ered, pale. Italy.


Subsection 11. VERNONIUM.

Section 1. PSEUDOLACUS.

a. Inferior bracts unilaterally
b. Spikelets 1–2-fld.
   c. Branches of the panicule recurved
   d. Spikelets 3–4-fld.
   e. Panicule-branched narrowly 2-flowered or less.
   f. Spikelets 2–3-flowered.
   g. Calyx 3–5-toothed

Subsection III. GONOLONUM.

a. Inferior bracts unilaterally
b. Spikelets 2–3-flowered at the apex.
   c. Branches of the panicule recurved
   d. Spikelets 4–5-flowered.
   e. Calyx 3–5-toothed

Subsection IV. CHROMONUM.

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1. tataricum, Mill. (Statice tataricum, Lnn. Gonolinum tataricum, Boiss.). Perennial, glaucescent; about 1 ft. high; lvs. ovate-oblong, 3-footed, coarsely serrate, broadly obtuse, sharp at base; branches and spikelets panicled, narrowly 2-flowered; scape densely corymbose above, more or less broadly 3-wughed, "lugs produced into rotundate cymes; corolla yellow, limb truncate, crenulate, corollas yellowish white, Aug. Medit., reg. B.M. 6066. Var. speciosum, Kuntze. (Statice speciosum, Hort.), has lance-oblong leaves, more or less divided, sharply serrate and sinuate, yellowish white, July. Teneriffe. B.I. 3776. P.M.

2. collinum, Hubb. (Statice collina, Grise. S. bestemmiana, Friv., not Schult. Gonolinum collina, Boiss.). Perennial, glaucescent: lvs. oblong-lanceolate or lanceolate, acute, serrate-cuneate, narrowed to the petiole; scape nearly 2-flowered; branches elongate, spreading-recurved, narrowly 2-flowered; spikelets 2–3-flowered, densely arranged in a terminal cyme; calyx white, green-nerved, tube short-puberulent, about 2 ft. long; lvs. oblong-obovate, obtuse, short-puberulent;

3. speciosum, Kuntze (Statice speciosa, Lnn. Gonolinum speciosum, Boiss.). Perennial, glaucescent, about 1 ft. high; lvs. suborbicular or oblong-obovate, abruptly attenuate-cuneate, narrowing to the petiole; scape densely corymbose above; branches narrowly 2-flowered; spikelets 3–4-flowered, densely imbricated in a terminal cyme; parts white, tube densely appressed-pubescent; corolla rose or purplish pink, very deciduous. July. S. Russu, Caucasus. B.M. 560. L.R. 14:1336.

4. eximium, Kuntze (Statice eximium, Schroch. Gonolinum eximium, Boiss.). Perennial, glaucescent; about 1 ft. high; lvs. oblong-obovate or ovate, acute, serrate-cuneate, narrowed to the petiole; scape nearly 2-flowered; branches narrowly 2-flowered, spreading-recurved; spikelets 3–4-flowered, densely imbricated in a terminal cyme; parts white, tube densely appressed-pubescent; corollas rose or purplish pink, very deciduous. July. S. Russu, Caucasus. B.M. 560. L.R. 14:1336.

2. collinum, Hubb. (Statice collina, Grise. S. bestemmiana, Friv., not Schult. Gonolinum collina, Boiss.). Perennial, glaucescent: lvs. oblong-lanceolate or lanceolate, acute, serrate-cuneate, narrowed to the petiole; scape nearly 2-flowered; branches elongate, spreading-recurred, narrowly 2-flowered; spikelets 2–3-flowered, densely arranged in a terminal cyme; calyx white, green-nerved, tube short-puberulent, about 2 ft. long; lvs. oblong-obovate, obtuse, short-puberulent; June. July. S. Eu., Caucasus, Russia, and Siberia. B.M. 6371. Var. angustifolium, Hubb (Statice tataricum var. angustifolia, Hort. S. Besseriana, Schult. S. inaeia, Boiss., not Lnn. S. inaeia var. kryloviana, Gomolimon etalurn, Boiss.). Perennial, glaucescent, about 1 ft. high; lvs. oblong-obovate, acute, serrate-cuneate, narrowed to the petiole; scape corymbose-pallate a little above the base; branches and spikelets panicled, abruptly 2-flowered; scape elongate, spreading-corymbose above, more or less broadly 3-wughed, "lugs produced into rotundate cymes; corolla yellow, limb truncate, crenulate, corollas yellowish white, Aug. Medit., reg. B.M. 71. G.W. 7, p. 220—Usually treated as a annual. Var. candoinsimum, Hubb. (Statice candoinsima var. candoinsima, Hort.), has pure white fls.—A good plant for edging. The material known in the trade as Stanice avata hybrids are hybrid forms of this species.

7. Bondueiili, Kuntze (Statice Bondueiili, Lnn.; also miseploped Bondueiilli, P.G. 3082). Annual or biennial about 1 ft. high; lvs. ovate, obtuse, obtuse-oblong, hairy, sharply serrate, black at base, blackish at apex. Calyx green, limb 3-toothed, corolla yellow, June-Oct Algeria. B.I. 2129. If F. 2:220—the Calif. material seems to have more broadly winged branches and branchlets than usual.

8. Thouinii, Kuntze (Statice Thouinii, Lnn. S. seguillea, Pers.). Annual, glaucescent; about 1 ft. high; lvs. sinuate or pinnatifid-lobate, lvs. and sinus rounded, margin short-ciliate; scapes nearly 2-flowered; branches and spikelets panicled, narrowly 2-flowered; branches and spikelets panicle-flowered; corolla deeper yellow, June-Oct Algeria. B.M. 5138. F.S. 20 1219. If F. 2:220—The Calif. material seems to have more broadly winged branchlets and branches than usual.

9. arborescens, Kuntze (Statice arborescens, Boiss.). Shrub about 2 ft. high; stems terete, naked; lvs. broad-obovate-oblong, petioled, obtuse, serrate-cuneate, base attenuate, leaves nearly 2-flowered; branches nearly 2-flowered; branches and spikelets panicled, with the branches narrowly 2-flowered; branches and spikelets panicle-flowered; corolla yellow, July. E. Tenerife. B.I. 3776. P.M. 4:217 (under the name Stanice arborea).
10. fruticans, Kunth (Stütice fruticans, Webb, S. arborea, Brou. S. fruticosa, L.).-Shrub: st. short, naked, terete: lvs. in a rosette at the base of the cape, very acute, very oblong, pinnately crenate, very oblong, narrowly lanceolate, shortly attenuate to the petiole; scape very short, corymbosely-peduncled above, it and the branchies winged; branches 2-winged, wings at base very narrow, broadened upward, running out into short, unequal rotundate auricles below the spike; spikelets 1-flowered, 1-fid., very short, second spikes: calyx blue, tube glabrous, limb acutely ciliate, corolla yellow. Sommer. Tenero. F.S. 4: 333. R.U. 4, p. 104.-Commonly allied to S. arborescens from which it differs in the smaller size of its lvs., which are 1½-2 in. long, the scape 4-6 in., 2-edged, not winged and the number of the branchies rotundate.

11. macrophyllum, Kunth (Stütice macrophylla, Brou. S. Hultfordii, Hort.).-Subshrub about 2 ft. high: lvs. radially pubescent, very obtuse, lower part long-attenuate, oblong, ciliate above the petiole; scape 3-7 ft. high, the whole plant shortly soft-tomentellous: IV8. H.U. 1: 217.-Section GENUINUM.

16. Perezii, Hubb. (Statice Perezii, Stapf).-Subshrub, less than 2 ft. high: lvs. slightly short-pubescent, ovate, canaliculate, in a rosette at the base of the cape, rather acute, apex bearing a small triangular decurrent on the petiole: scape 3½-4½ in. long and the same wide, very narrow, the lower leaves remote and retractive, spike short, 3-5-fid., the same wide, 2-edged, 2-nerved: corolla yellow, white. July. A. S. 8: 425-437.

17. pectinatum, Kunth (Stütice pectinatum, Ait.).-Subshrub, about 2½ ft. high: lvs. radially pubescent, lanceolate, obtuse, margin short-ciliolate, 2½-3½ in. long: IV8. Hart. (H. U. 1: 217).-Section GENUINUM.

18. vulgaris, Mill. (Statice vulgaris, Linn. in Lam.).-Perennial, about 1 ft. high: glabrous; lvs. oblong-elliptic, acute; scape from which it differs in the 3 times smaller lvs., which are 1½-2 in. long, the scape 4-6 in., 2-edged, not winged and the number of the branchies rotundate. Subsection CHRISTEANUM.

19. sinense, Kunth (Stütice sinensis, Girard, S. Fortunei, Kuntze).-Perennial, about 1 ft. high: glabrous; lvs. oblong-elliptic, acute; scape from which it differs in the number of the branchies rotundate; corolla yellow. July. A. S. 8: 425-437.

20. vulgare, Mill. (Statice vulgaris, Linn. in Lam.).-Perennial, about 1 ft. high: glabrous; lvs. oblong-elliptic, acute; scape from which it differs in the number of the branchies rotundate; corolla yellow. April. China. R.U. 31: 63. F.S. 2: 42.
Section 4. LIMONIUM.

23. limonidiformis, Kuntze (Sít&ce limonidifórmis, Girard; S. Willd.).** Perennial, 1-2 ft. high; Ivs. oblong-lanceolate, obtuse or retuse, spreading, oblong-lanceolate, 6-8 in. long, entire or usually coarsely runcinate, the base or branched; spikelets 2-3-fl.d., densely clustered; calyx-tube somewhat glandular, pubescent, 5-toothed, rose-red; corolla tubular, rose-red, lobes ovate-rotund. July, Aug. Spain.

24. bicornua, C. E. Salmon (L. occidentale, Kuntze; Sít&ce bilobum, G. E. Smith, S. occidentalis, Lloyd; S. curvifolia, Vahl). Cespitose perennial, 6-10 in. high, Ivs. lanceolate-spataulate, without nerves, rather linear-spatulate. Sepals 6, linear, acute; corolla 3-fl.d., rather densely and distichously clustered in spreading, redundaent spikes: Ivs. rosulate. small, obovate or oblong-spatulate, very obtuse, margm somewhat ciliate, opposite or subopposite, slender, flexuous, very much branched almost from the base; branches short, strict, flaxen, very much branched almost from the base, forming an oblong panicle; spikelets 2-4-fl.d., rather densely and distichously imbricated in spreading or erect-spreading, oblong-spikelets: calyx-tube long, apiculate, linear-spatulate, the spikes forming a small densely crowded panicle: fls. blue, rose-red. S. W. Eu. and Morocco.

25. limonium, Hubb. (Sít&ce limoníum, Thunb.; Sít&ce purpurea var. longifolium, Boiss.). has Ivs. oblong-lanceolate or nearly linear, up to 10 in. long, 2 lines wide, usually much smaller. S. Afr.

Subsection 3. HYALOLEPIDEA.

26. limonium, Hubb. (Sít&ce limoníum var. díbos, Hubb.; Sít&ce limoníum var. a&en, Hubb.). Perennial or subshrub, about 9 in. high, glabrous, rarely pubescent, rather cespitose; Ivs. rosetulate, small, obovate or lanceolate-spatulate, obtuse or retuse, scales deep, slender, branched from the base; branches straggly, slender, lower ones sterile, upper corymbose-fasciculate; spikelets 2-3-fl.d., disposed in lax often fasciculate straight terminal spikes: calyx-tube slightly pubescent or glabrous, limbus white, deeply 5-lobed, lobes ovate, plinate, rather obtuse; corolla redish. July, Aug. S. Frans.
beryl globose, finally splitting open.—About 10 species, China and Japan.

The stauontiineae are beautiful evergreen climbers and well adapted to the soil and climate of the South Atlantic and Gulf regions. Both *S. hexaphylla* and the related *Holballa latifolia* (known also as *Stauontina latifolia*) grow well in the writer's Florida garden, although they are not such very luxuriant climbers as *arc* the allamandas, thunbergias, and bigonias. It requires a few years before they are fully established. They are excellent subjects to be planted on old stumps and on small trees, such as catappa and mulberry trees, which they perfectly cover in the course of time with their pretty evergreen leaves and their rather insignificant but powerfully fragrant flowers. They will not flourish in dry hot sandy soil, demanding for their welfare rather moist shady spots containing a profusion of humus. A little commercial fertilizer containing a fair amount of nitrogen and potash will also prove very beneficial. The need of some kind of a stimulant is shown by the plant itself, which assumes a rather yellowish cast in the green color of the foliage. A few days after it has received some plant-food the foliage shows a very beautiful dark green color. These two species and the beautiful *Kadsura japonica* are valuable additions to the garden flora of the southern states. (H. Nehrling.)

*S. hexaphylla*, Deane. Fig. 3655. A handsome vine becoming 40 ft. high: its oval, about 2 in. long, stalked: its in axillary clusters, white, fragrant in spring: berry about 4 in. long, splashed with scarlet. *Japan*. A.G. 12:139.

F. W. BARCLAY.

**STAUROPSIS** (Greek, cross and stigma, in allusion to the cross or star-shaped stigmas). Tuberous stoloniferous herbs, adapted to the warm-house: lvs. long-petioled, hastate-cordate in outline, pinnately cut or 1-2-pinnately parted, the pinnnae solitary or several, as long as the lvs.; spathe erect, lanceolate, base connectate, gaping open above; spadix cylindrical: fls. monccious, all perfect, the male and female corniculated periangu: perianth wanting: berries subglobose, deeply 3-5-sulcate, 2-5-celled, the cells 1-seeded.—About 7 species, Trop. Amer. The oldest name for this genus is Asterostigma. *S. cotanenum*, Koch. About 1½ ft. high: young lvs. reniform, pedately cut, the segms. obovate-lanceolate, the oldest 3-parted, the middle part pinnately cut, elongated-oblong, the lateral parts cymose bisected or trisected; the petioles marked with pale violet and dark purple; spathe narrow-lanceolate, very acute; spadix white and purple, the male part dense-flid.; peduncle vivid purple, shorter than the petioles. *Brazil*. L.B.C. 16:1690 (as *Caladium buridum*). Variable. *S. Luchneodilea*, Koch (*Asterostigma Luchneodilea*, Schott). Lvs. 1-2 ft. long, deep green, pinnatifid, broadly ovate, the 2 lower segms. deflexed, deeply cut into 3-5 lobes, the remaining segms. 4-6 pairs, sessile, remote; the petioles 6-12 in. long, white, with long-petioled young lvs.; spathe deep green within and speckled with brown, reticulated externally, 2-4 in. long, erect, cylindric, acute; spadix cylindric; anthers scarlet; ovaries white; spadix subglobose, finally splitting open above; spadix cylindrical: fls. moncious, all perfect, the male and female corniculated perianth wanting: berries subglobose, deeply 3-5-sulcate, 2-5-celled, the cells 1-seeded, —About 6 species, Phil., Polynesia. (known also as *Fieldia luchneolda*, Gaudich. *Vanda luchneodilea*, Lindl. V. B. 11. 32:59. J.H. III. 63:71. Desc. also under *Vanda*.)

**STEIRONEMA** (Greek, sterile threads, referring to the staminodia). *Primulaceae*. Loosestrife. Erect glabrous herbs useful for borders in damp soil. Leaves opposite, or rarely whorled, entire: fls. rather large (6-12 lines broad), yellow, axillary, solitary or clustered: peduncles slender: corolla rotate, 5-parted; lobes crose and often cuspitate, each separately involute around its stamen; stamens 5, opposite the lobes, with 5 alternating subulate staminodia; filaments distinct, or nearly so; ovary superior, 1-celled with free central placentas, becoming capsular in fruit; seeds many; style and stigma 1. Differs from *Lysimachia* in the presence of the sterile stamens, and in the evagination of the corolla.—About 5 species. N. Amer. All perennial. Offered by collectors of native plants, for colonizing, borders and wild-gardens.
STELIS (an old Greek name used by Theophrastus for some parasitical plant). Orchidaceae. Epiphytic herbs, some of them adapted to the warmhouse and others to the intermediate house; stts. cespitose or creeping, with simple branches 1-lvd. at the tip and frequently 1-lvd. or 2-lvd. below the inflorescence, not pseudobulbous. Inflorescences frequently short; Ivs. leathery, often contracted at the base to the petiole which is frequently concave or channeled and sometimes articulated near the base; fls. small to minute, short-pedicelled in an elongated raceme at the base of the terminal fl., secund, rarely opposite, distinctly or only sometimes distinct; bracts alternate, various; sepals frequently subequal, broad or triangular, spreading, more or less connate; petals much shorter, broad, the margins thickened; labellum sessile at the base of the column, equal and similar to the petals or narrower and sometimes a little acuminate; column equaling or shorter than the labellum; hp hooded, about as long as the petals. About 200 species, Mex. and W. Indies to Brazil and Peru. Treatment the same as for Pleurothallis.

S. borbata, Rolfe, is a species differing from S. Endressii in having long-bearded sepals and a tridentate labellum. Fls. are greenish ochre-yellow with purple hairs and red-brown blotches. Costa Rica. - S. Brunnii, Wilderm., grows about 2 ft. high; Ivs. thick, 2-3 in. long, deeply channeled above; racemes 1-3, many-fl.: fls. greenish white, not spotted; sepals and petals concave; petals very short, about half as long as the sepals. Rio de Janeiro. - S. Bruckneri, Lindl., has Ivs. 1-2-2 in. long; Ivs. yellowish green outside, pale purple within, disposed at intervals along the rachis; sepals broadly ovate, acute, spreading, hairy within, petals and lip linear, all green, freely united. Mex. (B.M. 660). - S. B:M. 660. - S. OphlOglo8soides, Hitchc. (Lysimachia quadrifiora, Sims. L. longiflOll, Pursh. S. longifOllum, Gray. St. 4-angled, 1-3 ft. high; Ivs. thick and firm, sessile, subhyaline, 1-4 in. long, smooth and shining; margins slightly revolute; basil often broader; veins obscure. E. U.S. B.M. 660. K. M. WIRGAND.

STELLARIA (Latin, star, referring to the form of the flower). Caryophyllaceae. Annual or perennial herbs, mostly diffuse, tufted or weakly ascending, glabrous or pubescent, of little cultural value.

Leaves opposite, simple: fls. usually white, in terminal or axillary, naked or leafy paniculate cymes or rarely subsolitary; sepals 3, very rarely 4; petals as many as the sepals, 2-leaf or rarely 1-leaf per sepal, nearly or wholly emarginate; stamens 10 or fewer by abortion; ovary 1-celled: caps. globose, ovoid or oblong, dehiscent by as many or twice as many teeth as there are carpels. - About 100 species, scattered all over the world but chiefly in the temperate regions.

AA. Fls. 7–10 lines across.

Hofstede, Linnaeus, Easter Bell. A hardy perennial, erect, 0-15 in. high, simple or somewhat branched, from a creeping rootstock: lvs. sessile, lanceolate, 1-3 in. long: fls. white, abundant, in a terminal leafy panicle; sepals one-half or three-fourth as long as the petals. May, June. Eu., Asia. B.B. 2:22. - This and the next are desirable for dry banks where grass will not grow well and for other carpeting purposes.

AA. Fls. 2-5 lines across.

BR. Lvs. narrow.

graminea, Linnaeus. A slender-stemmed, prostrate, creeping perennial plant not usually over 6 in. high, from a creeping rootstock: lvs. sessile, linear-lanceolate, usually about 1 in. long: fls. white, in terminal or lateral scarious bracted open panicles; sepals and petals nearly equal in length. May, June. Eu., Asia. B.B. 2:23. - S. aurea, Hort. Golden Stitchwort, has pale yellow lvs. and is lower and more matted in growth. Well adapted for sandy banks where grass does not grow well.

BB. Lvs. ovate.

média, Cyril. Chickweed. Fig. 3686. A low, decumbent annual weed common in all rich, moist, cult. soils, especially troublesome during the cooler months of the growing season and in frames, and the like, during winter. Lvs. 2 lines to 1½ in. long, the lower petiolate, the upper sessile: fls. axillary or in terminal leafy cymes; sepals longer than the petals. Eu., Asia; naturalized. B.B. 2:21. - It is considered to be a good fall and winter cover-plant in orchards and vineyards, but is never cult. It is a surface-rooting plant.

F. W. BARCLAY.

STEMONA (Greek, stamen, alluding to the folia-um). Syn., Roxburghidce. Tall climbing perennial herbs, from a tuberous fusiform root, suitable only for other carpeting purposes. Stems 4-5 in. long, oblong-linear, rather broad, long-tapering at the base; raceme slender, 1-sided, pedunculate; fls. greenish, with a tinge of purple, minute. W. Indies. B.R.

3686. Stellaria media. (Flower X9)
CVII. Effective shrubbery border.—Spiraeas in good form.
to Austral. S. Cúrtisii, Hook. f. St. twining, leafing and flowering at the same time; lvs. 4–5 in. long, alternate; the petiole very long and slender; fls. small, apparently unisexual. India. B.M. 7254. Similar to the following. S. tuberosa, Lour. (S. gloriosae, Vogt. Rottboellia gloriosae, Jones. R. gloriosa, Pears. R. widtflora, Smith). Tubers cylindrical, 6–12 in. long: st. woody below, twining, leafing and flowering at the same time; branches terete; lvs. 4–10 in. long, broadly ovatecordulate, acuminate, membraneous, shining; peduncle 1–2 in. long, usually 2-fl.: fls. erect, fetid; perianth spreading and revolute, segms. lanceolate, acuminate, greenish with many purplish nerves, or ovate-oblong, 5–6-seeded. India and Assam. F.S. 2:86. B.M. 1500. H. U. 3, p. 353. The plants are allied to the lily family.

**STENÁCTIS:** Eriogonum.

**STENÁNDRIUM** (Greek, narrow anthers). Acanthaceae. Nearly stemless or short-stemmed herbs, frequently villous or pubescent, adapted to the warm- or coolhouse; lvs. often radical or clustered at the base of the st., very entire: spikes scape-like, peduncled, dense or interrupted: fls. usually small at the axils of the opposite bracts, solitary, sessile, spicate; calyx 5-parted, segments narrow, acute; corolla-tube slender, cylindrical, limb ovate, acute, retuculate, reticulate; stamens 4, didynamous: caps. oblong or subflattened, subterete, 4-seeded or by abortion fewer-seeded.—About 30 species. Trop. and Subtrop. Amer.


**STENÁNHIMIUM** (Greek, narrow flower; referring to perianth-segments). Liláceo. Bulbous plants, useful both out-of-doors and in the greenhouse.

Stems erect, tall, simple except for the infl.: lvs. radical or at the base of the st. long, linear or linear-lanceolate, smaller upward along the st. or none: fls. polygamous, 2-fl.; perianth-segments 6; stamens 6; ovary ovoid, 3-celled: caps. ovoid-oblong, partly dehiscent into 3 carpels.—About 5 species; one native of Sachallale Island, another Mexican, the others W. American.

**occidentális**, Gray. St. slender, 10–20 in. high: lvs. linear-lanceolate, acuminate, 3–10 in. long: raceme simple or branched at the base; pedicels slender, spreading or recurved: fls. campanulate, nodding, brownish purple; perianth-segments 6–8 lines long, oblong to lanceolate, acuminate. Rocky banks, Ore. to Brit. Col. and Idaho.

palústris, Bedd. (S. scádens, J. Smith). Rootstock widely climbing: lvs. 1-3 ft. long, with pinnae 4-8 in. long; fertile pinnae slender, 6-12 in. long; texture leathery. India. S. 1:224.—A vigorous grower and coarse feeder, much used in cooler houses of large fancies. It will form a mass of rootstocks several feet long if grown on a fern stem, producing a large number of the rather pale lvs.

sorbiólium, Linn. Rootstock climbing, often prickly: lvs. 12-15 in. long, 6-12 in. wide, with close veins; fertile pinnae 2-4 in. long, narrow. E. and W. Indies to Brazil.

R. C. BÉNÉDICT.

STENOGLOTTIS (Greek, narrow and tongue). Orchidaceae. Terrestrial herbs, with short s.t. and tuberiferous or thickened fleshy fasciculate roots, which are suitable for the intermediate house, but not commonly cult.: lvs. radical, numerous, rostrate or tufted: fls. small, short-pedicelled, arranged in loose somewhat 1-sided racemes; bracts small; sepals free, subequal; petals somewhat narrower than the sepals and suberect; lip continuous with the base of the column, cuneate-oblong without a spur, 3-5-cleft at the apex; column very short and broad; pollinia granular: caps. narrowly obovate-oblong, acute, bright green, usually with few or numerous blackish or purple-black blotches; styles recurved sheaths; racemes 4-10 in. long, stout, 9-21 in. high, with numerous linear-lanceolate-oblong, acute, bright green, usually with few or numerous blackish or purple-black blotches; flowers erect, slender, 6-12 in. high: racemes 1½-6 in. long, lax, many-fl.: fls. light purple with a few elongated dark purple blotches on the lip; sepals broadly ovate, obtuse or subacut; petals ovate, subacute; lip linear-oblong, 3-cleft or 3-parted: caps. narrowly obovate, suberect. S. Afr. B.M. 5872. B.R. 778 (as Chrysalidium flavum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, oblongate, obscurely petioled, at first compressed on the margin; scape 1 ft. high: fls. bright yellow, 1½-2 in. long, usually few in an umbel. B.M. 2461. B.R. 78. (as Chrysalidium flavum).

F. W. BACILY.

STENORHÝNCHUS (Greek for small and beak). Orchidaceae. Terrestrial plants: scape arising from a rosette of lvs., bearing a raceme or spike: fls. with a distinct chin; dorsal sepal and petals forming a helmet, parallel; lip with a broad base and narrower apex, the base surrounding the column; beak narrow and long.—About 10 species, in Trop. and warm Temp. Amer. speciosa, Rich. (Spéránthès colorándis, Bedd. Br. S. floróvora, Hentl.). Lvs. elliptic, green; bracts acuminate, oblong-lanceolate, as long as fls.: fls. crimson. Trop. Amer. B.M. 1374 (as Neottia speciosa).

GEORGE V. NASH.

STENOSPERMÁTUM (Greek for small and male element). Sometimes written Stenospermátum. Aráceae. Climbing warmhouse plants: lvs. with long-sheathed petioles; blades elliptic or lanceolate, inequilateral, the primary lateral nerves numerous, ascending; peduncles rather long, at first nodding at apex, later erect: spathe convolute, at length expanding; spadix stipitate, cylindric, white: fls. perfect; staminodes 4.—About 20 species, natives of the Andes of Peru and of N. Brazil.

multivolválum, N. E. Br. Three to 6 ft. tall: blades 12-18 in. long, 4-6 in. wide, oblong-elliptic-oblong, coriaceous, opaque green, paler beneath: peduncle 12-18 in. long; spathe 5-6 in. long; spadix 4½-6½ in. long. Colombia. GEORGE V. NASH.

STENOTÁPHRUM (Greek, stenos, narrow, and taphros, a trench, the spikelets being partially embedded in the rachis). Graminéae. Creeping grasses with compressed culms, flat divergent blades and narrow flat spikes; spikelets as in Panicum, imbedded in the surface of a broad rachis forming terminal spikes.—About 3 species of tropical regions, one species found along the Gulf coast, especially in Fla., where it is utilized as a lawn grass. In this respect it is similar to Bermuda-grass, being naturally adapted to a sandy soil, which it binds by its rhizomes and creeping habit as does that grass.

The introduced form of St. Augustine grass is one of the most valuable lawn grasses for the extreme South. It will grow on almost any soil and thrives even in shade. The leaves are rather broad, never over 6 inches high and require little mowing. This grass does not become coarse, does not hold dew or rain, and is particularly good for house lots and lawns. It does not


AA. Style longer than the perianth.

flánum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, ob lanceolate, obscurely petioled, at first compressed on the margin; scape 1 ft. high: fls. bright yellow, 1½-2 in. long, usually few in an umbel. B.M. 2461. B.R. 78. (as Chrysalidium flavum).

F. W. BACILY.

STENOTÁPHRUM

3687 Stenotaphrum secundátum. (×2)
need as much water as Bermuda or St. Lucie grass. It is propagated mostly by cuttings. (E. N. Reasoner.)

**secundatum**, Kunz (S. americanum, Schrank). Sr. Atwater. Gt. 45:150. Fig. 3687. Flowering branches erect, 6-12 in. high. Var. variegatum, has lvs. striped with white, and is used as a basket-plant. G.W. 15:681 (as S. glabrum). Dept. Agric., Div. Agrost. 20:42.

**STEPHANÁNDRA** (Greek, steфанανδρα, crown, and amer, admirable, alluding to the persistent crown of stamens). **Rosaceae**. Ornamental shrubs grown chiefly for their handsome graceful foliage.

Deciduous; lvs. alternate, lobed and serrate, stipulate: lvs. slender-pedicelled, small, with cup-shaped calyx-tube, incised lobes and petals 5; stamens 10-20; carpel 1; pod with 1 or 2 shining seeds, dehiscing only at the base.—Four species in China and Japan. Closely allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1-2-seeded pod.

The stephanandas in cultivation are low graceful spreading shrubs with slender more or less zigzag branches, bright green medium-sized or rather small lobed leaves and small white flowers in loose terminal panicles. They are hardy as far north as Massachusetts, but **S. incisa** is sometimes killed back in severe winters; it grows, however, freely from the base and is not injured in its appearance except that it remains rather low. They are well adapted for borders of shrubberies or rocky banks on account of their graceful habit and handsome foliage. Propagation is by greenwood cuttings under glass, which root readily, and by seeds; also by division, and **S. incisa** by root-cuttings with bottom heat in early spring.

**incisa**, Zabel (S. fenzliana, Sieb. & Zucc.). Fig. 3688. Shrub, to 8 ft. high, but usually lower, almost glabrous; with angular spreading distinctly zigzag branches: lvs. triangular-ovate, cordate or truncate at the base, long-acuminate, usually 3-lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish green, 3/4-1 1/2 in. long: lvs. white, about 1/2 in. across, in terminal, short, 8-12-fl., usually panicled racemes; stamens 10-20; carpel 1; pod with 1 or 2 shining seeds, dehiscing only at the base.—Four species in China and Japan. Closely allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1-2-seeded pod.

**STENOTAPHRUM** (perhaps a personal name; or by some derived from the Greek word for a garland or crown). **Menispermaceae**. More than 30 climbing shrubs (rarely herbs) of the Old-World tropics, as defined by Diels in Engler’s Das Pflanzenreich, hft. 46 (IV. 94), 1910, differing from Cocculus in the solitary ovary, often more than 3-merous lvs., and a nearly basal rather than nearly terminal style-scar: lvs. usually peltate: fls. in axillary, simple or compound clusters, diclinous; males with 6-10 free sepals, 3-5 fleshy petals, and 6 connate anthers; females with 3-5 sepals, petals like those of the males, 1 ovary with 3-6-parted style: fr. a glabrous drupe with ring-like seed. The species are little known in cult., although the following may be expected in southern regions or sometimes under glass as an ornamental climber. **S. herandiafolia**, Walp., in India, Austral., Afr., and Malaya, has striate glabrous branches, and ovate or somewhat deltoid obtuse or acute more or less pubescent lvs. 3-6 in. across: fls. in capitately peduncled puberulent umbels of 8-12 rays: drupes red. **S. japonica**, Miers (Cocculus japonicus, DC.), a common roadside weed in parts of China and Japan, has glabrous lvs. and infl.; probably not cult.

**STEPHANOPHYSUM** (Greek, crown and bladder, in reference to the shape of the crown). **Acantthaceae**. Herbs with more or less dentate or entire lvs., the fl. in lateral umbellate cymes: fls. red; calyx 5-parted, corolla-tube short, the lobes erect or more or less spreading; stamens 4, didynamous: caps. contracted from the base to the middle. Trop. Amer. with the exception of the below-mentioned. The genus is now included in Ruellia. **S. Bolletii**, Hook. Subshrub, 2-3 ft. high, branches 4-angled, opposite; lvs. opposite, about 6 in. long including the petiole, ovate-lanceolate, entire, acuminate, attenuate at base; pani. terminal, many-fl.: fls.
opposite, sessile, scarlet; calyx-segments narrow, erect, linear-subulate; corolla more than 2 in. long, tubular-
funnel-shaped, curved, the lobes triangular; ovary sunk in
H. F. II. 3:182.—This species is apparently not known
today and has not been recently treated in works on Trop. Afr.

3690. Stephanotis floribunda. (X4)

STEPHANOTIS (from Greek words for crown and ear, alluding to the five ear-like appendages on the staminal crown). Aselepiadaceae. Twinning glabrous shrubs of the Old-World tropics, of about fifteen
species, one of which, S. floribunda, is one of the best of greenhouse climbers.

Leaves opposite and coriaceous; fls. large and showy, white, in umbell-like cymes from the axils; calyx 5-
parted; corolla funnel-shaped or salverform, the tube
cylindrical and usually enlarged at the base and somet-
times at the throat, the lobes 5; crown mostly of 5 scales
that are usually free at the apex and adnate to the anthers on the back, the anthers with an infixed tip or
membrane; fr. a more or less fleshy follicle.

There are few plants that have all the good qualities
of S. floribunda. It is a splendid grower, has good foli-
age, is very free-flowering, and the flowers last well on
the plant or when cut for decorative work. Cuttings
are secured from half-matured wood, and can be rooted
at any time of year, although spring is the most con-
vienient time. Pot the cuttings singly, in small pots, in a
moist loam with enough sand added to keep the soil
porous. When the shoots have grown to a height of
about 2 ft., cut them back several joints. This will
make the plants break into several leads. As S. flor-
ibunda comes from Madagascar, it can stand a good
heat, but does not like so humid an atmosphere as many
other tropical plants. About 65° will generally be
found sufficient after it has started growing in the
spring. By midsummer the young plants may receive
another potting, and again be cut back to make sure of
having a good foundation for the following year. About
the end of October, begin to withhold water from the
roots, and cease syringing, which must be attended
to during the period of active growth. Reduce the
temperature to 55° to 60° during the night and give
only enough water to keep the leaves from shriveling.
As the sun gets higher in March, they will show signs of
activity and the weak wood may be all cut back, and
the plants repotted in a good strong loam with ample
drainage. If not repotted for a specimen plant, stephan-
отис may be planted out on a well-drained bench and
trained to wires over the roof. It is astonishing the
amount of space a single plant will cover in course of
time. For specimen plants, the shoots should be
trained to strings until they set flowers; when they may be
trained on a trellis in any shape desired. They will do
in the same size of pot for many years, if fed during their
growing period as advised for ixoras. Mealy-bug and
scale are sure to locate on stephanotis, but during
the winter they may be treated with fumigations with
hydrocyanic gas, as already advised for other plants,
and if syringed well when out of flower, will be easily
held in check. (Geo. F. Stewert.)

floribunda, Brongn. Fig. 3690. Glab-
rous, 8-15 ft.; lvs. elliptic, with a short
point, thick and shining green, entire; fls.
1-2 in. long, of wax consistency, white
or cream-color, very fragrant, in many
umbels, the calyx one-fourth or less the
length of the corolla-tube: fr. 3-4 in.
long, ellipsoid, glabrous, fleshy, contain-
ing melon-like seeds which are provided
with a tuft of hair. Madagascar. B.M.
23:144; 57:397. Gn. 21, p. 541 (showing
a pygmy plant blooming in a small pot
and not climbing); p. 208; 55, p. 150;
73, p. 211. G.C. II. 14:169 (a dwarf
variety, the Elveston); 24:817; 25:137;
50:165.

S. Thandartia, Brongn. From Madagascar,
appears to be the only other species in cult.,
but it is not in the American trade. It has elevate
lvs., fls. in 3s., and sepals about one-third the
length of the corolla-tube.

L. H. B.

STERCULIA (Sterculia of Roman
mythology, from stercus, manure; applied
to these plants because of the odor of the
leaves and fruits of some species). Sterculiaceae. Trees grown in the green-
house, but also outdoors in the South.

Leaves undivided, lobed or digitate; infl.
panicle or rarely racemose, frequently axillary,
with the terminal fls. commonly feminine and earlier;
fls. unisexual or polygamous; calyx 5-crenated or 5-parted,
rarely 4-merous, often colored; petals none; stamens
united in a column which bears a head of 10-15 seedy
anthers; pistil of as many carpels as calyx-lobes and oppo-
site them, each carpel 2- to many-ovuled, the stigmas
free and radiating: fr. follicular, each carpel distinct and

INDEX.

acerifolia, 6. colorata, 5.
alata, 7. diversifolia, 8.
apetala, 3. f{etida, 2.
Blethisu, 4. Gregoria, 8.
carpophaga, 5. variegata, 1.

KEY TO THE SPECIES.
A. Carpels expanding before maturity into
f. like bodies, exposing the seeds . . . . . . . . 1. planatofolia
AA. Carpels not becoming f. like . . . . . . . .
BB. Lvs. all digitately compound . . . . . . . . . 2. f{etida
BB. Lvs. entire or only lobed (sometimes
compound on some branches of
Nes. 8 and 9).

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Nes. 8 and 9).
3001. Mature foliodes or fruits of Sterculia piantanifolia, bearing seeds on the margins. (X1/2)

5. colorata, Roxb. Large tree, bark ashy: lvs. roundish, 5-9 x 5-12 in., glabrescent, palmately 3-lobed, lobes triangular, acuminate, base cordate; petiole 4-9 in. long; panicle terminal, many-fld.; pedicels covered with orange-red tomentum: calyx ¼ in. across, tubular, elavate, orange-downy outside, 3-lobed; corolla 2-3 in. long, stipitate, glabrous, membranous. India.—Intro. into Calif.

6. acerifolia, A. Cunn. (Brachychiton acerifolium, F. Muell.). BRACHYCHITON. FLAME TREE. Evergreen tree, reaching a height of 60 ft., glabrous: lvs. long-petioled, large, deeply 5-7-lobed; the lobes of lanceolate to rhomboid, glabrous and shining: fls. brilliantly scarlet, the calyx about ¼ in. long, in large, showy trusses: foliodes large, glabrous, long-stalked. Austral.—A most showy tree when in bloom, and planted on streets and lawns in Calif. Thrives in either dry or fairly moist places. (See also page 538.)

7. alata, Roxb. Large tree, the young parts yellow-pubescent, the bark ash-colored: lvs. large, cordate-obtuse, acute, 7-nerved: fls. about 1 in. across, in few-flowered panicles shorter than the lvs., and which arise from the leafless axils, the calyx tomentose and the segments linear-lanceolate: foliodes 5 in. diam., glabrous, with winged seeds. India.—Intro. into S. Fla.

8. diversifolia, Don (Brachychiton populneum, R. Br.). Tree, 50 ft.: fls. large, glabrous, the calyx 1-1 in. diam.: fls. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes variously 5-3-lobed on the same tree, all parts acuminate; fls. tomentose when young, bell-shaped, greenish red and white or yellowish white: foliodes 1-2½ in. long, ovoid, glabrous, stalked. Austral.—Planted in Calif., and commoner than the last. (Page 538.)

Var. occidentalis, Benth. (Brachychiton Grégorii, F. Muell. S. Grégorii, Hort.). Lvs. deeply 3-lobed, the lobes narrow, sometimes with short lateral ones: fls. salmon-color; calyx smaller and more tomentose. W. Austral.—Offered in S. Calif.

9. rupestris, Benth. (Delabêrèe rupestris, Lindl.). BOTTLE-TREE. Considerable tree: trunk often swelling out to a large size, contracted top and bottom: lvs. glabrous, either quite entire and oblong-linear or lanceolate, 3-6 in. long, or digitate, consisting of 5-9 linear-lanceolate, sessile lfts. often above 6 in. long: calyx about 4 lines long, campanulate, tomentose both inside and out: foliodes ovoid, acuminate, about 1 in. long, on stalks longer than themselves. Austral.

S. acuminata, Beaut.—Cola acuminata.—S. Ruseckii, Hort., is said to be an aralia-like plant with the same leaf and petiole light green and the narrow divisions of the fl. very dark green. Offered in the trade but not known botanically.

F. TRACY HUBBARD.

STEREOSPERMUM (Greek, hard seed). Bignonid.- About 12 species of tropical evergreen trees in Afr. and E. India, with handsome once- or twice-pinnate foliage and large bignonia-like fls., pale yellow or rose-colored to purple, in large and loose terminal panicles; calyx campanulate, 2-5-lobed or 5-toothed; corolla funnelliform-campanulate, with round crisped or toothed lobes; stamens 4, included; disk terete or 4-angled, 2-valved; seeds in 2 rows, with the thick nutlets deeply impressed in the thick spongy sepal. Only the following species seems to be in cult.

S. suaveolens, DC. Tree, 30-60 ft.: lvs. simply pinnate, 12-18 in. long; fls. 7-9, broadly elliptic, acuminate or acute, entire or serrate, hairy white, about 5 in. long: panicle many-fl., viscous-pubescent: calyx campanulate, with 3-5 short lobes; corolla 1½ in. long, pale or dark purple, puberulous outside, with crestedly crisped lobes: car. 18 in. long. Ind.—Adapted for tropical or subtropical regions only and prop. by seeds or cuttings, also by air-layering.

3. citrium, Hance—Radermacheriana alata.
STERIPHOMA

(Greek, foundation, alluding to the large peduncle of the fruit). Capparidaceae. Unarmed shrubs with the branches and influ. stellate-pubescent, grown in the warmhouse: lvs. long-petioled, with 1 ft. which is lanceolate, entire; the petiole thickened at the top: fls. showy, orange, in terminal racemes; the pedicels bent or curved down, 1-ft.; calyx cylinadr- campanulate, 2-4-lobed at the top; receptacle very short, expanded into a ring-like disk; petals 4, sessile; stamens 6; ovary ovate or oblong; berry globose or angular, ciliate, pulpy.—Four species, Trop. Amer.

paradaxum, Endl. (S. cleomoides, Spreng.). Leafy shrub, 4-10 ft. high: branches erect or ascending, slender: lvs. alternate, crowded toward the ends of the branches, 4-7 in. long, oblong or ovate-oblong: raceme terminal, dense-ft., 1-3 in. long: fls. abruptly deflexed from the apex of the orange-yellow pedicels; calyx bright orange, oblong-cylindric, irregularly split halfway down; petals linear-oblong, pale yellow: fr. said to be cylindrical. Venezuela. B.M.5788. P.F.5:564-565. Gt. 57, p. 242.

STERINBERGIA (named for Count Caspar Sternberg, a botanist and writer, 1761-1838). Amaryllidaceae. Low-growing bulbous herbs, hardy and used for outdoor planting.

Leaves produced after or with the fl. strap-shaped or linear: scape short: fls. frequently solitary, rarely 2, bright yellow; perianth-funnel-shaped, erect, tube short or rather long, lobes linear, erect-spread- ing; filaments filiform, free; ovary 3-celled: fr. fleshy, ovoid or oblong, scarcely dehiscent; seeds subglobose.—About a dozen species, E. Eu. to Asia Minor. The bulbs should be planted rather deeply, about 6 in. J. N. Gerard says of their culture in G.F. 10:168 that they require a rather heavy soil, in a somewhat dry sunny position where they will be well ripened in summer.

a. Fls. and lvs. appearing together.
b. Blooming in fall.


F. W. BARCLAY.

STEUDNERA (bears the name of Steudner, a German botanist). Araceae. About 5 or 6 perennial herbs of E. Asia, sometimes seen under glass in collections, requiring the treatment of other aroids. Plant with a mostly short ascending sheathed caudex, and ovate-oblong long-stalked peltate lvs.: spathe ovate-lanceolate, recurving above the middle and convolute at base, much surpassing the spadix: fls. imperfect, the female with a subglobose 1-loculed ovary and 2-5 short staminodia: fr. a many-seeded berry. S. colocalisia-folia Koch. St. short and fleshy: lvs. green above and paler beneath, the petiole often colored: spathe yellowish, purple or redish inside; spadix white, erect, one-third as long as the spathe. S. discolor, Bull (S. colocalisia-folia var. discolor, Hort.), has purple-blotched lvs., and spathe yellow on both surfaces but reddish at base. These plants are warmhouse subjects, grown for the foliage and interesting habit, as well as for the inf."
Stewartia connate: fr. a woody, usually hirsute caps., loculicidally dehisc into 5 valves; seeds 1-4 in each locule, compressed, usually narrowly winged.—Six species in E. N. Amer. and E. Asia.

The stewartias are very desirable ornamental plants, with handsome bright green, rather large foliage which turns deep vinous red or orange and scarlet in fall; they are very attractive in midsummer with their white cup-shaped flowers, which are in size hardly surpassed by any others of our hardier shrubs. *S. pentagyna* and *S. Pseudo-Camellia* are hardy as far north as Massachusetts, while *S. Malachodendron* is tender north of Washington, D. C. They thrive best in deep, rich, moderately moist and porous soil, preferring a mixture of peat and loam, and, at least in more northern regions, a warm, sunny position. Propagation is by seeds sown soon after maturity and by layers; also by cuttings of half-ripened or almost ripened wood in late summer under glass.

A. Styles united; petals always 5.
B. Stamens purple, spreading; caps. subglobose.


This is one of the showiest species, but tender.

Bb. Styles united; petals 5.

**Stewartia Pseudo-Camellia, Sieb. & Zucc.** Shrub or small tree; lvs. oval to oval-oblong, acute at both ends, remotely serrulate, slightly pubescent beneath, light green, 1½-2½ in. long; fls. white, 1½ in. across, with flat, spreading, obovate petals; stamens connate at the base; anthers violet; fr. about ¾ in. across. Japan. S.Z.I: 96.—This is the least desirable species and probably as tender as the preceding; it is doubtful whether it is in cult. Plants intro. under this name seen by the writer proved to be *S. Pseudo-Camellia*. Also the closely allied *S. serrata*, Maxim., differing in its glabrous lvs. and larger fls. with serrate sepals and distinct stamens is apparently not yet intro.

cc. Bracts small, shorter than calyx.

**Pseudo-Camellia, Maxim.** (S. grandiflora, Briot. *S. japonica* var. grandiflora, Hort.). Fig. 3693. Shrub, with upright branches, or tree attaining 50 ft. or more in Japan: trunk with smooth red bark, peeling off in larger thin flakes; lvs. elliptic to elliptic-lanceolate, acute at both ends, often acuminate at the apex, thickish, bright green, glabrous or nearly so beneath, 1½-3 in. long; fls. hemispherical, 2-2½ in. across; petals almost orbicular, concave, silky-pubescent outside; anthers orange-colored; seeds 2-4 in each cell, narrowly winged. dull. July, Aug. Japan. B.M. 714S. R.H. 1879: 450. G.C. III. 4: 187. Gn. 43: 172. G.F. 9: 30 (adapted in Fig. 3693). M.D.G. 1900: 450. R.B. 28, p. 81. F.S.R. 3, p. 263. J.H. III. 54: 57. S.I.F. 1: 73.

aa. Styles 5, distinct; petals often 6.

**pentagyna, L'Héro. (Malachodendron ovatum, Cav.).** Fig. 3694. Shrub, 6-15 ft. high; lvs. ovate to oblong-ovate, acuminate, usually rounded at base, remotely serrate, sparingly pubescent and grayish green beneath, 2½-5 in. long; fls. cup-shaped, 2-3 in. across; petals obovate, with wavy crenulate margin; stamens white, with orange-yellow anthers; caps. ovate, pointed, sharply 5-angled; seeds narrowly winged. July, Aug. N. C. and Ga. to Tex. and Fla. B.M. 3018. B.R. 1104. M.D.G. 1900: 479. H.U. 3, p. 366. This shrub is handsomer than the preceding species and as hardy. Var. grandiflora, Bean. Fls. 4½-½ in. across, with purple stamens. A very desirable variety which was found along with the yellow-stamened one in the woods of Ga.; the flowers are as beautiful as those of *S. Malachodendron*, and the plant is much harder.

ALFRED REHDER.
STIGMAPHYLLON (Greek, stigma and leaf; referring to the leaf-like appendages of the stigmas). Sometimes written: Stigmaphylhum. Malpighiaceae. Woody vines, grown in the greenhouse and also out-of-doors in the extreme South.

Leaves usually opposite, entire or denticulate, rarely lobed; petiole with 2 glands; stipules minute: fls. yellow in umbel-like corymbs which are peduncled and axillary; calyx 5-parted, 8-glandular; petals clawed, unequal, glabrous, stamens 10, unequal, 6 perfect, 4 without anthers or deformed; ovary 3-5-celled, 3 lobed, dorsal lobe gibbose: samarre 1-3, extended above into a wing.—About 55 species. Trop. Amer.

ciliatum, A. Juss. A tender woody twining vine: lvs. evergreen, smooth, opposite, cordate, ciliate: fls. bright yellow, large, in peduncled axillary clusters of 3-6. P.M. 16:77. Gn. 35:170.—Apparently the only species in the trade and possibly the handsomest of the genus. G. W. Oliver says that S. ciliatum is one of the best medium-sized vines for outdoor trellis-work. For pot culture it is of little service and thrives in the greenhouse only when planted out. Sept. is the best month for prop. On outdoor plants much of the wood is useless for this purpose, being thin and soft. Choose the wood made early in the season; a heel or joint is not necessary; root in bottom heat and carry through the winter in the greenhouse as small plants. Winter in the greenhouse only is stand temperatures at least to —10° F. It is readily grown from seeds but is not easily transplanted.

sylvatica, Linn. QUEEN’S DELIGHT. QUEEN’S-ROOT. YAW-ROOT. Root perennial, woody: sts. clustered, herbaceous, 1-3 ft. high, with an umbel-like top: lvs. lanceolate to oval or oblong, glandular, crenulate to obtusely ciliate, acute or obtuse: spikes 2-3 in. long: fls. small, yellow. Spring to fall. Va. to Texas.

3695. Stipa eleganssima. (x 14)

3696. Stipa pennata. (x 14)

STIPA (Greek, stipe, tow, in allusion to the plumose awns of some of the species). Gramineae. Perennial grasses with narrow involute lvs. and usually loose panicles: spikelets 1-4d.; glumes membranaceous, longer than the indurated lemma; lemma with a sharp hairy callus below and a stout persistent awn above, falling from the glumes at maturity. —A large genus of about 100 species, throughout the world except the colder parts. Particularly characteristic of the plains, savannas, and steppes. The longawned, sharp-pointed frs. of some species are troublesome or even dangerous to stock, especially sheep, on account of their tendency to work through the skin and into the vital organs. The species here mentioned are cult. for ornament, including the making of dry bouquets.

a. Awns and pedicels not plumose.

b. Fr. or mature lemma, excluding the long awn, 3/4-1 in. long.

capillata, Linn. Similar to S. pratensis: fls. more numerous but smaller in every way; lemma about 1/2 in. long; lower part of awn only minutely pubescent, the upper or bent portion sinuous. Plains, Eu.

spartea, Trin. PORCUPINE-GRASS. Culms 2-3 ft., in bunches: panicles contracted; glumes broad, nerved, about 1 in.; awn usually about 6 in. long, the lower half erect, pubescent but not plumose, strongly twisted, the upper half bent to one side, rough. Ill. to Calif. Dept. Agric., Div. Agrost. 20:62.

b. Fr. or mature lemma, excluding the short awn, less than 3/4 in. long.


spíndens, Trin. (Lasiógrósis spíndens, Kunth). Culms 3-6 ft.: panicles rather dense, about 1 ft. long, nodding; spikelets numerous, small, the glumes less than 3/4 in., pearly and shining, tinged with purple at the base; lemma 3/4 in., villous, the awn 3/4-1 in. Steppes of W. Asia.
AA. Axils or pedicels plumose.

b. The pedicels plumose.

elegantissima, L., Habit. Fig. 3695. Culms 2-3 ft., erect from a horizontal rhizome: lvs. narrow and erect: panicles, very loose, 6-8 in. long, the capillary panicle branches and pedicels plumose; spikelets 4-6 lines long; awn 1½ in. long. Austral.—Thrive in sandy soil.

BB. The awns plumose.

Pennata, L., Feather-Grass. Fig. 3696. Culms 2-3 ft., in bunches: glumes narrowed into awns an inch or more long; lemma ½ in. or more long; awn about a foot long, the lower portion smooth and twisted, the upper very plumose, giving the panicle a feathery ornamental appearance. Sometimes erroneously called B. gigantea. Steppes of Eu. and Siberia. Gn. 9, p. 199. V. 3:247. R.H. 1890, p. 489.

tenacissima, Linn. Esparto-Grass. Culms 2-3 ft., in bunches: lvs. narrow, smooth, cylindrical, elongated: panicles contracted; awn 1-2 in. plumose below the bend. Spain and N. Afr.—The lvs. furnish fiber from which are made ropes, mats, paper, and the like. In Afr. it is called halfa or alfa. A. S. Hitchcock.

STIZOLOBIUM (name refers to the stinging pods). Leguminosae. Velvet Bean. Some of the species are grown as ornamental vines in warm countries, as the growth is very strong, but the genus is valuable mostly for its forage species and therefore does not demand extended treatment here.

These plants are allied to Glycine, which includes the soybean. The lvs. are large and 3-foliate: lts. in axillary clusters, long or oblong, large, dark purple (sometimes white or yellowish) but turning black when dried, the corolla much longer than the narrow-lobed calyx; the keel long, boat-shaped and usually twice or thrice longer than the obtuse standard and also longer than the wings; stamens diadelphous (9 and 1) the anthers not uniform in kind: pod often hairy, bristly or pubescent, containing pea-like seeds.—Species perhaps a dozen, tropics of Old World. The genus Stizolobium was formerly included under Mucuna, but is now distinguished from that genus (which see, p. 2074, Vol. IV) by its seed and other characters. In Stizolobium the seeds are nearly spherical, or flattened-oval in shape, with the hilum covering often less than one-sixth of its circumference and never more than one-fourth, while in Mucuna the seeds are nearly circular in outline, flattened, and with the hilum extending at least three-fourths of its circumference. In germination Mucuna has alternate scale-like lvs., while Stizolobium has petiolated, trifoliate lvs. with cordate lts. Mucuna is perennial, while Stizolobium is strictly annual. Such species of Stizolobium as are cult. for forage have pods which are nearly smooth, or are covered by a dense velvety pubescence; but there are a number of other species, notably S. pruriens, grown in the tropics, in which the pods have a dense covering of bristly stinging hairs, and are known under the common name of “cowage” or “cowitch.”

The principal economic use of the velvet beans or stizolobiums is as a winter pasture crop in the southern states. They are commonly planted with corn, the stalks of which give the necessary support, without which they produce few seeds. Some cultivators plant two rows of corn and then one row of the beans, while others plant the beans in alternate hills with the corn; the former method gives more corn to the acre, while the latter yields the heavier crops of beans. The crop is seldom cut for hay, as the vines are too long and tangled to be handled easily, but is left in the field until it is killed by frost, and is then grazed, as the vines, leaves, and seeds may remain on the ground a long time without injury from frost or rain. There are many varieties of this bean, some of which mature in about one hundred days from planting, while others fail to ripen without ten to eleven months free of frost. Some varieties produce profitable crops as far north as Tennessee, while others often fail to mature even in southern Florida. Among the many kinds now cultivated in the United States the best known is the Florida velvet bean (S. Deeringianum, Bort). This is of unknown origin, but it has been cultivated as an ornamental vine in Florida many years. About 1890 its value as a forage plant attracted attention, and thousands of acres are now grown for feeding cattle and hogs. This species makes a wonderful growth, producing vines 60 to 100 feet in length, and bearing clusters of large purple pea-shaped flowers which are followed by pods 2 to 3 inches in length containing four to six nearly spherical seeds. In recent years several sports or varieties have been developed, which mature seed in 110 to 130 days from planting, and are now cultivated largely in the region from Florida northward to northern Georgia and Tennessee. Among the more common of the recently introduced kinds are the Lyon velvet bean (S. niveum, Kunze) which bears racemes fully 3 feet in length with white flowers; the Chinese, which is similar but has shorter racemes and matures much earlier; the Black (S. capitatum, Kunze), which has very long racemes with purple flowers, and late-ripening pods covered with a velvety pubescence; and the Yokohama (S. Hassio, Piper & Tracy), which matures within three to four months from planting. In addition to these there are numberless crosses and hybrids. As all the species are natives...
of tropical or semi-tropical regions they require a long season without frost for their successful cultivation. For botanical and other accounts, see Bulletins Nos. 141 and 179, Bureau of Plant Industry, United States Department of Agriculture; also Belling on inheritance problems in crossing stizolobiums, Report of Florida Experiment Station for 1914.

The varieties most grown for ornament are the Lyon, with flowers in racemes often 3 feet in length; the Chinese, which is very similar to the Lyon but shorter racemes and blooms much earlier; and varieties of *S. chlorospermum*, Piper & Tracy, with flowers light purple. All of these have pods 5 to 6 inches in length, f-shaped (the ends curved in opposite directions), somewhat brown- or gray-bristly. The most common species in this country is the Florida Speckled, *S. Deeringianum*, Hort. (Fig. 3697), which has been grown in Florida many years, and has been commonly known as “the vine.” This seldom matured much seed north of central Florida, but in recent years several varieties have been developed which mature as far north as Tennessee. The pods of this species are usually less than 3 inches long, and are covered with a black velvety pubescence. All are annual climbers, growing to a great length. The branches are somewhat appressed-hairy, the leaves more or less silky beneath, leaflets ovate, or the lateral ones rhombic-ovate, obtuse but apiculate.

The cowpea or cowage, *S. pruriens*, Medic. (Dolichos pruriens, Linn. *D. multiﬂorus*, Hort., *Mucuna pruriens*, DC.), is apparently the oldest species known, and has become naturalized in the West Indies, but is not grown in the United States. The pods of this species are red or reddish black in color, nearly straight, and 4 to 5 inches in length. They are very bristly-hairy, the bristles are easily dislodged by a touch and are extremely irritating to the skin, often producing trouble problems in crossing stizolobiums, Report of Florida Experiment Station for 1914.

The handsome globular beans (3⁄4 to 1⁄2 inch diameter) have marking which suggests the castor bean. The cowpea does, although it can not be grown so far north as that plant. It is a good ornamental plant, growing 10 to 20 feet high when supplied with support. The handsome globular beans (3⁄4 to 1⁄2 inch diameter) have marking which suggests the castor bean.

**STOKES.** Popular florists’ flowers, single and double, white, blush, pink, purple, yellowish, suitable for cut-flowers (Fig. 3698). They are divided into two groups; they bloom profusely in the autumn. See *Matthiola*; also *Cheiranthus* for the closely related wallflower (also *Wallower*). Virginian stock is a very different plant and is not a regular florists’ flower; it is grown for its small fragrant single ﬂs.; see *Malcomia*.

Florists now frequently grow stocks in benches instead of carrying them through as potted plants. They are in considerable demand for Memorial Day. After the early bedding plants are removed to the frames, the benches are filled with soil and the plants that have been growing in pots since the seed was sown in December are then planted in them. Stocks may also follow chrysanthemums, the seed, having been sown in August.

The seed of the summer stocks, or, as they are commonly called, “ten-weeks’ stocks,” is sown from the end of February until April, mostly in a lukewarm hotbed, which must be sunny and well aired. Good clean garden soil, well mixed with sand and humus, is proper soil in which to sow the seed. The seed will germinate in six to ten days, the light-seeded sorts germinating more quickly than the dark-seeded kinds. Air must be admitted as soon as the seeds have sprouted, very much in warm weather and less when the weather is raw, until finally the sash may be entirely removed during the day. If the seedlings need water it should be given in the morning, so that they are dry at night. It is an interesting fact that when any two distinct forms, both having relatively smooth pods, are crossed, the first generation always produces forms heavily covered with stinging hairs, although the second generation usually shows a large percentage of nearly smooth pods. This seems a strong indication that *S. pruriens* is the original type of the genus. Cattle have been fed successively on the meal made of the beans ground in the pod, but persons have been made sick by eating the green cooked beans, because of its vigorous growth; the velvet bean promises well as a soil-renovator.
the can is hot the seedlings must be shaded. If the seed
is to be raised from pot-grown plants a good well-
manured, sandy garden soil should be used which con-
tains an admixture of well-rotted sod or the soil taken
from river-bottoms. The pots are about 6 inches high,
with a diameter of 7 inches. In culture they show, their
fourth leaf the seedlings are planted firmly into these
pots with a dibber, pots being well filled with the above
soil; care should be taken that the roots are inserted
vertically. From six to eight plants are put into such a
pot. These pots are then placed on sunny stages, usually
protected by telt-roofs. The development of the
plants depends now principally on careful watering,
which is done mostly with watering-pots and at the
beginning with a fine spray attached to the spout of
the pot. After a crust has formed on the top of
the soil, the spray is discontinued and the pots are
watered with the pipe of the can. This watering is done
at night during warm weather and in the morning when
the weather is fair. Very little watering is necessary in
continuously cloudy or rainy weather. The watering of
the stocks is the most particular and important part in
the cultivation in pots, for if due care is not exercised
a white maggot will make its appearance while the plants
are in bud and destroy the roots. The common flea-bolde
is another of the enemies of stocks; this often appears
in large numbers and eats the leaves of the young
plants. Frequent syringing with water is the only
remedy found so far against these pests when they infest
stocks. After the plants have been in bloom for a
while the double-flowering specimens are cut out
and the watering is continued carefully until the seed-
pods which form in the single plants show indications
of ripening, which is in October. The plants are then
pulled up and tied in bundles, which are hung up in dry
sheds until the middle or the latter part of November
and December, in which time the seed fully matures in
the pods. Now comes the most important part of seed-
seving of stocks. The bundles of plants are taken down,
the roots and part of the stems cut off, and the stalks are
taken in hand by expert gardeners who sort them for
common seed and also for the seed-stock. The pods indicate by their shape, size, and form whether the
seeds contained therein will produce a high percentage
of double flowers the following year, and the selection is
made with care. The seed that goes on the market
can be vastly improved by the removal of "wild" pods,
which contain seeds that produce nothing but single
flowers. The seeds are removed by hand from the pods,
mostly by women and children.

CARL CROPP.

STOKESIA (Jonathan Stokes, M.D., 1755-1831,
English botanist). Compositae. Stokes' Aster is one of
the choicest and most distinct of American hardy per-
ennial herbs, although little planted.

Heads many-fl.; marginal fls. much larger, deeply
5-cut: involucres subglobose; outer leafy, the inner with
foliculate, pectinately spinulose-ciliate, spreading ap-
pendages; receptacle fleshy, flat, and naked: achene
3-4-angled, smooth; pappus of 4-5 thread-like, decid-
uous scales. The species is a blue-fl. plant about a foot
high which at first glance has points in common with
China asters, centaureas, and chicory. The heads are 3
or 4 in. across in cult. The marginal row of fls. is com-
poved of about 15 ray-like corollas, which have a very
short tube at the base and are much broadened at the
apex and cut into 5 long, narrow strips.

The plant is hardy as far north as Rochester, New
York, and Boston, Massachusetts. Probably many
persons have been deterred from trying it because it
is native to South Carolina and Georgia, and because it
is considered a greenhouse subject in some standard
works on gardening. The fact that it is found wild in
wet pine-barrens is also deceptive, for the roots, as Wool-
son and Keller testify, will decay if water stands on the
soil in winter. Moreover, the plant has been praised by

Moehan for its drought-resisting qualities. Stokes' aster
should be planted in a well-drained sandy loam,
not in cold and heavy clay. It blooms from August
until hard frost. According to Chapman, the heads of
wild specimens are only an inch across, but the size of
heads in cultivated plants is stated by many horti-
cultural experts to be 3 to 4 inches across. The heads are
frequently used for cut-flowers. In the wild the heads
are few in a cluster or solitary; in cultivation a good
branch sometimes bears as many as nine heads. No
double form seems to have appeared but a white-flow-
er form is now on the market.

Moehan, Hill (S. cyanea, Lin.). Fig. 3699. Much-
branchered, hardy perennial herb, 1-2 ft. high; branches
often purplish, sometimes hairy when young; lvs. lan-
ceolate; radical ones entire, tapering at the base into
long, flattened stalks; cauline lvs. gradually becoming
sessile, the uppermost with a few teeth near the base and
half-clasping; fls. blue or purplish blue, 3-4 in. across.

Var. alba, Hort., has white fls. Var. praecox, Hort., is
a lavender-fl. sort.

WILHELM MILLER.

STONECROP: Sedum.

STORAGE and refrigeration of fruits and vegetables.
The storage house has become a very important
adjunct to fruit-growing. In fact, fruit-growing would
not be possible in present-day large-scale practice
without storage, or some means to preserve the fruit
from deterioration. Without some way to hold fruits in
sound condition during the time required to trans-
port them from the place of production, the develop-
ment of the large fruit industries of the West and South
would be impossible. The two most important factors
underlying the success of modern fruit-growing are the
discovery of methods of controlling insects and dis-
ees and the application of refrigeration to the trans-
portation and storage of the crops. The time required
to transport fruit crops to the centers of consumption
varies from a few hours to ten days, and in some cases
two or three weeks are required, especially when the
fruit is exported to foreign countries. Under these con-
ditions, the trip to market really becomes a period
of storage and the application of storage principles is as important as transportation principles. The object of refrigeration in the transportation of fruits involves only the holding of the fruit in sound condition long enough to reach the consumer. Storage, on the other hand, includes the holding of the product for a long or short period, thereby lengthening the season of marketing as well as increasing the territory over which it may be distributed. The lengthening of the season of storage during which the product may be sold, is very essential when the production of fruit crops has reached a point greater than can be consumed during the normal season. This is aside from the general advantage of having a product out of season, for which many consumers are willing to pay a higher price. The conservation of the surplus crops through storage enables the equalization of the selling or marketing season, giving the consumer the advantage of obtaining supplies during a longer period, and giving the producer a chance to market larger crops at profitable prices. The application of storage to the apple industry has resulted in making this fruit an all-the-year-round staple food, as supplies are easily held from one season to the next. The advantages of this to both consumer and producer are manifest. If the apples had to go into consumption during the normal season of this fruit, there would be alternate periods of plenty and scarcity. The same is true, although to a less extent, of other fruit crops, such as pears, grapes, peaches, and oranges. Many of all others who are likewise held successfully in storage for longer marketing periods than their normal seasons. Potatoes, celery, cabbage, onions, and even lettuce and cauliflower are successfully stored for varying periods.

Storage also finds application in other horticultural industries. The nurserymen are enabled to hold their stocks of trees, plants, cions, or cuttings until the proper season of planting or propagation arrives. Bulbs, lily-of-the-valley crowns, and cut-flowers are also successfully stored, sometimes known as "dry storage." The products are held in their original or "fresh" condition throughout their normal life, provided they have been properly operated.

Another unfortunate fallacy, that cold-stored products may be used as fresh, has been over-emphasized. The present high cost of living has resulted in making this fruit an all-the-year-round staple food, as supplies are easily held from one season to the next. The advantages of this to both consumer and producer are manifest. If the apples had to go into consumption during the normal season of this fruit, there would be alternate periods of plenty and scarcity. The same is true, although to a less extent, of other fruit crops, such as pears, grapes, peaches, and oranges. Many of all others who are likewise held successfully in storage for longer marketing periods than their normal seasons. Potatoes, celery, cabbage, onions, and even lettuce and cauliflower are successfully stored for varying periods. Storage also finds application in other horticultural industries. The nurserymen are enabled to hold their stocks of trees, plants, cions, or cuttings until the proper season of planting or propagation arrives. Bulbs, lily-of-the-valley crowns, and cut-flowers are also successfully stored, sometimes known as "dry storage." The products are held in their original or "fresh" condition throughout their normal life, provided they have been properly operated.

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storage are frequently responsible for untimely deterioration, and the practice should be discouraged; but so far as fruits and vegetables are concerned, it is perfectly safe to state that no injurious effects have ever followed the use of these cold-stored foods. The evidences of deterioration are plainly visible, fruits and vegetables and there are no hidden germs or ptomaines. No one is likely to be deceived into eating a deteriorated fruit or vegetable.

The agitation against cold-stored food products has resulted in a demand for legal regulation of the storage business. Several states have passed laws prescribing certain conditions which must be met. Attempts have been made to obtain federal regulation, and no doubt federal laws concerning the cold storage of fruits and vegetables will eventually be enacted. The state laws now in effect and the proposed federal legislation place arbitrary limits upon the time the products may be held; provision is also made regarding the marking of the products, and the inspection of the goods from time to time is provided. Legal regulation of this business is desirable and wise, but it is not wise to present arbitrary obstacles to the development of refrigeration. It is questionable whether the adoption of an arbitrary maximum will fully meet all possible conditions, and the entire plan of restriction is open to criticism. Not only does the length of time vary for different classes of goods, but within the same class the condition of the product at the time it is placed in storage or its treatment previous to storage very materially influences the time the product may be held in whole or in part. Not only does the length of time vary for different classes of goods, but within the same class the condition of the product at the time it is placed in storage or its treatment previous to storage very materially influences the time the product may be held in whole or in part.

Through this system of food conservation, the extension of markets and the territory over which different commodities may be distributed are very materially increased. In the use of cold storage or refrigeration, the first establishments depended on ice for the refrigerating medium. In the earliest plants natural ice was used. This was gathered or "harvested" during the winter and used during the spring and summer months. There is a very large quantity of natural ice used under modern conditions, but the manufacture of ice is increasing and the use of "artificial" ice is likewise extending, even in districts where natural ice may be obtained without difficulty.

Systems of refrigeration.

In modern cold-storage plants two systems of refrigeration are used: (1) ice refrigeration, and (2) mechanical refrigeration. There are several methods of applying each system. In the use of the first, ice alone may be the refrigerant, or a mixture of ice and salt may be used to obtain lower temperatures than are possible from ice alone. In the application of the ice-and-salt refrigerant, several systems may be used, as will be explained later. The ice used may be manufactured or natural, depending on the relative cost.

In the mechanically refrigerated plant, the refrigeration is secured directly without first producing ice. It is apparent that the direct application of the refrigeration results in a very material saving in both time and energy. In this way, the cumbersome method of first manufacturing the ice and the consequent inconvenience in handling it are avoided.

There are two kinds of cold-storage plants—the general warehouse, provided with cold-storage equipment for handling all classes of commodities; and the storage plant constructed especially for the storage of a particular commodity, such as eggs, dairy products for example. It is evident that the large general warehouse may have a very great advantage in economy of operation. The general warehouse handles a mixed business which often results in a more economical distribution of overhead operating expenses than is possible when the entire burden of expense must be borne by a single commodity or single class of commodities. It is easy to see that the greatest efficiency and economy of operation occur where practically the entire capacity of the plant is used during the year. This is hardly feasible with fruits, with the possible exception of apples which are now held largely during the greater part of the year. But even in the case of apples, there cannot be a full use of the equipment constantly, as the withdrawals will be gradual throughout the season. Nevertheless, the construction and operation of cold-storage plants for apples or other fruits is constantly increasing. These plants may be owned by special corporations or built and operated by growers' organizations or by growers who have sufficient acreage to warrant the extra provision of storage facilities. In some instances the ownership or control of cold-storage facilities has rendered the storage of a particular commodity independent of its production. The ice used may be owned by special corporations or built and operated by growers' organizations or by growers who have sufficient acreage to warrant the extra provision of storage facilities. In some instances the ownership or control of cold-storage facilities has rendered the storage of a particular commodity independent of its production.

Mechanical refrigeration depends on the compression of a gas or vapor. The compression exerted heats the gas, and in some instances, liquefies the gas. The heat is absorbed by means of cooling water, and when the gas is allowed to expand, an equal number of heat units is absorbed from the surrounding medium. This, briefly, is the general principle upon which depends the operation of air-compressing machines. The gases used may be air, ammonia, sulfur dioxide or carbon dioxide, commonly known as carbonic-acid gas. In the cases of air machines, the air is simply compressed under very heavy pressure and cooled by means of water. There is no liquefaction of the air attempted in the case of these machines. The advantages of the air-compressors are that they are comparatively easy to manipulate and there are no injurious effects in case of leakage from the compressed vapor. These machines are used to a great extent on shipboard, and in England to a much greater extent than in the United States. Improvements in the construction of air-compressing machines are resulting in their increased use. The disadvantage of the air-refrigerating machines is that they are relatively inefficient for low temperatures. There being no liquefaction of the gas, the advantage of the latent heat due to the change of state is absent, and consequently there is a loss of efficiency to the extent of the latent heat necessary, first, to change the gas to the liquid and then back from the liquid to the gaseous state.

In the machines which utilize a liquefiable gas, that is, a gas which may be liquefied at comparatively high temperatures, the latent heat due to the change of state adds greatly to the efficiency of the machines, and consequently, much lower temperatures can be secured for a given amount of power. One of the essential qualities of the gas which may be used for this purpose,
is that it must be comparatively inexpensive and must be within the means of utilization by a comparatively simple apparatus. Ammonia, sulfur dioxide, and carbon dioxide are in general use in about the order named. Ammonia is the most common, and is in many respects the best. It may be supplied at a lower pressure and a higher temperature than either carbon dioxide or sulfur dioxide. Carbon dioxide is, therefore, somewhat less efficient to the extent that the high pressure requires more power, there is greater friction to overcome, and colder temperatures are not always obtainable within ordinary means. Carbon dioxide has the advantage of being a non-irritating and non-poisonous gas. If leaks occur in the system, there is no great danger of serious injury either to the operators of the machinery or to the goods stored in the rooms. If leaks occur in the ammonia system or in the sulfur dioxide machines, there is very great danger of injury to the workmen about the plant and the food commodities exposed to these gases may be very seriously injured, even with slight leakage. Nevertheless, the greater ease with which the ammonia machines can be manipulated is considered a sufficient advantage, and this type of machine is much the commonest in use.

The system of operation of the refrigerating plant is comparatively simple although rather complicated machinery is required. It is not essential that the fruit-grower who contemplates the erection of a refrigerating plant be conversant with all of the complicated details or that he understand the principles upon which the machines are designed. For the erection and planning of a complete storage plant depending on refrigerating machinery, the services of a competent refrigeration engineer are essential. While it may be possible for a mechanically inclined fruit-grower to design and have erected a complete refrigerating plant, it must not be forgotten that slight errors in the calculation of the power required and the capacity of the machinery necessary to handle a given load will frequently render the operation of the plant very much more expensive than need be, or the efficiency of the plant may be very seriously impaired. Refrigerating machinery is, of necessity, expensive; it is likewise necessary in many respects.

There are many styles and designs of refrigerating machines. All, however, are dependent upon the same general principles. There is, first of all, the motive power which may be either the gasoline or electric motor, or the steam engine, which furnishes the power to operate the compressor. The compressor exerts pressure on the gas, heating it to a rather high temperature. If the machine is operating with ammonia gas, the compression results in a dense hot vapor. From the compressor, this hot vapor passes to the condenser, which is a system of pipes arranged in such a way that streams of cooling water may be passed continuously around the pipes containing the hot gas. The absorption of the heat from the dense vapor condenses it into liquid ammonia. This liquid is ordinarily run into a tank, again heated, and the process repeated.

When one contemplates the installation of refrigerating machinery, one of the most important factors to consider is the supply of water needed for condensing. This is ordinarily of very much greater importance than is appreciated. Large quantities of water are needed unless the temperature of the water is very low. The higher the temperature of the water-supply, the larger the quantity needed. The same water may be used continuously if there is some means at hand to cool it after it has served to absorb the heat from the condensing ammonia. In large refrigerating plants this is taken care of by means of large racks or towers in which streams of cooling water may be passed continuously. In towers, the water is run through screens which break it into fine streams, thus increasing the evaporation and cooling the water by the absorption of its heat. Unless some means is at hand to cool the water, a constant supply must be provided; otherwise, the efficiency of the machinery will be very greatly reduced. This point is of the utmost importance when refrigerating plants are to be located in fruit-growing districts. In fact, the practicability of operating the refrigerating plant successfully depends primarily on the presence of a sufficient supply of water for condensation.

Ice systems.

Refrigeration may be obtained from the use of ice alone. In this instance, however, only cool-storage effects can be obtained, except in winter and in climates where the outdoor temperature is low enough to offset the lack of refrigerating effects from the ice. The minimum temperature obtainable from ice is its melting point, which is just above 32° F. or, under the very best conditions, about 33° or 34°. Generally, ice-cooled chambers cannot be maintained below a temperature of 38° or 40° and these temperatures are obtainable only under the most favorable conditions. To obtain a temperature of 32° F. from ice, the addition of salt is necessary. The mixing of salt with the ice lowers the melting-point and, consequently, the temperature is lowered, although the rapidity with which the ice is consumed is very greatly increased. When the mixture of ice and salt is used, the quantity of ice necessary for storage is much greater. A lower temperature is necessary to hold the storage chambers at 32° F. because of the heat leakage into the chambers through the walls.

There are two methods of obtaining refrigeration from ice and salt. One of these is the indirect method, known as the gravity-brine system, and the other is the direct circulation of air through the ice and salt mixtures.

The gravity-brine system, the invention of Madison Cooper, acts as the reverse of a hot-water heating system. It depends on the principle of the greater density of a cold liquid, and its consequent downward flow when confined in a impermeable medium; in this way the refrigeration is obtained. After expansion, the ammonia gas is passed back to the compressor where it is again compressed and afterwards liquefied, the same gas being used over and over again. Instead of the compressor, the same effect can be obtained from what is known as the absorption system. This is a combination of a chemical and mechanical process. No compressor is used. Dense aqu-ammonia, which is simply a strong solution of ammonia gas in water, is heated in a reservoir, and as the ammonia escapes from the solution, it is under high pressure and becomes a dense vapor. From this tank the gas is passed through condensing coils and liquefied, just as is done in the compression system. After liquefaction, it is allowed to expand in coils and the gas is then returned to a tank or a series of tanks known as absorbers. These absorbers contain cool water which readily absorbs or dissolves the ammonia gas. From the absorber, the ammonia gas is pumped into the heating tank, again heated, and the process repeated.

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The cold brine passes through the secondary coils, and, as it absorbs the heat from the rooms or chambers, its density is decreased and it flows upward and is returned to the top or primary coils, where it is cooled and the process repeated. Fig. 3700 is a diagram illustrating the principle upon which the Cooper gravity-brine system depends. At the top of the illustration the primary coils are shown and the methods of placing the pipe systems or coils is indicated.

The cooling effects secured from the Cooper brine system are indirect in that the refrigeration obtained from the ice-and-salt mixture is first exerted upon the brine solution and this solution is the means of carrying the refrigeration to the place where it is needed. There is an inevitable loss in the indirect method because of the loss of refrigeration in the conducting pipes.

In the second system of securing refrigeration from ice and salt, the air is passed directly through the mixture and, consequently, the refrigerating effect is obtained directly from the mixture. Experiments have shown that very low temperatures can be obtained by passing a current of air through an ice-and-salt mixture, the temperature depending on the proportion of salt used in the mixture. The higher the percentage of salt the lower the temperature obtainable. The device for obtaining refrigeration in this way is simple. It consists of a tank for holding the crushed ice and salt. At the bottom of this tank openings are provided through which a current of air can be forced. The particular working out of the design for obtaining refrigeration in this way has been accomplished by S. J. Dennis, of the United States Department of Agriculture. Dennis’ apparatus has been used successfully in several plants on the Pacific coast, and owing to the fact that it was developed as a part of the Departmental investigations, its use by the citizens of the country is free. It is essentially an ice-and-salt tank of “magazine” type. As the ice is melted at the bottom the supply from above drops down. From 7 to 10 per cent salt has been found to yield satisfactory temperatures. The apparatus can be constructed by almost any ordinary mechanic who can follow detailed drawings or instructions. A fan is used to draw the air through the ice-and-salt mixture and to force the refrigerated air into the storage chambers. Ducts are provided for the return of the air, and in this way the same air is used continuously.

There is another method of securing refrigeration from ice and salt which may be designated as the “tube system.” In this system the mixture of ice and salt is contained in tubes located at the sides of the room. The tubes are filled with the mixture from the top and the refrigeration is obtained by the cooling of the air in contact with the tubes. The number of tubes necessary to cool a given quantity of goods depends upon the character, size, and insulation of the room. The tubes are constructed of galvanized iron and are about 8 or 10 inches in diameter. The tops of the tubes open above the storage room, so that the filling can be done without opening the room itself. A proper arrangement of pipes at the bottom to carry off the brine is necessary, and in arranging for this melting outlet, a proper trap must be provided in order to prevent the wastage of the cold air. This system has found considerable application in the Hudson River Valley of New York state, and is very effective for a short season of storage.

Systems of applying refrigeration
Refrigeration may be defined as the cold obtained from a refrigerating medium or directly from mechanical appliances. The temperature-reducing properties of the ice-and-salt mixture and those of the liquid ammonia are the refrigerating qualities of these agencies. Refrigeration is ordinarily measured in terms of melting capacity in a day of twenty-four hours. For example, a machine which is rated as yielding a capacity of ten tons a day is based upon the melting of ten tons of ice in that time. Ordinarily, it is not the quantity of ice which can actually be produced by the machine, except when ice manufacture is the primary object.

There are three systems of applying the refrigeration secured by mechanical means: (a) direct expansion; (b) brine circulation; (c) air circulation. The claims for this system are that the work is direct; therefore there is no loss in conducting the refrigeration obtained from the pipe surface. The greatest objection to this system, especially with ammonia or sulfur dioxide plants, is the danger of leaks. Small leaks may allow a sufficient quantity of gas to escape to damage the goods stored in the room. There is also great danger to the workmen, which has already been referred to. The greatest care is necessary in constructing the direct-expansion system. With the perfection of mechanical devices for welding and fastening pipes, the danger from leaks has been reduced to a minimum, and there are many direct-expansion systems in operation in which no injuries have ever been recorded. One disadvantage is the fact that there is no reserve power except that which is contained in the liquid receivers. Should it be necessary to shut down the machinery for repairs for any considerable length of time, there would not be sufficient reserve to continue the refrigerating effects and the temperature of the storage rooms would be likely to rise to a considerable extent.

In the brine-circulation system, the expansion coils are surrounded by a non-congealable brine such as a solution of calcium chloride, which has a very low freezing-point. The brine is cooled in the pipes and this cold brine is circulated through coils in the rooms by means of pumps. In applying this method, there is first, what is known as a brine-cooler in which the brine is cooled.
collected in a brine tank of sufficient capacity to operate the plant for a considerable length of time. This really acts as a reservoir of cold, and from this reservoir the cold brine is circulated throughout the entire cold-storage plant, the temperature and quantity of the brine circulated being governed by the results desired.

The coils of pipes in the rooms are commonly referred to as the "piping." These coils or racks of pipes are the most important for refrigeration, and the number, coils or length of piping depends upon the size of the room and the temperature desired. Low-temperature rooms or freezers have a large number of coils and a great length of pipes. Pre-cooling rooms should also have heavy piping and many pipes. The advantages of the brine-circulation system are that there is no danger from leakage of ammonia or other irritating gas. The statement is also made that there is a more uniform temperature, the flow of the brine being under constant and easy control. The temperature of the brine is also under definite control. Perhaps the greatest advantage is that the supply of cold brine acts as a reservoir of refrigeration and a reserve supply can be drawn upon in case of necessary shutting down of the machinery.

In placing the pipes in cold-storage chambers, it is important to have them located at the upper part of the room. Ordinarily, the dependence for the circulation throughout the room is upon the natural circulation of the air within the room. The air in contact with the pipes is cooled and, being rendered more dense, flows to the floor, the warmer air from other parts of the room taking its place. In this way, a constant circulation is maintained throughout the room. It is easy to see, therefore, that the placing of the pipes in the upper part of the rooms is essential; otherwise, there is danger that the parts of the room above the pipes may be beyond the refrigerating effects. The air is, therefore, the medium of applying the refrigeration. It is due to convection currents that the transfer from the refrigerating pipes is effected, and it is very difficult to obtain a uniform cooling in all parts of the room unless the pipes are carefully placed.

In the air-circulation system of applying refrigeration, there is a forced air circulation. The air is forced through conduits or ducts by means of fans. In this system the expansion coils of pipes are in groups or batteries, what are known as bunker rooms, or more correctly, coil rooms. The refrigerating capacity of the plant is, therefore, concentrated in one place. In arranging the coil pipes, baffles are placed in such a way that the air passing through the coil rooms must come in contact with all of the pipes. If all of the pipe surfaces are not reached by the air, the full refrigerating effect of the plant is not obtained. The coils may be direct-expansion coils or brine-circulating coils, that is, have the brine circulating through them. The Cooper gravity-brine system may also be used. For this purpose, the secondary coils are located in coil rooms where the air to be cooled can be forced through.

In placing the fans for such a plant, the arrangement must be such that the air is drawn from the coil room and forced through ducts to the storage chambers. With this arrangement there is a constant pressure in the rooms which is preferable to the exhaustion of the air. Any leakage which occurs, therefore, is outward from the room instead of inward. Return ducts are provided which conduct the air back to the coil rooms, the same air being used continuously. Impurities from the storage rooms are absorbed by the air and deposited in the moisture which freezes on the cold pipes. The impurities, therefore, are very largely absorbed by the frost, and the circulation of the current of air through the coil rooms acts largely as a purifier of the air of the storage rooms. Some ventilation, however, is frequently desirable. The problem of ventilating a cold-storage chamber is a difficult one and special appliances must be provided for this purpose. The outer air cannot be admitted directly into the storage chamber unless it is at the same temperature as the air of the storage room. In warm weather, therefore, the admitted air must be cooled and in extremely cold weather it must be warmed. There are special mechanical devices for accomplishing both of these purposes.

Shape of storage plants.

Many storage plants are planned without consideration of the factor of the most economic shape; that is, the most efficient as well as the most economical size of plant to be constructed. The first consideration is that the plant should be planned to supply the required floor space and cubical capacity. In figuring the size of storage rooms to accommodate packages of fruits, the size of the fruit packages must be taken into consideration and enough space must be made to allow the air to circulate between the stacks or bales of packages. A barrel of apples, for example, requires 8 to 10 cubic feet. Another factor which must be considered is the economical handling of the packages in the storage rooms. Where the storage season is comparatively short, the extra exposure of packages in the rooms must be considered. Where, however, the storage season is to be long, higher stacks may be made and, consequently, rooms of greater height will be most economical. In the cubic contents of the chamber are determined, the next consideration is the shape of the plant or room.

The most economical shape for a storage plant is the cube. This is due to the fact that the ratio between the cubical contents and exposed outside surface is smaller for the cube than for any other shape. It is important to take this into consideration because of the fact that there is no perfect insulating material and, consequently, when the ratio of exposed outside surface is very high, the rate of heat leakage into the room is increased considerably when the shape of the room differs materially from the cube. Such a room must have either much heavier insulation or considerably more power supplied to offset the greater heat leakage. Sometimes limitations of space, as for example, utilizing parts of buildings, require that the rooms be of odd shapes. When this is necessary, it will require considerably more insulation or power, as suggested. The capacity of the plant must be determined by the shape of the commodity to be stored. Large rooms are easier to maintain at a desired temperature after the entire load of the room is reduced to the required temperature. In large rooms, however, it is more difficult to cool uniformly unless some special attention is given to the placing of the pipes, or the duct openings where forced air circulation is used. For periods of short storage, such, for example, as the more perishable fruits like berries, rooms of smaller capacity are more desirable than very large rooms.

Insulation.

There are three ways in which heat may be transferred: radiation, convection, and conduction. Radiation is the transference of heat from one body to another through a third medium without perceptibly affecting the medium. The heat which one feels when standing before a fire is radiant heat. The conduction of heat is accomplished by the passing of heat from one body to another by contact with the heated body. The heat that one feels when the hand is placed on a warm pipe is conducted heat. Heat is transferred by convection by means of a third medium, usually air. In attempting the construction of storage houses, all three methods of heat transference must be taken into consideration. The heat actually radiated is comparatively small in storage buildings. The quantity of heat transferred by conduction is greater, but the most
important problem of heat transference is through convection currents. In order to offset this heat transference, specially constructed walls must be provided. A storage chamber is a room so constructed that the temperature may be maintained at or near a constant point. In order to offset changes of temperature, sufficient refrigerating capacity must be provided, or some provision must be made to prevent the actual transmission of the heat from the outside to the inside of the room. The latter provision is known as the insulation of storage rooms. Therefore, the rooms are constructed in such a way that the walls act as barriers against the transmission of heat. Convection currents actually occur in filled walls, although slight, gradually destroy the insulating effect. Attempts to prevent this have been thought to be efficient insulation. Still air is a necessity where this method of insulating the wall is used. A slight leakage into the wall is sufficient to allow outer air to enter and, consequently, to destroy the insulating effects. In walls constructed of free air spaces, convection currents occur within the spaces, which act as effective transferers of heat either inward or outward, as the case may be. Fig. 3701 shows the action of convection currents within air spaces. When one air space is used, the transfer of the heat is very easily accomplished, as shown by the direction of the air currents—shown by the arrows in the diagram. Simply thickening the walls, therefore, does not act as a sufficient insulation. The effect of air spaces is constantly improved by breaking up the walls into smaller air spaces. The diagram shows the convection currents occurring in walls of one, two, three, or four air spaces. As the number of spaces is increased, the effect of convection is very greatly reduced, so that a wall consisting of four air-tight spaces may be considered as fairly efficiently insulated. It is, however, extremely expensive to construct these air-tight divisions, and some other means of insulation is desirable.

It is preferable to use some material to fill the walls. Such a filler breaks up the air spaces within the walls and confines the air in the small interstices between the particles. In this way, the air held within the wall approaches more nearly the desirable "dead-air" condition. Convection currents actually occur in filled walls, but they are very sluggish and the effect is very slight. Filled walls are effective barriers against heat conduction or radiation, provided, of course, that poor conductors of heat are used.

The most effective insulating material is a substance of low-heat conductivity which has many pores or cells. These cells are filled with air (practically still air); consequently the efficiency of the heat barrier is increased a number of times that are effective for storage walls. The requirements for an insulating material, besides non-conductivity of heat, are as follows:

1. Odorless; any strong odor would affect the goods stored in the rooms.
2. Moisture-proof or low capacity for moisture; dampness decreases the efficiency as an insulating material, and some substances ferment or rot when damp.
3. Vermic-proof; there should be no inducement for rats or mice to nest in the walls.
4. Non-liability to inherent disintegration or spontaneous combustion.
5. Lightness in weight; not only on account of the reduction of the actual weight of the walls, but because light materials are usually the best non-conductors of heat.
6. Elasticity; when packed firmly in the walls the material should not settle, as any settling within the walls results in open spaces in the insulation. After the walls are once constructed, these inequalities cannot be reached for repairs without completely rebuilding the walls.
7. Relative cheapness and economical handling; the material should not be so high in cost as to be prohibitive. In addition, the material must not be of such a nature that it is economical handling is impracticable.
8. Must allow of practical application in general work; very specialized material which would not lend itself to general conditions could not be considered as efficient insulating material.

The list of materials available for insulation may be divided into two classes: Those that can be considered as commercial insulation—that is, materials which are manufactured especially for insulating purposes; and common or waste materials.

Among the most common of the first class are the following: granulated cork, cork sheets or boards or bricks, hairfelt, linofelt, mineral wool, and lith.

Granulated cork is considered to be one of the best and most effective insulating materials. It is prepared from the trimmings of cork mills, and when used in the granulated state is simply filled into the walls and packed tightly. Cork sheets, bricks, or boards are manufactured of the cork particles which are compressed in molds at a high temperature. There is no cementing material used, the heat and pressure being sufficient to liquefy the natural gums and resins of the cork and these hold the particles together. Cork boards or sheets are also made by the addition of asphaltum pitch which renders the particles water-proof but may decrease the insulating efficiency.

Hairfelt is manufactured of waste cattle hair which is washed and deodorized. It is pressed or felted together by special machinery into sheets from 1/4 to 1 inch in thickness.

Linofelt is a patented material manufactured from...
flax fibers. It is prepared in sheets or quilts, from ¼ to ½ inch thick, somewhat like cotton-battting. These sheets are ordinarily quilted between water-proof paper. This material is used largely for insulating household refrigerators and refrigerator cars.

Mineral wool is also known as rock-wool, rock-cotton, rock-cork, or silicate cotton. This material is usually made from the slag of blast furnaces with the addition of limestone. Rock-wool is usually made from a mixture of granite particles and limestone. The crushed rock is mixed with coke and fused in furnaces at a temperature of about 3,000° F.; the molten slag or rock is run out through the bottom of the furnace by a high-pressure steam blast. This blows the slag into very fine shreds or fibers, much resembling fleece or wool. The result is a material which contains from 92 to 96 per cent air spaces and, although consisting primarily of a substance of high-heat conductivity, is fairly efficient as insulation. It is practically vermin-proof, fire-proof, and not liable to decay. It absorbs moisture very easily, and one of the greatest disadvantages is the difficulty of handling. The fibers are very penetrating and are glass-like, which result in considerable inconvenience in handling the material.

Lith is a manufactured insulation composed of flax fibers, lime rock-wool, and water-proofing compound. It is prepared in boards of standard sizes and thicknesses and is accepted as a standard insulation by refrigerating engineers. It is a very efficient insulating material.

Common forms of insulating material which are usually at hand or can be easily obtained for the construction of storage buildings are: straw, chaff, hay, dry grass, dry leaves, hulls of various grains, sawdust, and mill shavings.

All except sawdust and mill shavings can be considered as suitable only for temporary structures. These materials are all fairly efficient as non-conductors of heat provided they are dry and means are used to keep them in a dry condition after being built into the walls. There is also some danger from the depredations of rats, and the greatest possible care must be used to prevent these rodents from gaining entrance. Sawdust from different woods has about the same insulating effect. The sawdust must be thoroughly dried, otherwise its efficiency as insulation is very greatly impaired and, in addition, there is danger of fermentation and heating, and even spontaneous combustion. It is more difficult to obtain dry sawdust than mill shavings, and whenever sawdust is used it should be very carefully dried before being placed in the walls. It has not as great elasticity as mill shavings and, consequently, is likely to settle after packing unless very carefully pressed into place.

Mill shavings consist of small chips and shaving from planing mills. This material has largely replaced sawdust for insulating purposes and is much more effective. It is obtained easily in a dry condition, owing to the fact that the mills of this kind usually work dry lumber. It is much more plastic than sawdust and does not pack or settle down. If thoroughly dry, and means are taken to keep it so, it is a very efficient insulating material and will remain in good condition for many years. It should be packed in the walls at the rate of eight or nine pounds to a cubic foot.

Whenever walls are filled with insulating material in loose condition, much will depend upon the method of constructing the walls. Not only is it necessary to use the proper material in a dry condition, but unless the walls are properly built, the insulation will not retain dry any great length of time. Walls that are not practically air-tight allow the outside air to gain entrance and to mix with particles of insulating material; condensation of moisture takes place, and the insulating efficiency of the material is seriously impaired. The conditions for the condensation of moisture upon the insulation particles are ideal unless special means are used to prevent it. Contact with the inside walls lowers the temperature of the insulation to such an extent that when the warmer air from outside comes into contact with it, the moisture is deposited and absorbed. Therefore, it is necessary to build the walls in such a way that they will be practically air-tight. This is accomplished by having layers of elastic water-proof paper on the outside and inside of the walls. The proper method of constructing such walls is shown in Fig. 3702. The wall consists of two layers of matched boards on each side, between which the water-proof paper is placed. The figure also shows the proper method of overlapping the paper at the corners. It is very essential that these details be attended to; it is also necessary to prevent the tearing or breaking of the paper when placing it, and for this reason only elastic paper should be used. The more brittle forms of paper are so easily broken that it is almost impossible to place them without seriously injuring them. Any breaks at the corners or tears in the paper will allow considerable air leakage into the walls and very seriously impair their efficiency. This is probably one of the most important details in the construction of storage houses, both for cold-storage and for common-storage purposes. Too great stress, therefore, cannot be placed on this point.

Storage temperatures; humidity.

The general principles governing the application of low temperatures to the preservation of fruit products depend primarily on the fact that temperature is the most important factor governing the life activities of these products. A fruit or vegetable is a living organism in which the functions or life processes are continually proceeding as long as the body remains in a normal condition. The various processes of ripening depend upon the chemical and physiological changes within the
organism. Contrary to common belief, the life processes do not cease when the fruit is removed from the parent plant. These processes continue until the life cycle of the organism is completed. The fruit organisms respire and transpire just as plants do and the measurement of the end products of these respiration and transpiration processes serves as an index of the rate at which the life activities are proceeding. Definite measurements on a large scale has shown that the temperature factor is the most important from the standpoint of the rate at which the life activities proceed. Each fruit organism has a definite life span or life cycle, and it is easy to see that if in any way these activities can be retarded, the life span can be lengthened. The reduction of the temperature of the organism materially reduces the life processes, and the rates at which these activities proceed is slackened to such an extent that the definite life functions of the organism may continue slowly during a long period. The retardation of the life activities through the reduction of the temperature thus induces a slowness of the rate and a consequent increase of the length of the life span. This is the essential physiological principle upon which cold storage and common storage of fruits depend.

The most satisfactory temperature for storage purposes is one which is low enough to reduce the life activities to a minimum but not so low as to have the fruit become so cold that it is injured. It is important to remember that a complete stoppage of the life functions of a fruit organism means the death of it, and when this occurs, the fruit soon thereafter becomes unfit for food.

Much careful investigation remains to determine the most satisfactory temperatures for various fruit products. Many factors are involved. One of the most important of these is the condition of the product when it is placed in storage. Fruits of the same kind and the same variety have different cold storage qualities and require different storage treatments, depending upon the place where the fruit is grown or its previous handling. Until these factors are all known and controlled, it is unsafe to say that any particular temperature is exactly correct for all fruits. For this reason, it is difficult to limit storage periods by law, because no arbitrary limit can be satisfactory for all fruits. It would not be safe, for example, to state that apples should not be kept longer than a certain length of time. The same is true of pears, but with this fruit the conditions are even more extreme. Different varieties of apples and pears may be held in storage different lengths of time, and all warehousemen know by experience that the same varieties of fruits produced in different districts or in different seasons have different storage qualities.

The proper storage temperature for a fruit should be the lowest possible—that is, the lowest temperature at which the fruit can be held without actual injury. This is due to the fact that when other conditions are satisfactory, the lower it is possible to hold a given product the longer it will remain in good condition. This means, then, that the freezing point of the fruit can be safely approached under ordinary conditions. There are, naturally, some important exceptions to this general rule.

As has been indicated above, different fruits have different rates of life activities, and the more perishable fruits are those that have the most rapid rate. For example, perishable fruits like berries, peaches, and some varieties of grapes have very rapid life activities, while the less perishable fruits such as apples, pears, and the citrus fruits have a very low rate of life activities. This condition affects the storage period of a given fruit for the most favorable conditions. It is a well-known fact that the more perishable soft fruits cannot be held in storage for any great length of time. The naturally short life can be lengthened considerably but not to the same extent that the life span of the harder fruits can be lengthened.

Berries of various kinds, cherries and cranberries, may be hard frozen and held in such condition for several months when the product is intended for use in making sauce or pies. When the hard-frozen fruits are removed from storage they must be used immediately, as they soon become soft and break down physiologically.

The most desirable cold-storage temperature for a fruit, according to present knowledge of the subject, is 32° F. for apples, pears, peaches, plums, strawberries, raspberries, loganberries, blackberries (short time), cherries, grapes, mangos, celery, lettuce (short time). An apparent exception is in the case of apples from the middle coast section of California. The apples produced in this section require a somewhat higher storage temperature, due to the fact that a peculiar discoloration of the flesh develops when this fruit is held at the standard 32° temperature. This fruit is more safely held at about 35°. The varieties which are affected by this trouble are principally Yellow Newtown, Missouri Pippin, and, to a less extent, Yellow Bellflower. This apparent storage weakness seems to be confined to the mid-coastal district; apples from the mountains and other districts of the Pacific coast seem to possess normal storage qualities.

For potatoes, 35° to 40° F., for citrus fruits, 45° to 50° F., are the most satisfactory temperatures. Citrus fruits seem to be an exception to the general rule that fruits of low life activities can be held at temperatures near their freezing-point. Investigations show that temperatures below 45° F. are injurious to citrus fruits, except for a very short period. The low temperature seems to affect the skin of the fruit, inducing the deterioration by scald or stains and the development of various fungous diseases. At a temperature of 45° to 50°, or a common-storage temperature of 50° to 60°, citrus fruits may be held for several months without serious deterioration, provided means are taken to prevent shriveling. Lemons are sometimes held from four to six months at common-storage temperatures without serious deterioration, when humidity conditions are carefully attended to.

The proper humidity of the air of storage rooms is an important factor. Very little investigation of this
and when the air of the storage rooms becomes excessively dry, the fruit may become seriously wilted by excessive evaporation. The reduction of the temperature of the air reduces its water-holding capacity; consequently, as the air temperature is reduced to the freezing-point or below, all the excess moisture is removed and the air becomes saturated with water vapor for the temperature at which it is held. The total volume of water vapor is thereby greatly reduced. When the temperature of the air rises without the addition of moisture, its capacity for absorbing moisture from the fruit increases and, consequently, the drying effects due to refrigeration may be seriously overdone. The most satisfactory humidity condition in the storage room has never been correctly determined. Experience shows that the humidity condition should be as high as possible to prevent shrinkage from evaporation, but without danger from excessive moisture, which may induce the growth of mold.

Excessive wounding of fruits in storage is not always due to evaporation. Fruits which are picked in an immature condition wilt and shrivel seriously under the most satisfactory storage conditions.

From what has been said, it will be seen that humidity conditions in artificially refrigerated chambers very largely take care of themselves, due to the ameliorating effects of the refrigeration of the air. The control of the conditions becomes more important at high storage temperatures, e.g., it is very important in the storing of citrus fruits without artificial refrigeration. Under these conditions the humidity of the storage rooms or cellars must be held relatively high, because the higher temperature has a decided effect upon the life activities of the fruits, and a correspondingly high humidity is, therefore, essential. The fruit must be very carefully watched; otherwise, mold will occur when humidity conditions are too high. A relative humidity of about 80 to 85 per cent at a temperature of 50° F. has been found to be most satisfactory under the conditions which exist in California lemon-storage houses. It would not be safe to say that this humidity percentage is exactly correct, because the complexity of accurately measuring humidity conditions under different temperature conditions renders the problem very difficult.

Common storage.

The difference between common storage and cold storage has been explained (page 3246). The principal difference is that with cold storage, artificial refrigeration is used while in common storage there is no artificial refrigeration. Common storage is sometimes referred to as “dry storage,” inferring that cold storage must necessarily be wet. This assumption is incorrect; cold storage is not in any way connected with moisture nor is it more likely to produce moisture in storage rooms, provided they are operated as cold storage as is common storage. Any excess of moisture in the cold-storage room means some defect in the construction of the plant or in its operation. It has been said that cold-stored fruits are more moist when withdrawn from storage than common-stored fruits. Here again, the difference is due to the difference in the temperature. The cold fruit from the artificially cooled storage chamber, coming in contact with the warm moist air, will condense moisture on its surface. Fruits from the ordinary storage rooms may not be cold enough to condense moisture; hence, the assumption that the cold-stored fruit is more moist than that from common storage.

Common storage is not practicable for all fruits. The very active or highly perishable fruits cannot be held satisfactorily under common-storage conditions because there are no ready means at hand to cool them to the desired temperatures. Citrus fruits are eminently adapted for common storage. The curing of lemons is really a process of common storage. Winter varieties of apples and pears are also suitable for common storage. This method of storage is used to a considerable extent in New York and is coming into wide use in the Pacific Northwest. In the operation of common-storage rooms, dependence is placed on the ventilation for the cooling. There is a vast difference between ventilation due to the actual change of air by the opening of windows and due to the circulation of air. Ventilation means the admission of outer air, and circulation may refer merely to the movement of the air within the room or plant, the same air being used over and over again. This distinction is necessary because frequently the circulation of the air within the room is designated as ventilation.

In the operation of common-storage rooms, the rooms are ventilated, or outside air is admitted, when its temperature is low enough to cool the fruit. The ventilators are closed during the day and during warm periods, thus conserving to a certain extent the low temperature obtained through the low-temperature outside air. It is essential, therefore, that there be cold nights or cold weather. Otherwise, common-storage plants become mere cool-storage chambers, and the storage season is considerably shortened, due to the fact that the relatively high temperatures result in a high rate of life activities in the stored products. When the temperature of the common-storage room can be maintained somewhere near 32° early in the season there is no apparent reason why the storage period should not be extended to almost the same length of time that can be obtained under cold-storage conditions.

In the early part of the season, especially when there are few cold nights, it is difficult to reduce the temperature of the fruit to the desired point. This is the critical period, as the rapidity with which the temperature of the fruit can be reduced determines the length of time the fruit may be held in good condition. It is easy to see, therefore, that under common-storage conditions, usually the fruit must remain at a comparatively high temperature for a considerable length of time. The ripening which occurs during the period of high temperature cannot be offset by low temperatures later on. The developments which take place in this period of high temperature shorten the life span under storage conditions, and when the temperature is high and the fruit held warm for a considerable length of time, the storage period may be very materially shortened. There are frequent warm spells during the fruit harvest, and the nights are not so cold.
There is a widespread notion that common-stored fruits are better than cold-stored. It is difficult to understand how this opinion has become so fixed in the minds of many persons. It is probable that one reason is the fact that a comparison of fruit from common storage and from cold storage is really a comparison of fruits held under different conditions. The common-stored fruit is usually withdrawn after a shorter period and, therefore, may be in good condition. The cold-stored fruits are usually held for a long period and frequently the period is too long for the best condition of the product. Many carefully planned experiments show conclusively that cold-stored fruit remains in better condition during a longer period and, when carefully handled, remains in better condition after withdrawal than common-stored fruit. If the fruit is promptly and rapidly cooled at the beginning of the storage period, its life activities will be retarded to such an extent that the life span will be very materially increased. If this can be done under common storage, there is no reason why the fruit cannot be held in good condition. Frequently the fruit is placed in common storage during the fall and early winter; frequently also the common-storage room where the fruit is held is only a makeshift. After being held in this unsatisfactory condition for a time, the fruit is placed in cold storage later in the season when market conditions have improved. This is the wrong way to store fruit. The time when cold storage is most urgently needed is at the beginning of the storage period, in order that the fruit may be promptly cooled. It would be more reasonable to remove the fruit from cold to common storage later in the season, because common-storage rooms may then be held in a satisfactory condition and the fruit would be in a much better condition for holding.

It has been suggested that a combination of cold and common storage is really the solution of many of the problems of successfully holding the fruit in the district where it is produced. Where ice can be obtained at a reasonable price, it can be used at the early part of the storage season to cool the fruit promptly and quickly. After weather conditions are such that cool nights prevail, the place can be operated as an ordinary common-storage plant for the remainder of the season.

Common-storage buildings.

The earliest form of common-storage buildings for fruits was caves or pits. These were used for the storage of fruits under the impression that the earth is cool and also to protect the fruit from freezing in extremely weather conditions. The earth is cooler than the outside air in summer; in winter it is warmer, under ordinary conditions. Ordinarily, the temperatures of the ground range from 50° to 60° and this temperature remains fairly uniform below the frost line which, of course, varies materially under different climatic conditions. The protection against freezing in winter, therefore, is ideal, but unless some artificial method of cooling the room is at hand, the temperature of the earth itself is too high for best storage conditions. In the later development of the cave storage, ice was used to cool the chambers; this was naturally not satisfactory, due to the dampness and to the difficulty of ventilating.

Cellars have been a favorite place for common storage. They are open to the same objection as caves. The insulation for a common-storage room or building may be of the commercial kinds, which have been described, or use can be made of some of the cheaper common materials, such as straw, chaff, dry leaves, sawdust, and mill shavings. The principles of constructing the walls and using the insulation are all applicable to common-storage buildings and should be followed carefully if one expects to secure the best results. In addition to the insulation of the walls, an outer ventilat-
ing space is effective, especially during warm weather. Fig. 3704 is a diagram which shows the proper method of constructing a common-storage wall with an outer ventilating space designed to carry off most of the heat absorbed by the outer wall. Windows are not satisfactory for ventilating common-storage plants. The openings should be at or near the floor and there should be corresponding openings at the top, as shown in the diagram illustrated by Fig. 3704. The taking-in of the outer air depends upon the difference in temperature between the bottom and top parts of the building; therefore the greater the number of openings, the more rapidly the air of the room can be changed. A false floor is a distinct advantage, and will add very materially to the efficiency of the plant. The construction and use of such a false floor is illustrated in Fig. 3705. When the false floor is used, the openings or ventilators should open directly under the floor, so that the outer air may have an opportunity to pass directly beneath the product stored in the room. A forced circulation is very much more satisfactory and will result in a more rapid change of air. In order to accomplish this, an exhaust fan should be placed at the top of the chamber, so that the air of the room can be drawn to the fan and exhausted into the outer air, thus creating a reduction of the air pressure within the rooms and the consequent drawing-in of the air to the room when the ventilators or traps of the room are open. Fig. 3705 shows a cross-section of such a chamber and the proper location of the fan.

In the combination of the ice cooling and common storage, ice and salt or even ice alone can be used to cool the fruit at the early part of the season. The tube method may also be used with ice and salt or the gravity system before described can be advantageously utilized.

A diagrammatic cross-section of a combined ice-cooled and common-storage plant is shown in Fig. 3706. The design permits of the closing of ventilators and the opening of trap-doors, to utilize direct cooling from the ice stored above. A similar arrangement for the use of ice in small rooms can be made with the ice room or bunker placed at the end or side of the chamber.

The Figs. 3707 to 3713 are diagrams showing the proper construction of walls and the method of insulating walls, ceilings, and floors both with commercial insulation and common materials. Figs. 3707, 3708, and 3709 show the proper method of applying insulation to stone, brick, and concrete walls; while Figs. 3710, 3711, 3712, and 3713 show the method of applying insulating to ceilings and floors.

In the operation of common-storage plants, the fruit must be carefully watched at all times. The temperature should be taken frequently. It is very desirable that the actual temperature of the fruit itself be recorded from time to time. For this purpose, glass thermometers, the bulbs of which can be imbedded in the fruit, are desirable. Long-stem thermometers can be obtained which have the bulb at the end of a long tube and the recording scale at the upper end, thus allowing the temperature to be taken at the interior of the package. It is possible to note temperature conditions of the fruit by observing the influences of the temperature within the package upon the temperature of the room. When the fruit is thoroughly cooled throughout the mass, there will be little change in temperature after the closing of the ventilators. If the insulation of the room is effective, the change in the temperature of the air of the room will be very slight. If, however, there is any considerable heat left in the body of the fruit, there will be a marked and rather abrupt rise in the temperature after closing the ventilators.

Careful attention to the condition of the fruit is necessary also to determine whether the humidity of the room is too high or too low. This will be shown by the appearance of the fruit. Excessive ventilation, i.e., the circulation of large volumes of air through the room, will cause shrinkage or shriveling, while insufficient circulation will favor mold. Special recording hygrographs which record the changes in humidity almost instantly upon a chart are very convenient adjuncts to storage rooms in order to observe the humidity conditions. Instruments which record both relative humidity and temperature on the same chart are obtainable. When one desires to operate properly, an investment in such an instrument is a distinct advantage.

The length of time which different fruits may be held varies for the kind of fruits and even for different varieties of the same kinds of fruits. The importance of storage, then, is relative; it is most important for fruits

3706. Diagram showing construction and proper arrangement of ventilators in combined ice and common fruit storage room. Dotted arrows show directions of air when ice cooling is used.
which may be held longest. A short period of storage may be relatively as important for the short-season fruits, such as the perishable berries. The ability to hold these fruits even for a few days may result in a great profit due to changes in market conditions. The holding of short-period fruits for a brief time is important for canneries because the fruit may be held in its best condition and this may result in a great saving to the canneries or factories when sufficient help cannot be obtained.

Storage is most important for the apple. This fruit has the longest storage period of all. There are cases in which apples have been held in fair condition for as long as two years. It is, of course, not profitable or desirable to hold apples as long as this. The most important season is during the winter and spring months and until the fresh fruits come into the markets. As indicated above, the cold storage of the apple has resulted in making it an all-year-round fruit. Many varieties are held from one season until the summer apples of the next season are available. The so-called winter varieties are held to the best advantage.

There are three classes of apples: summer, fall, and winter. The summer varieties have the shortest storage season. The fall apples have a longer season but not so long as the winter varieties. It is upon the last class that dependence is placed for late-season supplies. The following fall varieties are the ones chiefly used for storage and, as a general rule, these may be held in first-class condition until the Christmas holidays or until the middle of January: McIntosh, Farmhouse, Yellow Bellflower, Jonathan, Grimes. The following winter varieties are the ones of most importance for storage purposes: Baldwin, Ben Davis, Winesap, Winesap, Yellow Newtown, Gano, Rome Beauty, Esopus, Northern Spy, Stayman-Winesap, Banana, Ortleppe, Delicious, Lawrence, Rhode Island Greening, Northwestern Greening, and York Imperial.

The varieties of pears which may ordinarily be used for storage are: Bose, Easter, Anjou, Clairegeau, Comice, Howell, Winter Nels, Duchess, Sheldon, and Kieffer.

The holding of short-period fruits for a brief time is important for canneries because the fruit may be held in its best condition and this may result in a great saving to the canneries or factories when sufficient help cannot be obtained.

Factors underlying successful storage.

By means of investigations of the United States Department of Agriculture, the factors which govern the successful storage of fresh fruits have been carefully determined. The investigations have been extended through a number of years, since the work of Powell with apples in 1901-1902. There has been more work with apples than with other fruits but studies of the storage of grapes, peaches, pears, plums, cherries, and small-fruits have also been made. It is beyond the scope of this article to give in detail the results of researches with all of these fruits. In general, it has been found that there is a very definite relationship between the character of the fruit and the treatment given it in preparing it for storage, and its behavior in storage. The results from extensive experimental storage holdings have been consistent throughout; there have been no exceptions to the general principle of this definite relationship. It has been found, for example, that the influence of the place of production is frequently of great importance. The place and condition under which the fruit may be grown have a material influence on its behavior in storage. This is contrary to prevailing impressions but it is definitely certain. The character of the soil upon which the fruit is grown may have an important bearing on its storage quality. For example, apples from the lighter loam soils have better keeping quality than fruit grown on heavy or wet soils. In the study of the storage of grapes, it was found that the fruit grown in certain types of soils have better market and storage qualities.

Factors underlying successful storage.

By means of investigations of the United States Department of Agriculture, the factors which govern the successful storage of fresh fruits have been carefully determined. The investigations have been extended through a number of years, since the work of Powell with apples in 1901-1902. There has been more work with apples than with other fruits but studies of the storage of grapes, peaches, pears, plums, cherries, and small-fruits have also been made. It is beyond the scope of this article to give in detail the results of researches with all of these fruits. In general, it has been found that there is a very definite relationship between the character of the fruit and the treatment given it in preparing it for storage, and its behavior in storage. The results from extensive experimental storage holdings have been consistent throughout; there have been no exceptions to the general principle of this definite relationship. It has been found, for example, that the influence of the place of production is frequently of great importance. The place and condition under which the fruit may be grown have a material influence on its behavior in storage. This is contrary to prevailing impressions but it is definitely certain. The character of the soil upon which the fruit is grown may have an important bearing on its storage quality. For example, apples from the lighter loam soils have better keeping quality than fruit grown on heavy or wet soils. In the study of the storage of grapes, it was found that the fruit grown in certain types of soils have better market and storage qualities. Some Tokay grapes, grown in California in light sandy soil, reach the limit of their market condition in November, while grapes of the same variety grown in heavy black soil may be kept in good condition until after Christmas. The Emperor grape, which has become an important storage fruit in California, is produced under best conditions in the red soils of the higher benches of the foothills of the Sierras. The same variety grown under valley conditions where the soil is of a different character, does not color so well and does not have as good storage qualities. The same is true of the Almeria grape, which is likely to become a very important storage fruit in California. At present the supplies of this grape come almost exclusively from Spain. The grapes are packed in granulated cork and the Spanish product is frequently held for several months in common stor-
age. California-grown Emperor and Almeria grapes are packed in redwood sawdust and are successfully held in cold storage, the former until the middle of January, and the latter several months later.

The growth of one to three months in the storage quality of some varieties of apples has been found to be due to the place of production. Mention has already been made of the storage weakness of the Yellow Transparent grown in the Central Pacific coast district of California. The same varieties grown in the Pacific Northwest and in Virginia and other sections of the country are free from this particular weakness.

The care of the orchard and method of culture given the trees have been found to be important factors. The character of tillage, pruning, age of trees or vines are also considerations, especially when taken in connection with different climatic conditions. The fruit from young trees or vines has weak storage quality; it is usually large, coarse, sappy, and cannot be held in storage nearly so long as fruit of the same variety from older and more mature trees. Dense-headed trees produce fruit of paler color; the green, poorly colored apples produced under such conditions do not have high storage quality. Such fruit is very susceptible to the trouble known as storage-scar; the loss from this source may be avoided and the storage quality of the fruit improved by thinning the trees or vines. Pruning to open up the crowns of the trees will improve light conditions, especially where intense sunlight does not naturally prevail. Some growers actually cut away the leaves of the vines to allow light to color and mature the grapes to better advantage. In sections such as the arid regions of the Pacific coast, where intense light conditions prevail, the opening-up of the tree crowns must be done with greater care. It is not necessary to open up the trees to such an extent as is necessary where intense light is not naturally available.

Late growth also affects the storage qualities, as it prevents the proper maturing of the fruit. In irrigated districts, the late application of water may stimulate the growth while the fruit is maturing and this may result in sappy poorly colored fruit of low storage quality. The question is often asked whether the fruit produced in irrigated districts has as good storage qualities as that from non-irrigated districts. The impression seems to prevail that it does not. This is erroneous, as has been shown by extensive investigations. It is manifestly impossible to compare directly the fruit grown under irrigation in one district with fruit grown in another. The varieties grown in different districts and other factors may operate to change conditions in the one case or the other. There are thousands of boxes of irrigated fruits held in the best possible condition in storage, and this would seem to be a direct answer to the question of the keeping qualities of fruits grown under irrigation. It is necessary, of course, to have the irrigation properly applied; if overdone by applying large quantities of water late in the year in order to induce large sappy growth, the results are fruits of poor storage qualities.

In sections which have dry summers, where tillage is depended on to conserve the moisture, the work must be thoroughly and properly done; otherwise, the moisture remaining in the soil may be destroyed by evaporation and other trees or vines will be under stress on account of the lack of sufficient moisture. Fruit produced under such conditions has very low storage quality. Any condition of soil, climate, and orchard treatment which results in the production of abnormal fruits may be important governing factors in their behavior in storage. Spraying for the control of insects and diseases is an important factor in the storage standpoint. It is necessary to be thoroughly and properly done, as insect and disease injuries render the fruit liable to deterioration. The insect or disease may be of itself or the cause of the decay or deterioration. There is also an indirect effect: when the trees are weakened by the effect of insects and diseases, the results may be weak fruit of poor storage quality.

Seasons affect the quality as well as the quantity of the crop. In seasons of unusual drought, for example, the fruit may be so weakened that its storage qualities are impaired. On the other hand, years of unusually wet seasons result in the production of sappy fruits which deteriorate rapidly. In seasons of unusual drought, the orchards under irrigation have a distinct advantage, provided the application of the water is properly done and other factors are considered.

Experiments with apples held at a comparatively high temperature for picking fruits is difficult; it must be learned by actual experience. Over-ripeness or over-maturity occurs when the fruit begins to soften. In some instances, growers are in the habit of allowing the crop to remain on the trees until all the fruits are fully colored. When a fruit is ripe but not fully matured, it is a wrong practice, as some fruits mature before the others. Frost-injured fruit of poor storage quality.

The insect or disease may be of itself or the cause of the decay or deterioration. There is also an indirect effect: when the trees are weakened by the effect of insects and diseases, the results may be weak fruit of poor storage quality.
ing. There is also a direct influence on the occurrence of scald. Prompt cooling, as a rule, prevents the occurrence of this disease. This factor is of special importance for early-season fruits or early varieties of apples, like Jonathan. The practice which prevails in many sections of allowing the fruit to accumulate for some time before placing it in storage is likely to result disastrously if the storage temperatur is warm. This is especially true where the fruit must be packed while warm. The ideal condition is the placing of the fruit under refrigeration immediately after picking from the tree and the nearer this can be approached in practice, the longer the fruit can be held in storage.

The proper storage temperature for different kinds and varieties of fruits has already been referred to. The influence of a low temperature, especially for apples, is most important. Experiments show the occurrence of scald to be less severe at 32° than at a higher temperature. The use of a low temperature is also important because of the rapidity with which the fruit within the package can be cooled. In operating either a common- or cold-storage plant, the temperature of the fruit is an important factor to consider. When a fruit is first placed in the storage room, a considerable length of time may be required to reduce its temperature to the desired point, if means are not at hand to increase the air circulation. In cold-storage rooms the cold can be hastened by holding the air of the rooms at a temperature several degrees lower than the desired temperature. A temperature of 25° to 27° F. may be safely maintained until the fruits in the packages approach the storage temperature. In this way the operator can materially hasten the cooling effect, and this hastening is desirable. It is commonly assumed that the cooling should be gradual, but as yet there is no experimental evidence to indicate that rapid cooling is necessarily less injurious.

The investigations of the United States Department of Agriculture show conclusively that the character of the treatment given the fruit in preparing it for market or storage has a material influence upon its keeping quality. Fruits which are roughly handled, bruised or injured to any extent have their storage qualities seriously affected, and decay and deterioration follow the injuries. There are some forms of decay or deterioration which cannot develop unless there are injuries of some kind on the fruit. A break in the skin will allow blue mold to gain entrance, while a sound skin may prevent the development of this form of decay. Blue mold is one of the most common forms of decay. Blue mold and cold storage are therefore factors which should be taken into consideration in relation to the problem of scald.

There are other decay which affect apples and other fruits: the principal diseases affecting apples are brown-rot, leaf-canker, anthracnose and bitter-rot. These diseases are not dependent upon the care in handling the fruit so far as the occurrence of bruises or injuries is concerned. The spores are present on the fruit when it is packed and the control of the disease in storage goes back to the orchard treatment and the control of the fungi on the trees. All three of these diseases occur on the trees; the fungus spores which inhabit the fruits develop from these cankers. Control of the cankers by cutting out or spraying will materially reduce the occurrence of decay in storage.

There are other forms of deterioration which, so far, have not been traced to any definite organism. These are obscure physiological diseases and result in the breaking down of the flesh of the fruit, or in burning of the tissues, or in a scaled appearance of the skin.

For the general principles of its management, consult Greenhouse Management.
SOLDIER. In England the planting of this species is discouraged from the fact that it spreads too rapidly. Pests arise rising from among the lvs. to a few inches above the water, much thickened at the top, bearing a spathe of 2 bracts: ovary and stigmas nearly as in Hydrocharis, but the fr. is ovoid and somewhat succulent. G. 2:466.

F. TRACY HUBBARD.

STRAWBERRY. The species of Fragaria, grown for the fruit. (For the morphology of the strawberry fruit, see Vol. I, page 40.)

The strawberry is an herbaceous perennial. It naturally propagates itself by means of runners that form chiefly after the blooming season. Seedage is practised only with the Alpines, and in raising new varieties. Division of the crown is useful for propagating varieties that are practically runnerless, as the Bush Alpine and Pan-American. The runner plants, either transplanted or allowed to remain where they will form, will bear the following year. Usually the plants will continue to bear for five or six years, but the first and second crops are generally the best. The plants are sometimes secured from plants over ten years old, especially when they are grown under hill training and intensive culture, but this is a special practice. It is therefore the custom to plow up strawberry beds after they have borne from one to three crops. The better the land and the more intensive the cultivation, the shorter the rotation. In market-gardening areas and in some of the very best strawberry regions, the plants are allowed to fruit but once. The plants therefore occupy the land only one year and the crop works into schemes of short-rotation cropping. When the bed is fruited more than one year it should be renewed immediately after the crop is harvested. In the case of matted or spaced rows, this consists of reducing the number of old plants, using the leaves and burn them. In the case of hill or hedge-row plants, renewal consists of mowing and in drawing about an inch of fresh soil around the plants, so that new roots will form above the old ones. Throughout the North, and as far south as Kentucky and Missouri, beds are fruited but one year, occasionally two, rarely longer. In Florida and the coastal plain of the Gulf states, the plants occupy the ground but six to eight months. In the lower Mississippi Valley and on the Pacific coast, beds are fruited three to six years. The strawberry delights in a rich rather moist soil and a cool season. It can be grown in the cool part of the year in the South and thereby becomes one of the most cosmopolitan of fruits. The young plants may be separated from the parent and put into new plantations in August; but under average conditions in the North it is usually better to wait until early the following spring, since the weather is likely to be too hot and dry in the late summer of Virginia, Tennessee, and Arkansas, and on the Pacific coast, most of the planting is done in the fall or winter months. Plants that have not borne are best for setting. They are plants of the season: that is, plants
CVIII. Strawberry.—The Climax variety.
be been found that under most conditions the plants
even 30 inches apart in the rows, much depending on
fruits are found on plants along the outside of the
fine fruits. These first runners are usually "bedded-in,"
about twelve months old yield the greatest number of
is now passing away. The largest and highest colored
growth vigorously, the first runners are used, as it has
30 to 36 inches apart and the plants from 18 to 24 or
almost necessary to crush fruits on the outside of the
rows are so wide that to pick fruit in the center it is
then allowing the runners to grow and root at will,
results, plants are generally trained in narrow rows.
In hill training, each mother plant, and are kept in alignment, forming
single, double, or triple hedge row; all other runners
this means. In the "narrow matted row," which is
surplus runners are pulled off or are cut off with a
knife, hoe, or one of the many types of runner-cutters
may be attached to the cultivator. Circular cutters
are used for hill plants. In late fall, the matted row
may be thinned by pulling out the weaker plants with
an iron rake or spike-toothed harrow.
In the North, strawberries are usually mulched in the
fall, in order to protect them from alternate freezing
and thawing in the winter and early spring and to
prevent the soil from heaving. In some cases the mulch
is allowed to remain on the plants rather late in the
spring, in order to retard the season of bloom. Some-
times the crop may be retarded a week or ten days by
this means. It should not be removed until settled
spring weather has come, nor left on so long that the
plants bleach. The mulch is more necessary in regions
of light and precarious snowfall than in those in which
the snow blanket is deep and lies all winter. In regions
of deep and continuous snowfall, a heavy mulch is
likely to prove injurious. Experience has shown that
the best mulch is some strawy material. Along the
seacoast, salt hay from the tide marshes is much used.
In interior places clean straw, in which there is no grain
to sprout and to make weeds, is very largely employed.
(Fig. 3717.) In the South, pine needles are used.
Some
times loose strawy manure is used, and the mulch adds fertilizer to the soil as well as affords protection. Corn fodder, leaves, bracken, seaweed, evergreen boughs, and other wild herbage are used occasionally. Cowpeas and sorghum are grown for mulching material when straw is scarce. The practice of growing oats, barley, or some other small grain between the rows of strawberries, to fall down and mulch the berries, is not generally advisable. Under ordinary conditions the mulch is 3 or 4 inches deep over the plants after it is fairly well packed down. It is not always possible, however, to mulch as heavily as this, since the material is likely to be expensive when one has a large area. The mulch is usually applied late in the fall after the ground has frozen, and, if the material is abundant, both the plants and the intervening spaces are covered. In the spring the mulch is raked from the plants as soon as they begin to start. Some persons allow it to lie between the rows as a cover to retain moisture and to keep the berries clean. The most expert growers, however, prefer to take the mulch from the field and to till the plantation once or twice before the plants are in bloom; the material is then returned and spread on the loose soil between the rows and beneath the vines. In the northern prairie states, heavy mulching is essential. For western Minnesota and Dakota a covering of at least 6 inches of straw is advised. This mulch is easily provided, since straw is so abundant in that country.

In the southern prairies the material is then returned and spread on the loose soil between the rows and beneath the vines. In the northern prairie states, heavy mulching is essential. For western Minnesota and Dakota a covering of at least 6 inches of straw is advised. This mulch is easily provided, since straw is so abundant in that country.

It is preferable to plant an early-blooming pollinator on one side of the rows of the pistillate sort, and a late-blooming pollinator on the other side. When planting pistillate varieties, every third row should be a pollen-bearing kind. Pistillate varieties as a class are somewhat more productive and harder than stamine varieties as a class; but this fact has little weight, since some stamine sorts are fully as prolific and hardy as the best pistillate varieties. It is an inconvenience to be obliged to mix varieties for pollination; hence pistillate varieties are steadily declining in popularity. In time, all North American varieties will be stamine, as is now the case in England. The horticultural bearing of the sexual characters of the strawberry in the United States is clearly explained in this country by Nicholas Longworth of Cincinnati (see page 1585; also his essay on the subject in his "Cultivation of the Grape," 1846, and the "Strawberry Report" of the Cincinnati Horticultural Society, 1848). When many of the staminate "seeds" of the strawberry are not fertilized or are killed by frost or other means, the berry fails to develop at that point and a "nubbID," or imperfect berry, is the result (Fig. 371D). Nubbins are usually most abundant late in the fruiting season, when the pollen-supply is small and when the plants are relatively exhausted.

Ordinarily the common varieties bear but once a year, in the spring. Under certain conditions of temperature and moisture they may become "double croppers," and give a fall crop as well. In the South, particularly in southern California, the bearing season may be extended over several months; but no varieties were consistently everbearing in the North until 1868, when Samuel Cooper, of Delevan, New York, found the Pan-American in a row of Bismarck. European everbearers, which are hybrids of the common strawberry and the Alpine, do not succeed here. The numerous descendants of the Pan-American are true everbearers; they yield a small spring crop, followed by a heavy summer and fall crop from spring-set plants. It is better, however, to cut off all blossoms until midsummer; then there will be considerable fruit from August until frost, but not so much as a good crop from a spring-bearing variety. The culture of the everbearers does not differ materially from that of other sorts, save in the cutting of the blossoms weekly, which is a heavy expense. They require rich soil and an equable supply of moisture; they fail in a dry season. The market for berries in late summer and fall is limited, and the cost of picking is heavy. The following spring, a year from the time they were set, the everbearers produce a good crop, perhaps equaling that of single-bearing sorts. This is one point in which the North American everbearers are distinctly superior to those of Europe. The everbearers have little commercial future merely for supplying summer and fall berries, but their habit of bearing a heavy spring crop, also, may make them useful to some growers who cater to personal demand. They are not likely to find favor with those who grow strawberries for the wholesale market. The everbearers are valuable mainly for the home-garden.

The cost of growing an acre of strawberries under commercial conditions in Oswego County, New York, is approximately as follows:

- The cost of planting:
  - One point in which the North American everbearers are distinctly superior to those of Europe.
of them. These three are the most important North American varieties; two-thirds of the 348 varieties of known parentage have descended from them. Other old favorites, now no longer grown, are the Cumberland, Triumph, Downer Prolific, and Charles Downing. European varieties do not succeed here; notable exceptions are Jucunda, and Triumph. Over 1,800 varieties of North American origin have been introduced but less than 150 of these have attained prominence. The oldest North American variety now cultivated is the Longworth, introduced in 1851; it is still prized in the San Francisco market. The dominant commercial varieties of today are the Dunlap, Haverland, Marshall, Klondyke, Aroma, Gandy, Glen Mary, Bubach, Brandywine, Clark, Warfield. At least fifty others are grown to a considerable extent. The accompanying pictures (Figs. 3720-3725) show types of American strawberries.

The strawberry has been in cultivation but a short time, as compared with other fruits. It has been grown in gardens less than 600 years, and was not cultivated commercially to any extent until early in the nineteenth century. The first record of garden culture is in France, early in the fourteenth century. This was the wood strawberry, Fragaria vesca. The common wild strawberry of eastern North America, F. virginiana, was introduced into Europe early in the seventeenth century. Neither species showed much promise under cultivation. F. chiloensis, which is native to the Pacific coast of America, was brought to Europe from Chile in 1712, by M. Frezier, a Frenchman. See Fragaria. Although the berries are large, this species found little favor because of shy bearing and poor quality; it gave practically no improved varieties. Near the middle of the eighteenth century the Pine strawberry (referring to the pineapple fragrance of the fruit) appeared in Europe, and became the principal progenitor of the garden strawberry. The botanical origin of the Pine is obscure. One view is that it was a form of F. chiloensis; another, that it resulted from the hybridization of that species with F. virginiana in European gardens; all the early importations of the Chile were pistillate plants, and varieties of the Scarlet were commonly planted with them. The first of the modern race of large-fruited varieties was the Keens’ Seedling, originated by Michael Keens, of England, in 1819; it was a Pine, and from it have sprung most of the European varieties of today. The Hovey, from which modern North American varieties have descended in large measure, was undoubtedly a Pine in part, but there is considerable evidence that one of its parents was a variety of F. virginiana.

Wild strawberries were so abundant in North America that there was no garden culture of this fruit until about 1770. The Alpine and Hauhock types of strawberries (F. vesca) were introduced then from Europe, but did not become popular; preference was given to transplanted wildings of the Scarlet. These varieties have never been grown here except by a few amateurs. Commercial strawberry-culture began soon after 1860, mainly in the vicinity of the four largest towns of that period—Boston, New York, Philadelphia, and Baltimore. The varieties used were slightly improved forms of F. virginiana, notably Large Early.
Scarlet, Hudson's Bay, Early Hudson, and Crimson Cone. These persisted until the introduction of the Wilson. The first variety of any fruit produced in North America by hand-crossing was the Hovey, originated by C. M. Hovey, of Boston, in 1836. The Hovey was a failure as a market variety, except in a few places, but it was an excellent amateur variety and greatly increased interest in strawberry-culture. The heated discussion of "Longworth's Theory" (1841-1845) concerning sex in the strawberry also stimulated interest and offered a practical solution of a pressing cultural problem. As yet, however, the strawberry was mainly a fruit of the open fields and home-gardens; the commercial planting was very limited. The total quantity of fruit marketed in 1854 was less than 40,000 bushels, the product of about 1,400 acres.

The variety that marked the beginning of commercial strawberry-culture in North America was the Wilson, originated by James Wilson, of Albany, New York, in 1851. Until then, strawberry-culture had been difficult, and the results very uncertain; the Wilson thrived under even indifferent care. Its introduction was followed by a remarkable increase, coincident with the modern refrigerator-car system, which made possible the great shipping districts of today, and made possible the great shipping districts of today, and greatly increased interest in strawberry-culture. The value of the crop is $20,000,000 annually. The Wilson, originated by C. M. Hovey, of Boston, in 1836. The Hovey was a failure as a market variety, except in a few places, but it was an excellent amateur variety and greatly increased interest in strawberry-culture. The heated discussion of "Longworth's Theory" (1841-1845) concerning sex in the strawberry also stimulated interest and offered a practical solution of a pressing cultural problem. As yet, however, the strawberry was mainly a fruit of the open fields and home-gardens; the commercial planting was very limited. The total quantity of fruit marketed in 1854 was less than 40,000 bushels, the product of about 1,400 acres.

There are several serious fungous diseases and insect pests of the strawberry. White grub is controlled by avoiding newly plowed sod land when setting the bed, by planting largely of pistillate varieties or profuse-blooming staminate sorts; leaf-roller, by spraying with arsenate of lead, and burning the leaves; root-louse, by setting clean plants in clean land. The several types of leaf-blight (Fig. 3726) may be prevented to a considerable extent by spraying with bordeaux, but it is more practicable to plant resistant varieties. The fundamental treatment of all these is to fruit the bed but once, or at most but twice, and to grow succeeding crops on other land, cleaning up the old plantation thoroughly after the last fruiting. Short, quick, and sharp rotations and clean culture do much to keep all enemies in check.


Strawberry-growing in the South.

The strawberry is by far the most important small-fruit grown in the South, being raised commercially in every state. The industry is more concentrated in the South than in the North. This concentration is probably due to the fact that nearly all of the strawberries are shipped by freight to distant markets. The strawberry industry in the South has developed as an independent unit, or as an adjunct to truck-growing rather than in connection with other fruit-growing enterprises.

An important consideration in growing strawberries for northern markets is the selection of a location where the soil and climatic conditions are conducive to early ripening of the fruit, so that there will be little competition from regions farther north. In many southern sections where strawberries are grown on a commercial scale, shipments practically cease as soon as berries from a more northern location begin to move in car lots. This is due to the fact that toward the end of the picking season the berries are small and cannot compete successfully with the larger fruit from a region nearer the market that is just beginning to harvest its crop.

While strawberries are grown on nearly all types of soil and in nearly all climates, they are most successfully grown where the soil is rich, well drained, and the climate mild. The best varieties for commercial growing are those that ripen early, are large, and hold their color well. The most important shipping districts are: California, 7,000 acres; New Jersey, 5,000 acres; New York, 5,000 acres; Pennsylvania, 3,000 acres; Illinois, 2,000 acres; Ohio, 1,000 acres; Indiana, 1,000 acres; Michigan, 8,000 acres; Wisconsin, 3,000 acres; Illinois, 7,000 acres; Missouri, 5,000 acres; and others.

The strawberry is fourth in commercial importance among deciduous fruits, being preceded by the apple, peach, and grape. The most important shipping districts, according to the Census of 1900, are Maryland, 14,292 acres; Tennessee, 10,761 acres; Missouri, 9,048 acres; New Jersey, 8,684 acres; Michigan, 8,061 acres; Arkansas, 7,361 acres; Ontario, 7,702 acres; Delaware, 7,194 acres; Virginia, 6,606 acres. Sussex County, Delaware, has the largest county acreage, with 8,041 acres in 1908.
soil in the South, sandy and gravelly loams are considered best. A warm quick soil, although poor, is preferred to a heavy retentive soil well supplied with plant-food. Plant-food can be supplied by the addition of fertilizers, but the physical condition of the soil can be modified only with difficulty and loss of time by cultivation, drainage, and the addition of humus. The soil for strawberries should be well supplied with humus in a well-decomposed state. Many growers think that new land is essential for good results, but when old soils are well supplied with organic matter they will yield as large crops as new soils.

Few soils in the South that are adapted to strawberries growing are rich enough to produce large crops of fruit without the addition of fertilizers. Stable or barnyard manure is the best fertilizer for strawberries as it supplies both humus and plant-food. It is best, however, to apply the manure to the crop preceding the strawberries in order that it may become well-decomposed, and so that most of the weed seeds will have germinated. When manure is not available, commercial fertilizers are applied in large quantities, but these should be used in connection with green-manure crops such as cowpeas, soybeans, velvet beans, vetch, and clovers. Some growers use as high as one ton, or even as much as 2 tons and a half, of commercial fertilizer to the acre. However, under most conditions, 1,000 to 1,500 pounds of a fertilizer analyzing 2 to 3 per cent of nitrogen, 6 to 8 per cent of phosphorus, and 6 to 8 per cent of potash, should be sufficient. On land where legumes have been grown, a part of the nitrogen may be left out. It should be borne in mind that large applications of commercial fertilizers are profitable only when used on soils in good physical condition, and well supplied with humus.

There are three systems of growing strawberries in the South: the hill system, the hedge-row system, and the matted-row system.

In the hill system the plants are set separately, one plant in a place, and no row plants are allowed to form. The plants are set 12 to 14 inches apart in rows 3 to 3½ feet apart. This makes a large, vigorous plant, producing large uniform berries which ripen evenly. This system is followed in Florida. The quantity of berries produced is not so large as under the other systems, but the quality is better and the percentage of first-class berries larger.

In the hedge-row system the plants are set 10 to 18 inches apart in rows 3 to 3½ feet apart, and runners are allowed to form plants along the row in a strip a few inches wide. This system is practiced in the southern part of the lower tier of southern states, with the exception of Florida, where the hill system is used.

In the matted-row system the plants are set 15 to 18 inches apart in rows 3½ to 4 feet apart. The runners are allowed to form plants 6 to 9 inches on either side of the row. Sometimes the plants are allowed completely to cover the ground. This system probably produces the largest crop of berries, but the fruit is usually smaller and does not ripen so well as under the other systems.

Strawberries are planted in Florida any time from June to November, whenever the soil and climatic conditions are favorable. In other southern sections of the South Atlantic and Gulf Coast states, the plants are set in late summer or autumn. In all other sections of the South, the plants are usually planted in late winter or early spring, and no crop is allowed to be produced the first season.

The length of time that a field should be allowed to produce fruit depends upon many conditions and varies in different parts of the South. In sections where weeds and grass grow very rapidly and where the picking-season is long, as is the case in the lower South, usually only one crop is grown. In the upper sections of the South, two or more crops are produced. Some growers allow their fields to produce five or six crops, but under most conditions two crops should be the maximum, as the fields become weedy and the soil compact. It is possible to clean up an old patch in such a way that large crops can be secured for several years, but very few growers give the fields the attention necessary to produce heavy crops of first-class fruit.

When the field bears more than one crop, the strawberries should be thoroughly cleaned out, thinned, cultivated, and fertilized after the fruit has been harvested. As a rule, the best crop is produced on new plantings and for this reason frequent renewal is recommended.

Cultivation should begin soon after the plants are set, and should be continued whenever weeds start or a crust forms. Frequent shallow cultivation will make it unnecessary to do much hand-hoeing or hand-weeding. A cultivator which merely breaks the surface without disturbing the roots is to be preferred. Any weeds which interfere with the development of plants or fruits during the picking-season are pulled by hand, or cut off with sharp hoes.

In most sections of the South, some form of mulch is used to hold moisture during the picking-season when the soil is not stirred, to keep the berries clean, and to prevent "heaving out" in regions where freezes occur. The materials used for mulch are pine straw, oat, wheat, or rye straw, leaves, and marsh hay. These materials are of value as humus when turned under. In sections where freezes do not occur, the mulch is usually applied in late winter.

For best results in growing strawberries a good system of rotation should be followed. In any system of rotation, a leguminous crop should be turned under once in three or four years, and a cultivated crop grown on the area the season before the strawberry plants are set. The following system of rotation is a good one for the South:

1. Strawberries one or two years, followed by cowpeas after the strawberry plants are plowed under.
2. Early vegetables followed by cowpeas or late vegetables.
3. Corn with cowpeas between the rows. The corn stubble and the cowpeas should be turned under for...
strawberries the following year, in case the plants are set in the spring.

In sections where vegetables are not grown commercially, oats may follow the cowpeas turned under the second season.

The varieties of strawberries grown in the South are Klondyke, Missionary, Lady Thompson, Excelsior, Aroma, Gandy, Chesapeake, and Early Ozark. In the lower sections of the South, the Klondyke and Missionary are grown more than all others. For a succession of crops the Excelsior or Early Ozark may be grown for early fruit, the Missionary, Klondyke, and Lady Thompson for medium, and the Aroma or Gandy for late ripening. In the upper sections of the South, the Early Ozark, Chesapeake, Klondyke, Aroma, and Gandy are all grown, but very rarely does any grower raise more than two varieties for commercial purposes.

As a large part of the strawberries grown in the South are shipped to distant markets, they must be picked before they are fully ripe. For long distances the berries should be fully grown and about three-fourths ripe. When picked before they are at all colored, the berries will shrink and wither, making them unfit for sale.

The berries should be well graded and packed before being shipped. When experienced pickers are employed the best results can be secured by grading the berries in the field, as they are picked, so as to avoid rehandling and the consequent bruising and deterioration of the fruit. The common practice, however, is for expert packers to do the grading and packing in a packing-shed to which the fruit is delivered by the pickers. The top layer of berries should be placed so as to hold them in place, but care should be taken not to put small inferior berries in the center and large berries on top. All types of berry boxes are in use in the South, but the tendency is toward a standard full-size quart box. In some sections of the South, particularly in Louisiana, pint boxes are used for the early shipments. The fruits carry better and the price received is higher; later in the season as fruits become more abundant and the price is lower, fruit from these same regions is shipped in quart boxes in crates holding twenty-four or thirty-two quarts. A long narrow box is objectionable.

Berries which are well graded and sorted and put in clean, neat, attractive packages of standard sizes command the highest price and sell most readily. The type of crate depends upon the boxes used. Any crate that is substantially built and well ventilated is satisfactory, but the cost is an important consideration, as they are not returned to the shipper. The largest crate that can be handled conveniently is the one to use, as the large ones are cheaper in proportion to the quantity of berries they carry. The twenty-four- and thirty-two-quart crates are in most common use, although in some sections the sixty-quart crate is employed. Crates with hinged lids have the advantage that they can be opened easily and quickly, and as a result invite inspection. A large part of the Florida crop is packed in quart boxes which are placed in pony refrigerators for shipment to northern markets.

The cost of growing strawberries in the South is from $75 to $150 an acre, divided about as follows:

- Interest on investment (land and equipment)...
- Preparation of land...
- Manure or fertilizer...
- Plants...
- Setting plants...
- Cultivating and hoeing...
- Mulching...
- Picking, grading, and packing crates...
- Hauling to station, loading, etc...

The lower estimate is about the average for most sections of the South, while the higher figures cover the extreme cost. The average cost in Florida is between the two estimates, but nearer the higher.

H. C. THOMPSON.

The strawberry in California and northward.

California conditions include both those most favorable and most trying for the growth of strawberries. There are situations where, through local topography and proximity to the ocean, winter temperatures are very seldom too low for the growth and fruiting of the plants and where, by summer irrigation to maintain this continuous activity of the plants, it is possible to gather fruit every month in the year. This fact is not, made of much commercial account, however, nor is it widely true that one can have strawberries all the year round in the open air. It is true, however, that even on the lowlands, where the commercial crops are chiefly grown, the winter is so mild that strawberries begin to ripen in shipping quantities as early as March and by proper cultivation and irrigation the fruiting is continued until late in the autumn, and the grower has therefore a very short closed season. The trying condition for the strawberry is found in the long dry summer, which enforces dormancy as early as June on light soils. The plants become dry and hot to a depth of several inches in spite of surface cultivation and cause the dwindling and death of a shallow-rooting plant like the strawberry unless frequent irrigation is begun in time. This trouble is less acute on more retentive soils in regions of lower summer temperature and greater rainfall, and plants in such situations may survive the summer dormancy, but it is true that everywhere in California and even in the more humid states on the north that strawberry-grow-
STRAWBERRY

The varieties chiefly grown in California are different from those popular at the East. New varieties from the eastern states and from Europe are freely tried, but few are successful and they retain local popularity after abandonment in their birthplaces. A striking instance of this fact is the continued popularity of Longworth Prolific, Sharpless, Monarch of the West, Wilson, Albany, and the like. Longworth has survived more than fifty years' continued growing. Other popular varieties are Melinda, Jessie, Dollar, Brandywine, Marshall, and Lady Thompson. Brandywine (Fig. 3725) is the most widely approved variety. In the state, the Dollar and Marshall lead among the newer kinds and the Banner is exclusively grown by some producers for the San Francisco market. Jessie and Dollar are largely grown for shipment to interior states and to the northern coast before the local fruit ripens.

The growth of strawberries is almost wholly in matted rows, the rows usually occupying low ridges only sufficiently elevated to allow the slightly depressed intervals to serve as irrigation ditches and as walks during picking. The slight elevation of the plants also assists in surface drainage, when heavy rains fall during the early part of the fruiting-season, and this promotes early growth and fruiting of the plants. Where the soil is too coarse to permit free rise of water from the depressed ditches, the conditions are reversed and low levees are made to inclose blocks of plants which are irrigated by flooding the inclosures. In the chief commercial regions a fine loam is used and irrigation from the small ditches on both sides of the ridges, which are about 2 feet wide, is the ruling method. Nearly level land is selected and grading is done before planting to reduce dry knolls and fill low places so that the water will flow slowly and will evenly moisten the whole field. Subirrigation by tile has been often advocated but never has been employed to any extent.

One of the chief strawberry-shipping districts in central California is characterized by a shallow loam underlaid by an impervious indurated clay or hardpan, which prevents the percolation of the irrigation water and enables growers to maintain a large acreage by means of the small water-supply secured by windmills. In this case water is applied very frequently, even oftener than once a week in some cases, but the total amount for the season is small. Quite in contrast to this is the growth on light deep loams where water sinks so rapidly that the plants suffer, although water is almost constantly running in the ditches. In such cases mulching and sprinkling are the price of success, and these are too costly except on a small scale for home supply. The largest producing districts have soils midway between the extremes above noted, viz., deep retentive loams, situated rather low in the valleys and with irrigation available either by ditch system or by wells both flowing and pumped. The pump wells require usually only a short lift, and abundant water is secured cheaply by the use of modern pumps and motors.

In addition to supplying the home markets, which are very good, California strawberry-growers find a good outlet for the fruit all through the region west of the Missouri River. Southern California supplies the southern portion of this district, while the pears grow in central California, chiefly near Florin in Sacramento County, make large shipments eastward as far as Colorado and northward to all the great interior states and to Oregon.
Washington, and British Columbia before the locally grown fruit in those regions is available.

The states of Oregon and Washington in their areas lying west of the Cascade Mountains have conditions excellently suited to the growth of the strawberry. Their conditions more nearly resemble those in the eastern states than any other part of the coast. The cooler weather and abundant moisture give a better spring season than that of California, but the season is on the whole much shorter because of the longer winter. Irrigation is also necessary in most places for continued fruiting during the summer. The most famous district is Hood River, Oregon, where grid conditions east of the Cascade Mountains are modified by western influences which reach through the gap in these mountains where the Columbia River flows through. Irrigation is regularly employed and a large commercial product grown. The varieties chiefly grown in this region and in adjacent parts of Washington and Idaho are of local origin, the Hood River (Clark Seedling) and Magoon being widely approved. Jessie, Sharpless, Wilson, Havenland, Crescent, Cumberland, Jucunda, and Parker Earle are also recommended by growers in the northwestern states.

E. J. WICKSON.

Cultivation of the strawberry on home grounds.

Of all the fruits which can be grown in the garden, the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it.

The strawberry thrives best in a sunny location but will also do well in partial shade like that from small-fruit bushes or young fruit-trees. Heavy shade draws the vines up, and while a luxuriant growth of foliage will also be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it.

The strawberry-bed in the garden is very important and should be governed to a large extent by the other crops. Remembering that the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it. The strawberry-bed in the garden is very important and should be governed to a large extent by the other crops. Remembering that the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it. The strawberry-bed in the garden is very important and should be governed to a large extent by the other crops. Remembering that the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it.

The strawberries thrive best in a sunny location but will also do well in partial shade like that from small-fruit bushes or young fruit-trees. Heavy shade draws the vines up, and while a luxuriant growth of foliage ensues there will be but little fruit. On the other hand southern slopes where the berries are exposed to the unbroken rays of the sun will result in scalded fruit unless some artificial protection can be given.

The location of the strawberry-bed in the garden is very important and should be governed to a large extent by the other crops. Remembering that the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it.

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having prepared the ground as outlined, the next question to settle is the system under which to grow the bed. There are three systems which may be used for the garden strawberry-bed: the wide matted-row, the hedge-row, and the single-hill systems; and as the plan of a system depends very much on the variety grown it will be necessary to consider variety in this connection. In the selection of varieties for the home-garden, the following conditions should be carefully considered: quality, attractiveness of the fruit, productivity, vigor of plants, season. Many very productive varieties lack quality and attractiveness while as a rule the quality berries are not good commercial varieties-and it is often difficult to procure the plants of the better varieties in the nursery.

As it is practically impossible to obtain all of the points outlined above in one variety, it is generally best to plant at least three, not alone to insure a longer season but variety in the fruit is very essential; also some years one variety alone does not do well while with a number of varieties some are sure to succeed. This will be found especially true when late spring frost may entirely ruin one variety and not injure another.

Vigorous-growing varieties with good clean-growing watering may be practised, it is often done at the expense of quality in the fruit. Soils may be easily improved. A light soil can be well filled with manure or humus of some sort, and a heavy soil drained with tile. If possible the land should have a slight slope to turn off surplus water in the winter, but if this is impossible,
pot-grown plants should be secured and a good compost of garden loam. Place in the barrel and over the holes cut in the center of the bottom a piece of 6-inch drain-tile about a foot long, filling the center of the tile with coarse gravel or small stones. Put the roots of the plants into the 1/2-inch holes in the sides of the barrel and fill the barrel with the compost, adding pieces of tile to that in the center as the barrel is filled so that the drain-pipe comes up to the top of the barrel. A row of plants may be planted on the top of the barrel so that sides and top are covered. Watering should be done through the drain-pipe and if the coarse material used inside the drain is satisfactory, the plants will take up about the proper amount of water before it all passes through the barrel. The barrel should be carefully protected in winter by covering with straw and pine branches and the top protected so that excessive rain will not get in; elevating the barrel on stones will help the drainage.

Having decided upon the method or system of growing strawberries, the season for planting should be the next consideration. As a rule the early spring, from April 1 to May 10, is the best time to plant in the North, although in many gardens which have to economize space, August and September planting is made necessary,

as the strawberry has to follow some of the other early crops, as peas, beans, lettuce, and the like. For August or September setting, pot-grown plants are better than the runner plants unless one can take runner plants directly from one's own bed and transplant them under favorable weather conditions. To obtain the best pot-grown plants, the runners of the current season's growth should be used, as these make better plants than those of last season's growth which have been placed in cold storage and potted after their natural season of planting has gone by. If layer plants are used in spring, great care should be taken in planting so that the plants may be assured of a good start. Remove practically all of the foliage and cut back the roots at least one-half. If the ground has been prepared carefully the hand may be used in making the hole for the roots, but in stony ground it is best to use a trowel. Be sure that the crown of the plant is not set too deep or too far above ground. The crown should be on a level with the surface of the soil. When setting, spread the roots out fan-shape and be sure to press the soil firmly about them. Be sure that the rows are straight. Various devices are used on commercial

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3730. Brandywine strawberry.
farms but for garden culture nothing is better than a line for securing straight rows.

Whether set in spring or fall, cultivation of the soil should begin as soon as the plants are set and kept up until late September, when cultivation should cease and the plants given a chance to harden up for the winter. Cultivation, whether done by wheel-hoe, hand-hoe, or weeder, should be shallow, never more than 2 inches deep, as the strawberry roots are near the surface and light cultivation of the surface soil does as much good as any other form. Weeds of all kinds should be kept down and comparatively little weeding will be necessary provided the ground is kept stirred.

During the summer at least three applications of fertilizer should be made, preferably before or during a rain. If the fertilizer mentioned previously cannot be obtained, bone-meal will give good results, particularly if wood-ashes are added.

If the season is particularly dry or the land is inclined to dry out rapidly, artificial watering may be practised, but it is better not to use water if it can be avoided. Plenty of cultivation will grow good plants on nearly all soils.

In the late fall after heavy frosts have come and the ground freezes slightly at night, it will be necessary to put some winter protection on the strawberry-bed. Many kinds of materials may be used, but first it is best to have a light mulch of well-rotted stable-manure scattered among the plants and worked under the foliage. Following this the winter protection may be put on. This should be of coarse hay, cornstalks, or very strawy manure, care being taken not to put on too much. A good rule to follow in placing a covering is that it must not be too close to prevent seeing some of the foliage of the strawberry plants under the mulch. The mulch may be held in place by brush, light cordwood or even soil, and in places where there is little snow great care must be taken to keep the mulch in place. It must be borne in mind that this careful protection is not to prevent the ground from freezing but rather to prevent the alternate freezing and thawing of unprotected ground in winter. In the spring as soon as danger from extreme frosts is past, the material for holding the mulch in place should be removed and also a part of the mulch itself, leaving some of the covering on the land to serve as protection to the fruit in the fruiting-season and to keep the soil moist. Some persons prefer to remove all the mulch and to cultivate the ground, and in some cases this is desirable; but, when the plants have had good culture the previous year it is just as well not to do much cultivating in the spring. Fertilizers should be added at this time, preferably bone-meal and wood-ashes mixed at the rate of one-half pound of ashes to one pound of bone-meal and put on about one-eighth pound to the square foot.

If the weather is dry and the soil more or less inclined to dry out, water may be applied one-half inch two or three times after a short rest in July. Many of these everbearing varieties do very well in the usual strawberry season and those which are now been permanently established are great sources of satisfaction to strawberry-lovers to have fruit after the regular season is over. There are several varieties of these everbearing strawberries, and every garden should have a few of them. They may be planted in any of the ways suggested for the regular varieties but they should have plenty of water during the summer to insure the full development of the fruit. In most locations in the northern states these varieties begin to ripen early in August and continue until heavy frosts are past. It is advisable to cut off the blossoms in May if the weather is dry and the soil more or less inclined to dry out, water may be added at this time and up to the time the fruit is well set, being careful not to water during the daytime when the sun is shining. The question of watering strawberries is a very difficult one as so many conditions enter into the discussion. Some soils are naturally moist, and when water is added artificially to these, the tendency is for the plants to go to foliage or soft fruit or decayed berries. Too much water on a dry soil, particularly if added as the berries are coloring, is likely to injure the quality of the fruit while increasing the size, so that quality often is sacrificed to bulk. Generally speaking, in most seasons, if the land has been well cultivated the season before and the bed has been well mulched, there will be enough moisture in the land to carry the crop to maturity.

As quality in the strawberry depends very much upon ripeness and condition, it is well not to begin to pick too soon, but wait until the fruit has colored all over and has taken on the characteristic depth of tint which may be common to the variety. Be sure to pick the fruit early in the morning before the sun gets hot, keeping what is not used early in the day on ice. Pick the fruit with a stem; and for household use berries are much more attractive when picked in a shallow basket with some kind of foliage.

Within the past few years a new race of strawberries has been developed commonly called everbearing from their habit of producing fruit after the regular strawberry season has passed. This strain has now been permanently established and it is a great source of satisfaction to strawberry-lovers to have fruit after the regular season is over. There are several varieties of these everbearing strawberries, and every garden should have a few of them. They may be planted in any of the ways suggested for the regular varieties but they should have plenty of water during the summer to insure the full development of the fruit. In most locations in the northern states these varieties begin to ripen early in August and continue until heavy frosts are past. It is advisable to cut off the blossoms in May if a large crop is wanted in August, but they will fruit at both times after a short rest in July. Many of these varieties have a tendency to make more foliage than is wanted in August, but it is well to follow the same general directions as given for growing the standard varieties. Most of these everbearing varieties do very well in the usual hill culture.

Wilfred Wheeler.

Forcing of strawberries. (Figs. 3731, 3732.)

The forcing of strawberries for a winter crop has not as yet become of any great commercial importance in North America. Some gardeners grow a few potted plants for either Christmas or Easter decoration. Very few, if any, commercial growers are forcing strawberries exclusively to any profitable extent. The few strawberries that are forced are grown either in pots or planted out on benches. The former method is the one generally employed. There are several good reasons for this, some of which are: first, the confinement of the roots; second, the ability to ripen the crowns in the fall; third, the control of fertilizers and liquid manure; fourth, the privilege of having the crop grown in several houses at one time or brought from a coolhouse into heat; and fifth, the opportunity to supply particular demand of the potted plants or their fruits. The first expense of the pot method is considerably more than when the plants are grown in the benches, but after
the pots are once purchased the cost of each method should be about the same.

The pot method as practised at Cornell University is about as follows: As early in the spring as possible large plants are set in well-enriched soil. The first strong runners made by these plants are secured and potted. Numerous 2- or 3-inch pots filled with good soil are plunged to the rim along the strawberry row. The runners are trained to these pots, and a small stone is placed on each runner to keep it from growing beyond the pot. When the pot is filled with roots the young plant is cut from the parent stock, the pots lifted and taken to the potting-shed or other convenient place, where they are at once shifted into the fruiting-pots (usually a 6-inch pot). The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting-soil should have mixed with it bone-flour or dissolved rock at the rate of about one pint to two bushels of soil. Ample drainage should be given, as through the season of ripening the crowns and the following forcing-period, a large quantity of water must be given and none should be allowed to stand around the roots.

The pots should then be plunged to near the rim in some coarse material, preferably coal-ashes, which, if deep enough to extend from 4 to 6 inches below the plunged pots, will prevent the earthworms from entering the pots. The use of a frame in which to plunge the pots is recommended for protection against heavy rains or early frosts. Attention to watering is all that will be necessary through the growing season. Late in September or early in October the pots will be filled with roots and the plants will have attained their full growth. At this time larger and firmer crowns will be had by careful attention to watering and subsequent drying off to almost the wilting stage than by watering the plants up to the time of freezing weather. The drying process seems to represent the late fall season and causes the plant to store up material in the crowns at an earlier period. At the coming of cold weather the soil in the pots may be allowed to freeze. It is very desirable that the soil be on the dry side before freezing, for if the ball of earth is wet there is danger of breaking the pots when the cold becomes intense. The period of forcing, from the time the frozen plants are brought in until the ripening of the fruits, will be about eight weeks. The time will vary slightly under different conditions of heat and sunlight. When first brought in, the plants should be cleaned of all dead or diseased leaves. The pots should be plunged to near the rim in some material that will retain moisture, e.g., tanbark or coal-ashes. The benches or shelves should be as near the glass as convenient. A thorough spraying with bordeaux mix-ture or some other fungicide should be made at once.

For the first few days the house should be held at about 35°, with little if any rise through the day. After a week a rise of 10° may be given. At the end of the second week 50° at night, with a rise of 10° to 15° through the day, will be about right.

Strict attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red-spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel-hair brush is useful for distributing the pollen. A ladle or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. During the first week give one dilute application. After this give two applications a week, increasing the strength of the manure liquid each time. Well-rotted cow-manure or sheep-droppings furnish good material for this purpose. When the fruits are coloring the liquid manure should be withheld and only clear water given. As they swell, the fruits will need support, and the best method of furnishing this is probably by using small-squared window-screen wire cut into suitable squares. These squares may be laid over the pot, under the clusters of fruits. They hold the fruits away from the sides of the pots, protect them from any water or liquid manure that is given the plants, and enhance the beauty of the potted plant. After one fruiting, the plants are worthless.

C. E. HUNN.


STRELITZIA (for the wife of King George III, Charlotte Sophia, of the family Mecklenburgh-Strelitz, a patron of botany). Musaceae. Bird-of-Paradise Flower. Perennial herbs, adapted to the warmhouse, or grown for the banana-like foliage and the very showy flowers. Rhizome sometimes subterranean, sometimes an erect woody st.: lvs. large, long-petioled, scarcely terminal or in the upper axils, short-exserted from the sheaths of the lvs.: bracts large, spath-like, boat-shaped, acuminate, solitary at the end of the scape or 2 slightly dis-tant: perianth long-exserted; sepals free, long, carnate; petals very dissimilar; stamens 6; ovary 3-celled, many-seeded.—About 5 species, S. Afr. The genus has been monographed by K. Schumann in Engler’s Pflanzen-reich, hft. 1 (IV. 45) 1900.

The Strelitzia Reginae requires a strong soil, a copious supply of water, and considerable sunlight. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A night temperature of 50° is sufficient. This plant may be induced to set seed if the flowers are hand-fertilized. The usual method of propagation, however, is by suckers and division.

1. Plant nearly stemless.
2. Lvs. ovate or ovate-oblong, margin crisped.

Reginae, Banks. Bird-of-Paradise Flower. Fig. 3733. About 3 ft. high: roots large, strong-growing: lvs. oblong, about 1 ft. long, stiff, concave; fl.-stalks all radical, 2-3 times as long as the lvs.: scape higher.

Strelitzia Reginea. (X 1/4)

Andr. (S. juncce, Link), has lvs. with practically no blade: spathe green margined with magenta, sepals orange, petals rich blue, white-tipped. S. Afr.—The species is probably not cult. Var. junccea,

3733. Strelitzia Reginea. (X 1/4)

STREPTOCARPUS

There are 7 species of Streptocarpus, according to Mez (DC. Monogr. Pl. Nov., vol. 9), of Brazil. The genus differs from Bromelia in the long corolla-tube. No species are in the American trade, but S. Fürstenbergii, Hort., is described in horticultural literature (sometimes as *Euchema Fürstenbergii*, Morr. & Wittm.). It is a stemless pineapple-like plant, with 20-40 long, narrow, linear, terete, splitting in 2, rarely 4 valves. About 60 species, natives of S. Afr. and Madagascar. In Oct. 1826, there bloomed at Kew a most interesting gloxinia-like little plant, seeds and specimens of which had been collected in S. Afr. by Bowie, on the estate of George Rex, at Knysna. The plant was described as *Didymocarpus Rexi*. It is a stemless plant, with 1 or rarely 2 long-tubular nodding pale blue fls. on each of several short scapes, and with several clustered root-lvs. It proved to be a profuse bloomer and easy to grow. “So abundantly does it produce seed,” wrote W. J. Hooker, in 1830, “that new individuals come up as weeds in the neighboring pots, and a succession of flowers may be obtained at almost every period of the year.” In 1828, John Lindley made the genus Streptocarpus for this plant, calling it *S. Rexi*, the name it now bears. It appears to have been nearly thirty years after the intro. of *S. Rexi* that another streptocarpus bloomed in England. This second species was *S. polyanthus*, which may be taken as the type of a group that has one leaf lying on the ground and from the midrib of which arise successive several-fld. scapes. The intro. of this curious plant seems to have revived the interest in streptocarpuses, an interest that has been kept alive by the frequent introductions of other species. The chief stimulus to the systematic breeding of these plants seems to have been the appearance of *S. Dunnii*, said by J. D. Hooker to be “quite the monarch of its beautiful genus” (but now excelled by *S. Wendlandii*). Seeds of this species were sent to Kew in 1884 by E. G. Dunn, of Cape Town. It is one of the monophyllous section to which *S. polyanthus* belongs. In the meantime, *S. parviflorus*, a species allied to *S. Rexi*, had been intro. from the Cape region. With the three species, *S. Rexi*, *S. parviflorus*, and *S. Dunnii*, Wm. Watson of the Royal Gardens, Kew, set to work systematically to breed a new race of streptocarpus, and his efforts met with unqualified success. When the hybrids came to notice in 1887, the Gardener’s Chronicle made the following comment on the value of the work: “The results are very striking, and we can hardly doubt that Mr. Watson has set the foundation of a new race of plants, parallel in importance to the Achimenes and Tyldenas.” Several hybrid races have now been produced and several interesting species have been intro. from the wild, so that Streptocarpus seems to be destined to become a very important and popular garden genus.

Bentham and Hooker’s treatment divides the Ge-
STREPTOCARPUS

neriaces into two great tribes: Gesnerieae, with ovary more or less inferior and fruit a capsule; Cyrtandraceae, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. R. Clarke in red. V of De Candolle's "Monographie Phanerogamorum," contains the genera Streptocarpus, Episcia, Cyrtandra, Echysanthesia, Ramanodia, and others. Streptocarpuses are of three groups: the stemless monophyllous species, with one prostrate leaf from the midst of which the scapes arise (this leaf is really an enlarged cotyledon, the other cotyledon not enlarging); the stemless species, with several or many radical more or less primuloid-like leaves (whence the English name, "Cape primroses"); the stem-bearing species, with opposite cauline leaves. The cultivated species chiefly represent the first two sections. In the American trade, four specific names chiefly occur, S. Rezii, S. Galpinii, S. Dunii, and S. Wendlandii; but since the hybrids represent several other species, these additional species are inserted in the following account. Streptocarpus is an African genus. The stem-bearing section is confined to central Africa and Madagascar, and the others to South Africa. Clarke's monograph, 1883, describes nineteen species, but S. Dunii, S. Wendlandii, S. Galpinii, and many others have since been discovered.

Streptocarpuses are not difficult plants to grow. They are usually raised from seeds, the seedlings blooming in eight to fifteen months from starting. The seeds are very small, and care must be taken not to cover them too deep. Give an open sunny place in an intermediate temperature. They are not stove or greenhouse plants. Of the new hybrid forms, seeds sown in February or March should produce plants that will bloom the following fall and winter; after blooming, the plants may be discarded, for better results are usually secured from new plants than from those more than one season old. The season of most profuse bloom is summer, but the bloom continues until winter. The monophyllous species can be propagated also by cuttings of the leaf. Some fanciers of Cape primroses advise propagating select types by leaf-cuttings or by division.

INDEX.

1. albescens, Vatke. Acaulescent, hispate: lvs. petioled, oval-oblong, entire, rather repand, spiculate, obtuse, base contracted to the petiole, puberulent above, villous beneath: fls. blue, 3½ in. across; calyx hirtellous, lobes linear; corolla up to nearly 3½ in. long, 6 times longer than the calyx, limb strongly unequal. Trop. Afr. B.M. 6814.
2. Rexii, Lindl. (S. Gärdenii, Hook.). Fig. 3734. Acaulescent: lvs. several, subrect, 8 to 12 in., oblong, crenate, hairy on both surfaces: scapes several, 4 to 12 in. high, 2 to 4-flowered: calyx-labellae narrowly oblong, hairy; corolla 2 in. long, about as wide, blue or mauve, tube 1½ in. long, very narrowly linear-funnel-shaped, lobes a little unequal. S. Afr. B.M. 3005; 4862. B.R. 1173. L.B.C. 14:1055. F.S. 12:1214. Var. biflorus, Oortgens, differs in having stouter 2-flowered scapes. Gt. 6:204.
3. cyaneus, S. Moore. St. prostrate, slightly elongated, bearing 4 lvs.: lvs. linear-oblong, crenate below the middle into a narrow petiole-like portion, spatulate: scapes almost 2-flowered: fls. varying from pale lavender or blue to rose-pink or rosy mauve, with a few streaks of red on the lower lobes and a blotch of yellow in the throat; calyx-labellae linear-oblong, pilose-pubescent; corolla about 1½ in. long, puberulent outside. Transvaal. B.M. 8521. G.C. III. 55:31.—Allied to S. Rezii.
4. parviflorus, Mey. Acaulescent: lvs. several, spreading or suberect, nearly or quite sessile, elliptic to elliptic-oblong, 8 to 12 in., oblong, 2½ to 3½ in. long, puberulent below, crenate, villose on both surfaces, almost tomentose beneath: peduncles and fls. almost as in S. parviflorus: corolla shorter, white, throat yellow, or almost white penciled with purple, tube slightly widened upward, capsule 1½ in. long, arched, limb 5-lobed.
5. luteus, C. Clarke. Lvs. several, petioled, elongate-oblong, 8 to 12 in. long, oblong, attenuate at base, crenate, villose on both surfaces, almost tomentose beneath: peduncles and fls. almost as in S. parviflorus: corolla shorter, white, throat yellow, or almost white penciled with purple, tube slightly widened upward, capsule cylindrical, sepal unequal, linear, recurved; corolla hisrate outside, 1½ to 2 in. long, arched, limb 5-lobed.

KEY TO THE SECTIONS.

A. Plants of native origin.
B. Sts. elongated; lvs. opposite.
C. Sts. lacking or very short; lvs. all radical.
D. Lvs. several, forming a rosette.
E. Lvs. solitary.
F. Lvs. not decurrent on the petiole.
G. Corolla-tube much curved, limb very oblique.
H. Corolla-tube cylindrical, nearly straight, limb slightly 1-sided.
I. Section I. CAULESCENTES. Species 1-7.
J. Section II. ROSULATI. Species 8-17.
K. Section III. UNEOFLORI. Species 18-22.
L. Section IV. HYBRIDA. Species 13-17.

STREPTOCARPUS 3273

3734. Streptocarpus Rexii. (X½)
STREPTOCARPUS

oil-rose, lobes rotund, the lower yellow-blotched at base. S. Afr.

Section III. UNIFOLIATA.
A. Corolla-tube broader than long. 7. Galpinii
AA. Corolla-tube longer than broad.
B. Fls. rose to redish.
BB. Fls. bluish or purplish.
C. Tube of corolla linear-cylindrical. 9. polyanthus
CC. Tube of corolla more or less widened at the mouth.
D. Limb of corolla much shorter than the tube. 10. grandis
DD. Limb of corolla nearly as long as the tube.
E. Lf. rarely over 1 ft. long; corolla usually less than 1 in. across. 11. Saundersii
EE. Lf. usually over 1 ft. long; corolla usually more than 1½ in. across. 12. Wendlandii


8. Dunnii, Mast. Fig. 3735. Acaulescent, soft glandular-pubescent or tomentose; lf. solitary, very large, 2-3 ft. long, sessile, ovate-oblong, obtuse, margin irregularly lobulate and crenate, pubescent between the reticulate veins, midrib thick and villous beneath; flowers numerous, clustered, produced serially, stout, 1 ft. or more high, bearing many-fl., second panicles; fls. 1½ in. long, pale brick-color to rose, short-pedicelled, linear-cylindric, both surfaces closely hairy, red-purple beneath; scapes several, up to 1 ft. high, forked; inf. 6-8 in. long, 30-tid.; calyx-segments linear-oblong; corolla curved, tubular-funnel-shaped, puberulent, lobes short rotund, ciliolate. S. Afr. B.M. 6903. G.F. 3:609 (adapted in Fig. 3735).—A plant sometimes produces more than 100 fls.

9. polyanthus, Hook. Acaulescent; lf. solitary, 5-7 x 3 in., round or elliptic, obscuringly crenate, hairy on both surfaces: scars 1-3, up to a foot or more high, rather stout, 4-10-fl.; calyx hairy, teeth linear; corolla pale blue, about 1½ in. long, tube linear-cylindric, curved, limb unequal, the 3-lobed lip much longer than the 2 upper segms. S. Afr. B.M. 4850. Gt. 6:206.

10. grandis, N. E. Br. Acaulescent; lf. solitary, radical, 2-3½ ft. long, 1-2½ ft. broad, ovate, base cordate, crenate, pubescent on both sides; cauline lvs. none or few, small, ovate, sessile; pedicels several, bearing above 2-6 lax racemes, pubescent; fls. in 2's, lavender or light blue outside, white within, marked with 2 broad-blue stripes in the throat; corolla-tube about 1 in. long, bent downward, upper lobes pale blue or lavender. Zululand. B.M. 8042.

11. Saundersii, Hook. Acaulescent; lf. solitary, sessile, flat on the ground, 14 x 12 in., very broadly elliptic, dark green; flowers numerous, clustered, produced serially, stout, 1 ft. or more high, bearing many-fl., second panicles; fls. 1½ in. long, tube more or less widened at the mouth; calyx-segments linear-oblong; corolla curved, tubular-funnel-shaped, puberulent, lobes short rotund, ciliolate. S. Afr. B.M. 5251. F.S. 17:1802. Gt. 24:826.

12. Wendlandii, Sprenger. Fig. 3736. Acaulescent; lf. solitary, attaining a size of 30 x 24 in., crenate, closely hairy, red-purple beneath; flowers several, 1-2½ ft. high, forked; inf. 6-8 in. long, 30-tid.; calyx lobes linear, hairy; corolla pale blue with purple blotches in the throat, tube somewhat funnel-shaped, a little curved, limb oblique, 2 lobes much shorter. S. Afr. B.M. 7447 (part of which is colored in Fig. 3736). G.C. III. 22:275. Gn. 45, p. 511; 50, p. 394. J.H. III. 23:223. G. 17:181.—One of the finest species in cult.

Section IV. HYBRIDA.

(For colored pictures of modern hybrid types, see Gn. 29:545; 41:843; 50:1092.)

13. achimeniformis, Hort. Acaulescent; lvs. several, radiating or opposite, rather elliptical, somewhat fleshy, brilliant light green; fls.—st. stiff, most often 1-fl.; fl. as large as a gloxinia, but with the corolla divisions more deeply cleft, and finely dentate, bright lilac tinted with marine blue through pale lilac to pure white, the lower part of the corolla is always striped with deeper color. Possibly a garden hybrid. R.H. 1906, p. 309. Var. Albus, Hort., is offered in the trade as a large-fl. white form. Var. gigantisans, Hort., is offered as a lavender-blue form. Var. roseus, Hort., is offered as a soft delicate rose form.

14. Bruantii, Hort. (S. Rexii x S. polyanthus). Lvs. very large, not cordate, very velvety, bright green; scarps up to 14 in. high: fls. about double the size of

3735. Streptocarpus Dunnii. (X about ½)

3736. Streptocarpus Wendlandii. (X ¾)
of *S. polyanthus*, about 1½ in. long, blue or bright mauve, throat yellowish white. Garden hybrid.


16. *kewensis*, Hort. (S. Reticii × S. Dunnii). Fig. 3737. Lvs. 2 or 3, large, but not so large as those of *S. Dunnii*, oblong or elongate-ovalate, bright green; fl.-sts. numerous, each 6-8-fl.d., forming a tolerably compact mass; fls. bright mauve-purple, striped with dark brownish-purple in their throat; corolla about 2 in. long, 1½-1½ in. across. Garden hybrid. G.C. III. 2:215.


The following species are either little known or have not found their way into general cult.: *S. Arnottanae*, Baker & Moore, is closely allied to *S. Dunnii*, differing in having a corolla much less funnel-shaped and straighter, with less spreading lobes; originally described as solitary-led, but 4 lvs. are said to have developed in the capsule. *S. A. × B. Birds*, Lynch (S. Wendlandii × *S. Dunnii* hybrid), has 2 lvs. about 10 × 13 in. for the lower, the second somewhat smaller: fls. large, purple-blue. Garden hybrid. G.C. III. 56: 192.- *S. bicornis*, Pucei, is a name appearing in horticultural journals for some unknown plant, which is said to have several blue fls.- *S. bicornis-polyanthus*, Duch., is a hybrid, the female parent of which is *S. polyanthus*, the male the above-mentioned *S. bicornis*: it is said to have 5 ovate-oblong, crenate lvs.; several scapes 8-10 in. long: berry red. May-July. A garden hybrid.

**STREPTOPUS** (Greek, twisted stalk, referring to the peduncles). Liliaceae. TWISTED STALK. Perennial herbs, with the aspect of Polygonum, hardy and adapted to the wild-garden; should be grown in shade or with rich, loose, and moist soil in sunlight.

Stems erect from a short, dense, or longer, repent rhizome, simple or slightly branched: lvs. alternate, ovate or lanceolate, membranaceous, sessile or clasping; fls. medium-sized, solitary or paired in the axil, nodding, rose or whitish; perianth campanulate, segms. distinct or connate at base; stamina 6: style 3-delt.; ovary sessile, ovoid, 3-celled; berry subglobose, indehiscent. About 6 species, Eu., Temp. Asia, and N. Amer. Woodland plants closely related to Disporum which has terminal fls.

1. *roseus*, Michx. Fig. 3738. Rootstock short, stout: st. 1-2 ft. high: lvs. sessile, only partially clasping, 2-4 in. long: peduncles less than 1 in. long, mostly 1-fl.d.: fls. about ½ in. long: berry red, ½ in. thick. May-July. Moist, rich woods in the northern states, S. to Ga.

2. *S. americana*, Hook. f. (S. Wendlandii × S. Watsonii), has 2 or 3 lvs., the largest of which is 15 x 9 in. and another is 12 x 7 in., green beneath, in some cases reddish toward the tip, in others with the color here and there; scapes 8-10, each with 6-14 fls. about 1½ in. long. A garden hybrid. B.M. 7857.- *S. Veitchii*, Hort., is offered in the trade.

**STREPTOPUS** 3275

3738. Streptopus roseus. (X½)

3737. Streptocarpus kewensis. (X3½)

**STREPTOPUS** 3275

3737. Streptocarpus kewensis. (X3½)

**STREPTOPUS** 3275

3738. Streptopus roseus. (X½)

AA. Fls. greenish white.

**amplexifolius**, DC. Rootstock short, stout; st. usually taller than *S. roseus*: fls. clasping, 3-6 in. long: peduncles 1-2 in. long, usually 2-fl.d.: fls. about 1½ in. long; berry red. May-July. Moist rich woods, N. U. S. and Canada south to N. C., and New Mex.; also in Eurasia.

F. W. BARCLAY.
STREPTOSOLEN


F. TRACY HUBBARD.

STROBLANTHES

STROBLANTHES (named in honor of Sir C. W. Strickland). Arosieris. Perianth narrowly funneled, tube short, segments oblong, equal; stamens, one to five, filaments united half-way in a cup, lanceolate above it, without any teeth below; ovary globose, 3-lobed, 3-celled; capsules short, deeply 3-lobed,iloculicidally 3-valved; seeds many, small. One species, Andes of Ecuador. S. crenatioloides, Baker (Leptenion crenatioloides, Baker. Pterodon crenatioloides, Bentham. F. STICKLANDI, Baker). Bulb ovoid, 2 in. diam.; tunics brown, membranaceous; leaves 2 to 3 ft. long, ovate, acute, base broad-oblong, suborbicular, entire, with a few short-pedicelled, sometimes in dense or interrupted terminal spikes or the peduncles clustered at the axis; calyx deep green, 5-parted, segments linear, corolla-tube slender at the base, widened above; limb spreading, 5-lobed, lobes ovate, perfect stamens 4 or 2; caps. oblong or linear, 2-celled at or near the base. About 200 species, India, Malay Peninsula, Java, and Japan.

S. STICKLANDI, New. Shrubs, 2-3 ft. high, glabrous, exserted, one to three at a time, the latter, acuminate at both ends: racemes axillary, very numerous, conical, 2-3 in. long; bracts rounded, white, tipped with green; flowers white, projecting slightly from the cone. Hymenophyllum.

S. crenatioloides, New. Shrubs, 2-6 ft. high, glabrous, exserted, one to three at a time, the latter, acuminate at both ends: racemes axillary, very numerous, conical, 2-3 in. long; bracts rounded, white, tipped with green; flowers white, projecting slightly from the cone. Hymenophyllum.

S. degeneri, New. Shrubs, 2-6 ft. high, glabrous, exserted, one to three at a time, the latter, acuminate at both ends: racemes axillary, very numerous, conical, 2-3 in. long; bracts rounded, white, tipped with green; flowers white, projecting slightly from the cone. Hymenophyllum.

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STROPHANTHUS (Greek, round and flower; said to allude to the form of inflorescence). Maranta. Perennial herbs grown in the warmhouse for the foliage. Stems leafy, erect, from a thick horizontal rhizome, somewhat branched, the base covered by the long leaf sheaths: lvs. short-petioled; infl. rather lax, terminal, on a long peduncle, more or less compound, rarely narrow, almost racemose-like, frequently all colored blood-red; bracts and bracteoles pubescent-like, colored; sepals 3, free, oval-oblong; petals 3, slightly narrower than the sepals; ovary 1-celled, 1-ovuled: fr. subglobose.—About 12 species, S. Amer. (Schumann, in Engler’s Das Pflanzenreich, hft. 11.—IV. 48). Closely allied to Calathea, Maranta, Phrynium and Thalia. It agrees with Maranta and Thalia in having a 1-loculed cap, and thereby differs from Calathea and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segments not standing opposite each other. From Thalia it differs, as does Maranta, in having 2 side staminodia rather than 1. For cult., see remarks under Callathea.

Portulacina, Griseb. (Maranta portulacina, Koern.). Two to 4 ft. high, with maranta-like lvs., the blades long-elliptic or ovate-acuminate, varying from acuminate to almost obtuse, purple beneath, bright green above with transverse stripes or bars of silvery white; fis. solitary or twin on the rachis, blood-red, the infl. simple or compound. Brazil. Lowe 26.

sanguinea, Sonder. (Thalia sanguinea, Lem.). Lvs. blades about 1 ft. long, oblong-acuminate, purple beneath and green above: scape 12-20 in. tall, red toward the top, bearing a panicle of bright red and red-bracted fls. Probably Brazilian. B.M. 4464 (as Phrynium). E.S. 19: 403.—An old garden plant.

Thrive in an intermediate house and attain a height of 5 ft. when planted in a border. Var. spectabilis, Eichler. B.M. 8494. F. TRACY HUBBARD.

STROPHOLIRION 3277

STROPHOLIRION (Greek for twisted rope and lily, referring to the twisting stem). Lilaeac. Herbaceous, with a cormed base, used for outdoor planting: lvs. few, radical: scape simple, leafless, often twining several feet lvs. rose, numerous in a terminal umbel; perianth urn-shaped, 6-lobed; stamens 3; ovary sessile, ovoid, 3-locular, ovary 1-celled, 1-ovuled: fr. subglobose. —About 40 species, Trop. and S. Afr. and Trop. Asia.

Sickle (S. dichtomus, DC.). Erect shrub with stout branches: lvs. elliptic-oblong or obovate, 3-5 x 2-3 in., obtuse, acute or apiculate, rather coriaceous; cymes more shorter than the lvs., dichtomus.
One species, Calif. Very like Brodiaea, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and sacate at the base. \textit{S. californicum}, Fort. (Brod. \textit{californica}, Baker). Fig. 3: (adapted from Pacific R. R. Rep.). In many ways it resembles \textit{Brevvoorta Ida-Maia}, except that the scape is climbing to a height of \(3-4\) ft., and bearing an umbel of delicate rose-colored flowers. Tilly about any stick or bush that stands near it. Lvs. 1 ft. or more long, keeled, \(\frac{1}{2}\) in. or less broad: corolla 1 in. diam. Cent. Calif. B.M. 6123. \textit{C.} of \textit{Brevvoorta Ida-Maia}.

\textbf{C. Purdy.}

\textbf{STRUTHIOPTERIS:} Matteuccia.

\textbf{STRYCHNOS} (an old Greek name used by Theophrastus for some plants belonging to Solanaceae). \textit{Lopadecea.} Scendent shrubs with short tendril, or trees, of economic importance; some of the species have been introduced into the southern United States.

Leaves opposite, in scendent species some axis bear short clavate tendrils, the adjacent if. being often suppressed; cymes terminal or lateral; bracts small: fls. white to yellowish; calyx \(4-5\)-lobed; corolla \(4-5\)-cleft, tube short or long or hardly any, lobes valvate; stamens \(5\); ovary \(2\)-celled (or \(1\)-celled above): berry globose or oblong.-About 220 species, tropics of both hemispheres.

\textbf{Nux-vomica,} Linn. Tree attaining a height of \(40\) ft.: lvs. ovate, \(5\)-nerved, glabrous, \(\frac{3}{4}\) x \(\frac{3}{4}\) in.; cymes terminal, short-peduncled, \(1-2\) in. diam.; pedicels hardly any: fls. numerous; corolla-lobes glabrous: berry \(\frac{1}{2}\) in. diameter: seeds: seedcoat many-seeded. India.—The seeds yield the drugs, nux-vomica and strychnine, and the bark is somewhat used as a tonic.

\textbf{Potatostrum,} Linn. f. Tree attaining a height of \(40\) ft.: lvs. elliptic, \(2\frac{1}{2}\) x \(1\) in., \(3\)-nerved, subsessile, glabrous or nearly so: cymes axillary, nearly sessile, \(1\) in. diam.: berry \(\frac{1}{2}\)-\(\frac{3}{4}\) in. diam. India and Ceylon.—The seeds are known as the clearing-nut as they have the property of clearing muddy water when they are rubbed on the inside of the vessel into which it is put.

\textbf{Spinosa,} Lam. Low tree: branchlets slender, armed with pungent spines from the nodes: lvs. obovate or suborbicular, \(5\)-nerved from near the base, glabrous, subcoriaceous: cymes terminal, short-peduncled, \(1-3\) in. diam., very compact: fls. greenish: calyx-tube very short, segms. linear: corolla-tube short, campanulate, the lobes usually \(5\): ovate: fr. the size and color of an orange, the shell leathery, the pulp abundant and edible; seeds large. Trop. and S. Afr., Madagascar, and Seychelles.—A promising fr. intro. into the U. S. 

\textbf{Staphylea.} Gilg (S. Schulmann, Hort.). Tree, \(12-22\) ft. high with axillary recurved spines: lvs. decussate, elliptical, gray-green or yellowish, \(\frac{1}{2}\) in. long: flowers yellow or white, \(\frac{1}{2}\) in. across: berries black, \(\frac{1}{2}\) in. in diameter: shrub. Australia. Gilg intro. into S. Calif. but not successful. —S. \textit{Schulmanniana}, Gilg. Tree, \(30-40\) ft. high: branchlets armed at the nodes with curved pungent spines: lvs. oblong or oblongate, glabrous; flowers yellow, from the tip of the branches: seeds ovate; corolla-lobes ovate: fr. shaped like an orange, edible. Trop. Afr. Reported as intro. into S. Calif. but not successful.

\textbf{F. Tracy Hubbard.}

\textbf{STROPHNODENDRON} (Greek, \textit{astrigend} and \textit{tree}; the bark has a puckery taste). \textit{Leguminosae.} Unarmed trees, usually small, with thick branchlets, grown in the greenhouse and also outdoors in the extreme S.: lvs. twice pinnate, lfts. small, many-paired, frequently rather broad: fls. small, hermaphrodite or polygamom, borne in short-ped-oleoed, axillary spikes, \(5\)-merous, sessile: calyx campanulate: petals obovate to the middle, finally free: stamens 10, free; ovary short-stipitate, many-ovuled: legume linear, compressed, thick.—Nine species in Trop. Amer.

\textbf{Guianense,} Benth. Branchlets subterete, they and the petioles rusty-tomentellous: pinnae \(6-12\) pairs; lfts. with \(8-10\) pairs of divisions, oblique, oval-oblong, \(4-5\) lines long, shiny above, reddish beneath: corolla smooth, about \(5\) times as long as the calyx: pod straight or slightly incurved. (Breed. & Hooker intro. into Fla.)

\textbf{S. forinandiun,} Benth. (Accacia pulcherrima, Willd.). Spines: pinnae \(13\) pairs; lfts. many-paired, oblong-linear, obtuse, pubescent beneath, petiole pubescent and Purpavus, fr. would apparently have been used twin, axillary, filiform: fls. \(5\)-parted, ptose. Brazil.

\textbf{STUIARTIA:} \textit{Steuartia.}

\textbf{Stylium} (\textit{stylis}, a column, referring to the body formed by the union of the stamens and style). \textit{Candollea} or \textit{Styliodeae}.—A woody perennial or tree of economic importance; some of the species mostly in Australia, seldom grown under glass or in the open in mild climates.

Confusion has arisen in the name of this group, and recent authorities adopt the name \textit{Candollea}, but \textit{Candollea} is itself confused. In 1805, La Billardiére founded the genus \textit{Candollea} for the plants which a few months earlier were named \textit{Stylium}, Swartz, by Wildenow (Sp. Pl. iv. 146). As the first application of the name \textit{Candollea} was that of Baker, in 1847, and \textit{Stylium} was used by Willdenow in 1805, \textit{Candollea} is a synonym for \textit{Stylium}, for the genus we are now considering, as is done by Bentham & Hooker. Schönland, however, in Engler & Prantl's Pflanzenfamilien, although kept separate by Bentham in \textit{Flora Australiensis} and by Bentham & Hooker in Genera Plantarum. Although the name \textit{Stylium}, Swartz, is antedated by \textit{Stylium}, Loureiro, founded in 1790 on a plant of the Cornaceae, Swartz's name stands, since Loureiro's \textit{Stylium} belongs as a synonym to the earlier genus \textit{Alangium} (see page 248, Vol. I). According to the International Rules, as well as on the principle of fifty years of accepted usage, it is correct to retain \textit{Candollea} for the \textit{Dilleniaceous plants} (page 653) and to use \textit{Stylium} for the genus we are now considering, as is done by Bentham & Hooker. Schönland, however, in Engler & Prantl, and, earlier, F. von Mueller, revive the \textit{Candollea} of 1805 and make \textit{Stylium} a synonym, and in this case the \textit{Candollea} of 1806 would become Eulalia of Durand if it is retained as a genus distinct from \textit{Hibbertia}. According to the Philadelphia or American Code, however, the existence of earlier homonyms, no matter whether valid names or synonyms, prevents the use of \textit{Stylium}, Swartz, and \textit{Candollea} of 1806, and it is recommended that \textit{Stylium} be the name to be used for the \textit{Stylium} of Swartz, while \textit{Eulalia} would replace \textit{Candollea}. The latest monograph, \textit{Mikr braud}, in \textit{Engler's Pflanzenreich}, art. 35 (iv. 278. 1908), adopts \textit{Stylium}, Swartz. It may be said in passing that the generic name \textit{Candollea} has also been used for plants distinct from either of the groups we are here considering, but these applications are of later origin.

The \textit{Stylium} are of very minor importance horticulturally and scarcely appear in the American trade, although \textit{S. adnatum} has been listed in southern California. The species are difficult of determination in Australia; \textit{Mikr braud} describes 103. Most of the species "form a spreading tuft of radical leaves from the midst of which springs the scape. Sometimes the following year the new leaves and scape are close to the old ones, forming a dense, tufted stock, the bases of the leaves sometimes assuming a bulbous appearance; in others one or two short stems or branches, may be observed." The plants are most or less lobelia-like, with pink, purplish, yellow, or white fls. in racemes, panicles, or cymes; corolla irregular, five-lobed of which four lobes ascend in pairs and the other (the lip) much smaller and deflexed or sometimes nearly as large as
the others and curved upward; calyx five-lobed, more or less two-lipped; stamens two, united with the style: fruit a capsule, two-valved from the top downward; leaves all radical, or scattered in whorl-like tufts, as described above.

*S. adnatum*, R. Br. (Candollea adnata, Muell.), has mostly very narrow or linear lvs. scattered along the st., the upper ones showed in a terminal tuft: fls. pink, nearly sessile in compound racemes or spike-like panicles: sts. 12 in. or less long.—*S. Brasunaniun*, Bentth. (Candollea Brasuniana, Muell.). Totally or rarely prolific, the radical lvs. linear to oblanceolate: scars 12-18 in. high, with whorse of narrow lvs., and bearing many small pink fls., the corolla-throat appended. B.H. 28:10. H.U. 4:72.—*S. eiliatum* Lindl. (S. sinicifragosae, Lindl. Candollea eiliata, Muell.), 8—piliferum.—*S. dodonaeum*, DC. S. nanoumifolium, Hook. (Candollea dichotoma, Muell.), low, the scars 2-4 in. high and glandular-pubescent: lvs. narrowly linear, acute, scattered between tufts at base and top: fls. yellow in a glandular-hairy compound racemes or panicle. B.M. 4386. F.S. 6:600 (as S. Hookeri). J.F. 1:59.—*S. graminidium*, Swarts (S. Armeria, Labill. Candollea graminidium, Muell.). Tufted or somewhat profloriferous, the scars 6-18 in. high, bearing a raceme or panicle of yellow or whitish or pinkish lvs., the corolla-throat not appendaged. B.R. 28:15. H.U. 4:282.—*S. Hookeri* L. H. B. Tufted, IVB.linear and hair-pointed, the plant with yellow glandular hairs; scars 6-12 in. high, bearing a raceme or panicle of yellow or whitish or pinkish lvs., the corolla-throat not appendaged. B.M. 3663 (as S. cilatum); 4629 (as S. saxifragosae). J.F. 1:34.


**STYLOPHYRUM** (Greek, style and bearing, in reference to the persistent style). *Papaveraceae.* Hardy, perennial herbs, with stout rootstocks and yellow sap: lvs. radical, pinnatifid or entire, scattered in whorl-like tufts, or cut: fls. yellow or red; peduncles elongated, solitary or aggregated between tufts at base and top; fr. yellow in a glandular-hairy compound racemes or panicle. *S. diphylum.* Nutt. (Papaver *Stylophorum*, Hort.) 3741. A hardy perennial about 1 ft. high, forming large clumps: st. with 2 lvs. at the summit: lvs. light green, pinnately parted: fls. yellow, 2 in. across, in clusters of 3-5. May, June. moist shade, W. Pa. to Wat. and Ark. B.B. 2:102. J.H. III. 34:475. Gns. 65, p. 283.—An attractive plant of easy cult. in any rich, rather loose, moist soil in either shade or open, but preferably in partial shade. It is easy to transplant. F. W. BARCLAY.

**STYRAX** (ancient Greek name of *Styrax officinalis*). *Styraceae.* *Styrax.* Ornamental woody plants chiefly grown for their handsome flowers.

Deciduous or evergreen trees or shrubs more or less stellate-pubescent: lvs. short-stalked, exstipulate, more or less covered, like the infl., with stellate hairs: fls. white; calyx campanulate, obscurely 5-toothed or truncate; petals 5, connate only at the base; stamens 10, inserted at the base of the corolla and usually somewhat connate below; ovary superior, often united at the base with the calyx, 5-lobed at the base, 1-lobed at the apex; style slender: fr. a drupe, mostly subglobose, fleshy or often dry with dehiscent pericarp, 1-2-seeded, with large, subglobose seeds.—About 100 species in the tropical, subtropical, and warmer temperate regions of Amer., Asia, and Eu. There is a monograph by Miss J. Perkins in Engler, Pflanzenreich (IV. 241). *Styraceeeae*, pp. 17-88 (1907). *S. Benzoin* yields the benzoin, a balsamic exudation of the wounded tree; styrax, a similar gum-resin, was formerly obtained from *S. officinalis*, but the styrax of today is a product of Liquidambar.

The storaxes are handsome trees of graceful, usually loose and spreading habit with numerous white and mostly fragrant, often pendulous, flowered or few-flowered clusters, followed by rather insignificant subglobose drupaceous fruits. *S. japonica* and *S. Obassia* are the hardiest and stand the winter in sheltered positions as far north as Massachusetts. *S. americana* is somewhat tender; *S. grandifolia* is hard about Philadelphia and *S. Wilsonii* is probably of the same hardiness; *S. officinalis* is hardy only South. They are well adapted for borders of shrubberies or as single specimens on the lawn, and thrive best in a light, porous soil. Propagation is by seeds which are usually profusely produced in cultivation, soon after ripening, and by layers sometimes grafted on *Halesia carolina*. *S. japonica* and *S. americana* may also be grown from cuttings, but usually only a small percentage will root.


**STYRAX**


**b.** Young branchlets, petioles, and racemes soon glabrous.


**AA.** Fls. in few-fl. clusters or short racemes; lvs. ½-1 in. long.

**b.** Lvs. ½-1 in. long, serrate or denticulate, tomentose beneath.

**Wilsonii,** Rehd. Small compact shrub, to 6 ft.: lvs. rhombic-ovate or oval, obtuse or acutish, sparingly toothed or denticulate, sparingly pubescent above, white-tomentose beneath, ½-1 in. long: fls. short-stalked in 2-5-fl. clusters, ½-1 in. long; calyx stellate-pubescent; corolla-lobes oblong: fr. globose-obovoid, ½±in. long, finely velvety. May, June, W. China. B.M. 8444. G.M. 45:47. S.Z. 5:169. (The hardest species and exceedingly handsome in bloom with its profusion of gracefully drooping white fls.)


**SUCCULENTS**

- **3742. Styrax japonica.** (×½)

**SUCCULENTS**

**SCALLOPED**

- **Succisca (succise, prenmorese); cut off at the lower end, referring to the root.** *Dipsaceae.* Three or 4 herbs, by some authorities incl. in Scabiosa, of the Medit. region to Trop. Afr., marked by the soft or herbaceous scales or pales (involutiones) subtending the florets in the head, and by other technical characters. To this genus or group belongs the "teufelsabiss" of the Germans. The plants are little known in cult., but S. australis, Mert., is listed abroad among outdoor perennials. Nearly or quite glabrous: lvs. ovate-elliptic, acuminate and entire, the lower ones somewhat auriculate: heads ovate, with lilac-violet or ochroleucous fls.; scales of involucre in 2 series. **S. pratensis, Moench.** (Scabiosa Succisa, Linn.), may be cult.: root premorese (at cut off): radical lvs. ovato-lanceolate, acuminate and entire, the cuneal ones conuate; scales of involucre in 2 or 3 series.

**Succulents:** Planting, page 2672.
SUGAR-APPLE


SURINAM CHERRY

SURINAM CHERRY (Fig. 3743), Eugenia uniflora (E. Micheli) of the family Myrtaceae, is a large shrub, sometimes becoming a small tree, but commonly branching close to the ground and forming a broad compact bush 6 to 12 feet high. It is indigenous to Brazil, but has now been sufficiently collected and isolated, with two or more rows of rows, in the manner of the star dahlias. It is hoped that some very good forms of the red sunflower will be developed along these lines. A new form of the wine-red sunflower has the bicolor pattern, with the background pale (dilute) orange instead of primrose. This gives, in certain cases, an exceedingly rich and bright color. By crossing the silky-haired H. argophyllus with vinous H. annua, and again crossing the resulting plants with vinous H. annua, a very pretty new hybrid has been obtained, the rays very pale yellow, tinted with vinous or with a broad ring of color at the base. It has the H. argophyllus foliage.

As early as 1896 (Bulletin Torrey Botanical Club, vol. 23, page 357) hybrids between annual and perennial sunflowers were recorded, but without details. The hybrid H. annua X H. scaberrimus (rigidus) was listed by Thellung in 1913. In 1918, Leonard Sutton in England used the pollen of H. annua, and the red variety of H. annua, and obtained fertile seed. The F1 had the characters of the perennial parent, but Sutton reports that an F2 plant has been obtained with small streaks and splashes of red. In 1914 Mrs. Cocke used the problem, and obtained H. x pumilus, with vinous H. annua, and obtained seeds which produced plants in 1915. These resembled the perennial parent, and formed rosettes only during the first season. An attempt to force these into flower in the greenhouse in the winter of 1915-1916 totally failed; but three seeds of the original lot placed in a coldframe early in 1916 produced plants, one of which is a rosette, while the other two have formed no rosette, and have flowered the first season, like H. annua. The largest of the first lot of plants from the H. pumilus X H. annua cross flowered about the middle of July, 1916, and in its mature form showed a curious combination of characters. The rays, however, were entirely without red, and as is usual with perennials, gave a red color (Since this was written, one of the hybrids has flowered showing the collarette character, and the lobes forming the collarette are largely red.) This hybrid plant has a curiously close resemblance to the horticultural form known as Daniel Dewar. The broad leaves with perennials, gave a red color with caustic potash. It seems probable that results of considerable botanical and horticultural interest will eventually be obtained. S. Alexander of Michigan has made an elaborate study of the forms of perennial sunflowers growing in his region. He finds that only part of the species are perennial in the strictest sense, the others reproducing by underground branches, having no permanent budding crowns. He also finds that the forms are extremely diverse and has recognized over 600 minor species, differing in a variety of characters. This great diversity of character should afford the basis for many interesting hybridizations, and increased by the system of vegetative reproduction by "earth-braches," which would give us areas covered with plants of the same composition, constituting apparently fixed and constant species. Alexander finds, however, that the true stationary perennial presents a great diversity of forms, though they appear to be far less numerous than are the migrants. T. A. COCKERELL.
suberosive, opposite, entire, ovate, subacuminate at the apex and rounded to subcordate at the base, 1 to 2 inches long, glabrous, reddish when young but when mature of a deep glossy green color. When crushed they emit a pungent odor which is rather agreeable; in Brazil they are often gathered and scattered over the floors of the houses, the odor which they give off when trampled upon being appreciated and considered efficacious in driving away flies. The white slightly fragrant flowers are about \( \frac{1}{2} \) inch in diameter, solitary in the axils of the leaves on slender peduncles up to 1 inch long; the sepals are four, oblong, concave, ciliate; the petals four, oblong-obovate, cupped, ciliate. The stamens are numerous, erect in a large cluster, the filaments filiform and the anthers oval, laterally dehiscent. The style is slightly longer than the stamens, filiform, the stigma simple; ovary bicarpellary.

The plant is of very simple culture. It is usually propagated by seeds, which will germinate upon the ground beneath the bush if the fruits are allowed to fall. They can be sown in flats of light sandy loam, and cov­ally takes place within a few weeks. When a foot high, the plants may be set out in the open ground, where they are reasonably drought-resistant. Because of their attractive appearance and close, compact growth they are often used in Brazil for hedges, for which purpose they are excellent.

F. W. POPENOE.

**SUTHERLANDIA** (named for James Sutherland). *Leguminosae.* Tender canescence shrubs, hardly in the extreme S., otherwise grown in the greenhouse; lvs. unevenly pinnate; lfts. many, very entire, without stipels; stipules small, narrow: lfts. showy, scarlet, few in short axillary racemes; calyx-teeth subequal; standard erect, spreading at the top; wings small, oblong; keel erect, incurved, rather acute, exceeding the standards; stamens 1, free from the standard, the others connate in a sheath; ovary stipitate: legume ovoid, membranous, much inflated, rather indehiscent. One species, *S. afr.* Prop. by seeds and said to be easily raised from cuttings. The seeds are generally sown in June or July and the plants wintered in the greenhouse, where they should have very moderate watering and as much air and light as possible. Grown for the bloom. 

**fruitescens**, R. Br. Shrub, about 3 ft. high; lvs. with 9–11 pairs of lfts. and an odd one: fls. drooping and in the best variety 1 in. or more long, not pea-shaped: pod sometimes \( \frac{1}{2} \times \frac{1}{2} \) in., bladder-like. *S. afr.* G.W. 14, p. 383. Var. *communis,* Harv. 14, p. 383. Var. *communis,* Harv. with small, oblong; keel much longer than the standard; stamens 1, free from the standard, the others connate in a sheath; ovary stipitate: legume ovoid, membranous, much inflated, rather indehiscent.-One species, *S. afr.* Prop. by seeds and said to be easily raised from cuttings. The seeds are generally sown in June or July and the plants wintered in the greenhouse, where they should have very moderate watering and as much air and light as possible. Grown for the bloom.

**SWAINSONA** (named for Isaac Swainson, an English horticulturist of the latter part of the eighteenth century). Often incorrectly spelled *Swainsona.* Leguminosae. Glabrous or subappressed-pilose bushes or subshrubs, adapted to greenhouse culture or out-of­doors in the extreme South.

Leaves odd-pinnate; lfts. many without stipels; stipules frequently herbaceous, base broad, rarely bristle-like: lfts. blue-violet, purplish, rarely white or yellowish, in axillary, usually peduncled racemes; calyx-teeth subequal or the 2 upper shorter; standard orbicular or reniform, spreading or reflexed; wings oblong, falcate or twisted; keel broad, incurved, obtuse; stamens 9 and 1; ovary sessile or subsessile, opposite, entire, ovate, subacuminate at the apex; fruits produced in great abundance during the early spring in south Florida, with frequently a second crop later in the summer; they are subglobose, about 1 inch in diameter or somewhat less, prominently eight-ribbed longitudinally, deep crimson in color when fully ripe, each containing one large spherical seed or two hemispherical ones. The flesh is soft and melting, very juicy, of the same color as the thin skin and of an aromatic, subacid flavor. The fruit is a great favorite in parts of Brazil, where it is commonly eaten out of hand or made into jellies, preserves, and sherbets.

The plant is of very simple culture. It is usually propagated by seeds, which will germinate upon the ground beneath the bush if the fruits are allowed to fall. They can be sown in flats of light sandy loam, and covered to the depth of about an inch. Germination usually takes place within a few weeks. When a foot high, the plants may be set out in the open ground, where they require very little attention. They succeed remarkably well on the shallow sandy soils of southeast Florida, but in their native home are found upon clay or clay-loam. Their behavior in California indicates that they are reasonably drought-resistant. Because of their attractive appearance and close, compact growth they are often used in Brazil for hedges, for which purpose they are excellent.

F. W. POPENOE.
broad, attractive shrub, with long flexuous or half-climbing branches; lfts. 5-10 pairs and an odd terminal one, small, oblanceolate and obtuse or somewhat emarginate; racemes axillary and mostly exceeding the foliage, bearing rather large deep red fls.: pod 1-2 in. long, much inflated, stipitate. Austral. B.M. 792. H.F. II. 4:276. J.F. 3:394. J.H. III. 49:547. —An old-time garden plant, blooming freely in a cool or intermediate house along with carnations and roses. It thrives well either as a pot-plant or in beds. It is hardy at San Francisco. It is a nearly continuous bloomer. Cuttings taken in winter bloom in summer; these plants may then be transferred to the house for winter bloom, although maiden plants are to be preferred. By cutting back old plants, new bloom may be secured. Cuttings grow readily. The plant is easy to manage. The original form of swainsonia is little known in cult., but the advent of the white form has brought the species to the fore.

Var. albiflora, Lindl. (var. alba, Hort. S. albißora, Don.) Fls. pure white. B.R. 994. L.B.C. 17:1642. A.F. 8:117; 10:611; 11:1130. Eng. 5:135. —N. America. This is one of the most popular of florists' white fls. for use in winter decorations. It has been called the "winter sweet pea" because of the shape of the fls., but it has no fragrance. The delicate bright green foliage affords an excellent contrast with the pure white fls. This variety is often grown at the end of a rose- or carnation-house, or trained on a trellis. It likes abundant sunlight, rich soil, and liquid manure. When allowed too much root-room, the plants become dwarf. It is hardy at San Francisco. The former should be used. B.M. 1725.


SWEET CICELY, or SWEET-SCENTED CHERVIL (Myrrhis odorata, Scop., which see), indigenous to Europe on the banks of streams, is a graceful hardy perennial 3 feet tall, with very large downy grayish green, much-divided leaves, hair stems and leafstalks, small, fragrant white flowers, and large brown seeds of transient vitality. The leaves, which have an aromatic, anise-like, sweetish flavor and odor, characteristic of the whole plant, are still occasionally employed in flavoring soups and salads, though their use as a culinary adjunct, even in Europe, is steadily declining. In American cookery, the plant is almost confined to the unassimilated distinctly foreign population. Those lvs. 3-5 in. long, divided by division, best results are obtained from seed sown in the autumn either spontaneously or artificially; the seedlings, which appear in the following spring, are set 2 feet apart each way in
almost any ordinary garden soil. Spring-sown seed frequently fails to germinate. When once established common care will be sufficient.

M. G. KAINS.


SWEET HERBS. The term “sweet herbs” has long been applied to the fragrant and aromatic plants used in cookery to add zest to various culinary preparations, principal among which are dressings, soups, stews, and salads. At the commencement of the nineteenth century many were to be found in gardens and kitchens that now have been dropped entirely or have but very limited use. Perhaps no group of garden plants during this time has been marked by so little improvement. Except in parsley, very few distinctly new or valuable varieties have been produced or disseminated. This is mainly due to the prevailing ignorance of their good qualities, to which ignorance may be charged the improper handling, not only by the grower, but by the seller and often by the final purchaser. With the public duly awakened to the uses of herbs, improvements in growing, handling, and in the plants themselves will naturally follow, to the pleasure and profit of all.

In this country the herbs best known and appreciated are parsley, sage, thyme, savory, marjoram, spearmint, dill, fennel, tarragon, balm, and basil, arranged approximately in their order of importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs combined. Hence some seedsmen do not rank parsley with sweet herbs. Sage is the universal flavoring for sausage and the seasoning par excellence for rich meats such as pork, goose, and duck. It is more widely cultivated than thyme, savory, and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken, and veal. With the exception of spearmint, without which spring lamb is deemed insipid and the famous mint julep a thing of little worth, the remaining herbs mentioned above are scarcely seen outside the large city markets, and even there they have only a very limited sale, being restricted mainly to the foreign population and to such restaurants and hotels as have an epicurean patronage. In many market-gardens especially near to the large cities, sweet herbs form no small source of profit, since most of them, when properly picked, can be shipped in the green state even a considerable distance, and when the market is over-supplied they can be dried by the grower and sold during the winter. Probably more than one-half the quantities used throughout the country are disposed of in the latter manner.

As a rule, the herbs are grown as annuals and are propagated from seed sown in early spring, though cuttage, layerage, and division of the perennials are in favor for home practice and to a certain extent also in the market-garden. Commercially they are most commonly grown as secondary crops to follow early cabbage, peas, beets, and the like. In the home-garden they are frequently confined to a corner easily accessible to the kitchen, where they remain from year to year. In general, herbs should be planted on good light garden soil of fine texture, kept clean by frequent cultivation, gathered on a dry day after the dew is off, dried in a current of warm, not hot air, rubbed fine and stored in air-tight vessels.

For specific information, see articles on the following: Anise, Angelica, Balm, Basil, Caraway, Coriander, Dill, Fennel, Hyssop, Mint (Marjoram), Parsley, Sage, Savory, Tarragon, also book on “Culinary Herbs,” M. G. Kains.

M. G. KAINS.

SWEET MARJORAM: Origanum.

SWEET PEA. The popular name of Lathyrus odoratus, one of the Leguminosae, grown for its handsome and fragrant flowers. See Lathyrus for botanical account of structure of the flower, see Legume; see also Orobus.

Because of its range of color, beauty of form, fragrance, and value as cut-flowers, the sweet pea is not only the queen of the large genus to which it belongs, but now ranks first among annual flowers. It has been long cultivated in gardens, and in recent years in America it has risen to a place among the five leading commercial cut-flowers.

The sweet pea is a native of the island of Sicily and was first described by Father Francisius Cupani, a devout Italian monk and an enthusiastic botanist, in a small work published at Panormi in 1695. Cupani sent seeds in 1699 to Dr. Uvedale at Enfield, England, and to Caspar Commelin at Amsterdam, Holland. The latter published a figure and description of the plant in his “Horti-Medici Anglomediterranei” (1967-1701). From this description it is learned that the flowers had purple standards and sky-blue wings, were fragrant, and that the plants were climbing in habit, as they grew to a height of 6 or 7 feet. A white-flowered variety of the sweet pea appears to have been known in 1718, and in 1737 Burmann called attention to the pink-and-white-flowered form. Although he admitted that his plant differed only in the color of the flowers from that described by Cupani, and which, he says, occurred frequently in gardens, Burmann proceeded to make a new species, Lathyrus zeilanophalus, because he received the seeds among a collection of plants from Ceylon. Later botanists have not found the sweet pea growing wild in Ceylon, from which the authorities conclude that a mistake was made. This form was named Painted Lady and was grown until about 1900, when it gave way to its improved form, Blanche Ferry.

Sweet pea seeds were offered for sale as early as 1724. The three colors mentioned above to have been the only cultivated varieties until 1793, when the black and scarlet varieties were catalogued. In 1837 the first striped variety, in 1850 a yellow-flowered and also the Blue Edged varieties, were offered. The latter was white with a distinct blue edge. Later this form was known as Butterfly, and it was the forerunner of the Picotee section. In 1855 Invincible Scarlet won the first certificate awarded a new sweet pea. Crown Princess of Prussia, the first of light pink varieties, was offered in Germany in 1858. Adonis (1882) was the first double rose-pink varieties. Until 1880 (a period of 135 years) little improvement had been made in the sweet pea, and it had not been given the attention that had been bestowed upon the dahlia, verbena, hollyhock, or the rose. There were nine distinct varieties in 1880, and although many new names appeared during the next twenty years, these mainly represented supposed improved strains of the existing colors. It is very probable that not more than fifteen distinct varieties could be found with sufficient merit to continue. In 1897 Eckford, the great specialist, began his remarkable work.

No one can understand the improvement in sweet peas within the last forty years unless one considers the form of the flowers as well as the limited number of colors which then existed. The oldest illustrations of the sweet pea show the wings to be more prominent than the standard, and although there appears to have been some improvement in the size of the standard flower, the 18th and 19th century flowers were not remarkable in any respects. The standards of most of the varieties had a tendency to reflex at the edges, and the apical notch was very prominent. Often there were side notches which caused the standard to droop forward. The natural line of improvement, aside from securing better colors or color combinations, was to round out the outline of the standard and to give it a more expanded form and greater substance.
CIX. Sweet peas of the Spencer or Waved type.
Eckford, after long experience and signal success as a breeder of florists' flowers, began his work on the sweet pea about 1876. Beginning with a few varieties, he patiently crossed and selected for several years before he began to secure results. His first notable variety, Bronze Prince, was awarded a first-class certificate by the Royal Horticultural Society in 1882. Soon he began to secure new colors and sent out the deep bronze-blue Indigo King (1885), Orange Prince (1886) and the dark maroon Boreatton (1887). Then arose a tendency year by year for new colors and improved forms of the flowers. The hooded varieties appeared and gave a new interest to sweet pea improvement. Although many of the hooded varieties that were introduced had flowers in which the standards were hooded so much as to appear triangular in outline, nevertheless many very were very beautiful. The perfection of this form was reached in the variety Dorothy Eckford (1903). The increased size of many of Eckford's varieties led to the name Grandiflora sweet pea, but this name is now used to designate all varieties which do not have flowers of the waved or "Spencer" form.

At the time of the great biennial conference on the sweet pea held in London in 1900, Eckford had introduced 115 out of the 264 varieties catalogued up to that time. Even in America the Eckford varieties constituted at least 60 per cent of all lists of selected varieties; and in 1916 the Grandiflora varieties remaining in the trade, as shown by the catalogue of the leading American dealer, more than one-half originated in Eckford's garden at Wem, in Shropshire.

Improvement in America.

The real interest in sweet peas in America began soon after the first introduction of the Eckford varieties by Breck and by Henderson in 1886. Added impetus was given by the introduction of Blanche Perry in 1889, and by Emily Henderson in 1893. As early as 1890 the sweet pea had become a popular flower in this country, and soon local sweet pea shows were held. The demand for seed greatly increased and the competition in the shows was keen enough to bring about a desire for new and better varieties. The groundwork was laid for increasing size and a greater average number of flowers to a spike. This was the introduction of the waved form, and that along with it would come increased size and a greater average number of flowers to a spike. This was the introduction of the waved or, as it is called in America, the Spencer type, in 1904. The first variety was raised by Silas Cole who named it Countess Spencer in honor of the wife of his employer. The parentage of this variety, although to be doubted by some, has been given as (Lovely x Triumph, 1888) x Prima Donna, 1899.

"Development of the waved varieties. (Fig. 3745.)"

At the time of the bicentenary conference on the sweet pea, it seemed as if the future improvement of the sweet pea would be along the line of an increase in the number of flowers to a spike or the securing of new colors or color combinations in the existing open and hooded forms of the flower. No one seemed to believe that the sweet pea was on the eve of the most remarkable improvement in the form of flower and that along with it would come increased size and a greater average number of flowers to a spike. This was the introduction of the waved or, as it is called in America, the Spencer type, in 1904. The first variety was raised by Silas Cole who named it Countess Spencer in honor of the wife of his employer. The parentage of this variety, although to be doubted by some, has been given as (Lovely x Triumph, 1888) x Prima Donna, 1899. It was shown at various English shows for three years prior to its introduction. Countess Spencer was such an improvement in size, and the form so distinctly new, that it created a sensation. The very large standard and wings were beautifully frilled and waved. The clear pink color was also especially pleasing. This variety was not entirely fixed when it was sent out and soon numerous sports were offered. Among the first of these were the orange-pink Helen Lewis and the dark maroon Boreatton. The difficulty was experienced when the seed of new waved varieties was grown in California, but from this tendency to sport have been secured many of the finest varieties.

About the time that the Countess Spencer appeared, W. J. Unwin found a sport in the variety Prima Donna which he named Gladys Unwin. It was also of the waved type of about the same shade of pink as Countess Spencer, but the flowers were not so large. Soon other
varieties appeared, and for a few years this group vied with the Spencer varieties for popular favor.

The introduction of the waved form aroused great interest and soon large numbers were growing sweet peas for exhibition. Many took up the production of new varieties, and soon new forms were offered in large numbers. In some cases the same sport had been found and given different names. It was seen that hopeless confusion would result if some means were not found to eliminate the synonyms. The English Sweet Pea Society established trial grounds, and when the American Sweet Pea Society was organized in 1909 it established trial grounds in cooperation with the Department of Floriculture of the New York State College of Agriculture at Cornell University, Ithaca, New York. These two national societies hold annual exhibitions, and the American Sweet Pea Society holds exhibitions of winter-flowering varieties at the National Flower Shows held each spring.

Classification.

More than 1,000 varieties of sweet peas have been introduced, but some of these represent strains of existing varieties or were applied to seedlings which did not present any improvement.

3746. Forms of sweet pea flowers: 1, hooded; 2, waved; 3, open. (X 1)

The modern sweet pea may be classified as follows: Climbing and dwarf types, the former being subdivided into garden and winter-flowering types. The varieties may be classified as to the form of the flower into open, hooded and waved forms (Fig. 3746).

Garden type

Winter-flowering type

Open form

Hooded form

Waved form

Dwarf type (Climbing)

Open form

Hooded form

Waved form

The open form may be further separated into notched and rounded standards; the hooded varieties according to the degree of hooding, the most extreme case being the snapdragon varieties; and the waved varieties may be classified according to the degree of waviness as it appeared to be less or greater than Countess Spencer. This latter classification would require that the flowers be taken from plants under uniform conditions of growth. The National Sweet Pea Society of England classifies sweet peas according to form of the flower into grandiflora or waved, and into thirty-seven color sections as follows: Bicolor; Bicolor (Dark); Light Blue; Dark Blue; Blush-Pink; Lilac-Blush; Carmine; Cerise (Pale); Cerise (Dark); Cream, Buff, and Ivory; Cream-Pink (Pale); Cream-Pink (Deep); Crimson; Fancy; Lavender; Lavender (Pale); Lilac; Magenta; Marbled and Watered; Maroon; Maroon-Red; Mauve (Pale); Mauve (Dark); Orange-Pink; Orange-Scarlet; Pootee-edged (Cream Ground); Pootee-edged (White Ground); Pink (Pale); Pink (Deep); Rose; Salmon; Salmon (Pink); Scarlet; Striped and Flaked (Purple and Blue); Striped and Flaked (Chocolate on Gray Ground); Striped and Flaked (Red and Rose); White.

The bright summer sun of America tends to destroy some of these fine distinctions of color, and the varieties can be grouped in about twenty-five color sections.

Garden culture.

One of the first essentials in sweet pea culture is the choice of an open sunny location, thus providing plenty of light and air. Plants grown in too much shade are weak and spindling in growth, producing few flowers. Any ordinary garden soil is suitable for sweet peas, provided it is sufficiently drained so that in periods of excessive rains the water will not lie on the surface, causing the plants to become yellow and the roots to decay. A heavy soil usually gives better results than a light one as it holds moisture better.

A preparation of the soil as is usually made for the growing of vegetables will give fairly good results; but extra care in the selection and preparation of the soil will be required for larger flowers, longer stems, better colors, and a longer blooming-period.

The sweet pea is a deep-rooting plant, and in order to provide suitable conditions so that the effects of drought are overcome, the preparation must be deep and thorough. Deep preparation not only gives better results than a light one as it holds moisture better, but also increases the area in which moisture and nourishment may be found, and the plant responds by sending feeding-roots in all directions.

The preparation of the soil should be made in autumn by trenching at least 2 feet in depth. Since this is an expensive operation, it is advisable instead to dig a trench 16 inches wide and 2 feet deep for each row of peas. If the subsoil is poor or of unsuitable character, it should be removed and replaced with good soil. If the subsoil is very heavy, coarse stable-manure should be mixed with it. A good dusting of air-slaked lime, applied while working the soil in the autumn, is very beneficial. Many soils that have been cultivated for a long time are acid, so that leguminous plants, such as clover or sweet peas, will not grow, or at least do not thrive. Lime corrects this acid condition and, furthermore, it releases plant-food that would not otherwise be available in soils which are not acid. Clay soils are made more open and porous by the use of lime. Half-decayed stable-manure should be mixed with the top soil. Bone-meal applied at the rate of one-quarter to one-half pound to a lineal yard of trench will prove beneficial. The trenches should be filled more than level full, and left rough. During the winter the soil settles, but if in spring the ridges can yet be seen, it will be found that these dry rapidly and thus favor early planting.

Sweet peas for the garden are either sown where the plants are to be grown or are sown in pots and transplanted. Sowing in the open ground may be done either in autumn or spring. South of the latitude of New York, sweet peas may be successfully grown from fall sowings. North of this line the practice is not always successful unless they are planted in a well-drained situation in a sandy loam. The general conditions requisite to success are to plant late so that the seed does not germinate and appear above the surface. If any top growth is made, the plants will be killed in sections where the ground freezes. The rows should be slightly ridged up to prevent water standing over the row. After the ground freezes, a mulch of manure is
SWEET PEA

applied. Fall-sown sweet peas bloom ten days to two weeks earlier than the spring-sown, and usually produce better flowers.

Sweet peas planted in the spring should be sown early. As soon as the soil is dry enough, the rows should be sown over the trellises prepared in the fall. If the ridges remain, they will dry earlier than level soil. These may be raked level and a drill opened so that the seed may be sown 2 to 4 inches apart. After the plants have started, but before they begin to stool, the plants should be thinned so that the plants stand 3 to 4 inches apart. As soon as the tendrils appear, small twigs should be thrust in the ground to support the plants and prevent their injury by the wind.

Sweet peas may be sown in 3- to 4-inch pots (Fig. 3747). A suitable potting-soil made of well-rotted sod, with a little leaf-mold and sand, is best. Four or five seeds are sown in each pot and covered with an inch of clean sand. The sowing should be made six to eight weeks prior to the usual time sweet peas can be sown. The pots are placed in a cool greenhouse or a well-protected coldframe and given plenty of light and air so as to keep the plants short and sturdy. When the plants begin to produce tendrils, insert some small twigs in the pots to support the plants. The plants are gradually “hardened off” so that they may be set out in the open ground. One great advantage of this system is that the grower is independent, to a certain extent, of weather conditions as he can wait until the soil is in the best possible condition before planting. The pots may be set 12 to 15 inches apart, using care to keep the ball of earth intact and without intermixing with the supports. Good twiggy brush will make the best supports for sweet peas, but when not obtainable, wire netting makes an excellent support. The latter is durable and looks neat when not covered with vines. The soil should be frequently stirred, and in hot weather a mulch of straw or lawn-clippings will serve to conserve moisture. If waterings are given in dry weather, they should be copious. The quality of the flowers improves by watering with weak manure water, but other liquid fertilizers are seldom used. The prompt removal of all withered flowers and pods is essential in preserving a long period of bloom.

Sweet peas in greenhouses (Figs. 3748, 3749).

The winter-flowering varieties are the most important type yet developed from the garden form, and this type has attained its greatest perfection in the United States. This range of sweet peas is distinct in habit of growth and early-flowering character. Unlike the garden type which apparently ceases growing for a time when the plants are a few inches high while the side shoots develop, the winter-flowering sweet peas grow rapidly until they attain a height of 2 to 4 feet. Then they begin to flower freely, after which time side branches are developed. Winter-flowering varieties planted in September begin to flower between Thanksgiving and Christmas, while varieties of the garden type planted at the same time do not flower until April or May. A knowledge of these characteristics of the early stage of growth will enable a grower to guard against considerable loss from getting the wrong seed.

Soon after the introduction of Blanche Ferry, florists began to grow that variety in boxes placed across the ends of the greenhouse where the plants were near the glass, or small clumps were grown on carnation benches and trained round the purlin posts. With such methods of culture, and with the varieties then available, the flowers were not received on the market in sufficient quantity to be quoted until March or April.

Anton C. Zvolanek, in 1892, found a chance seedling among the variety Lottie Eckford which was much earlier and dwarfer in habit. This was crossed with Blanche Ferry, and the result of this line of crossing was the variety Christmas Pink, sent out in 1899. Miss Florence E. Denzer, a white variety, was introduced in 1902. Since the latter date many varieties have been sent out. The first varieties had flowers of the open or hooded form, but as soon as the waved sweet peas were introduced, Zvolanek made crosses with the winter-flowering varieties. It was not until 1912 that this class was ready to introduce to the trade, but in 1913 twelve varieties were offered. At present waved varieties of all the colors known among winter-flowering sweet peas are grown, and the older varieties are rapidly disappearing in the competition.

Another group of the early-flowering sweet peas is the Telemly, originated in Algeria in 1900. These varieties are an adaptation of the climate of northern Africa where the varieties of the garden type planted in the latter part of September do not flower until May. An exception to this was Blanche Ferry which flowered about the first of April. An early sport was found flowering in February, and from this have been developed a number of varieties which flower from Christmas until after the garden varieties come into bloom. Recently waved-flowered varieties have been introduced by Ada Wright, the originator of this strain. This group is better known in Australia or England, and in the latter country these varieties are grown to some extent in winter under glass.

The culture of sweet peas under glass has increased rapidly since 1902, when William Slim began to grow this flower extensively and has developed the modern methods. Today large greenhouses are specially constructed for the purpose of growing this flower, and the amount thus invested represents considerable capital.

Low or dark greenhouses are not suitable for raising sweet peas. Large, wide houses with side walls at least 6 feet high and with good top and side ventilation, are now built for sweet-pea growing. No beds or benches are required. If the soil in the greenhouse is not naturally good, it is removed to a depth of 2 or 3 feet and replaced with better earth. The soil is trenched 2 feet deep or deep trenches are dug in which to place composted soil in preparing to sow sweet peas. The soil should be made sweet by the addition of lime, and enriched by liberal applications of bone-meal. Each year the soil should be deeply prepared and manure worked into it before sowing.

The colors most in demand on the market are pink and white, pink, lavender and white. The reds and orange colors are usually grown in less quantity. The
varieties chosen should be those possessing good, clear, well-defined colors. The Grandiflora varieties are more productive, but do not bring so good a price in the larger cities as the waved or short-stalked flowers.

The early crop is sown about August 15, and the later crop during the latter half of September. The seeds are sown in drills where the plants are to stand, except the white-seeded varieties which are sown in sand and transplanted. The latter do not germinate well in soil, as a rule, but when treated in this way a good stand is secured. When the rows run east and west they should be 9 feet apart, and if they run north and south they may be placed as close as 3 feet.

The plants should be thinned to four plants to a lineal foot of row whether grown in single or double drills, and in planting from pots this rule should be observed.

Sweet peas are often grown after chrysanthemums, and for this purpose the plants should be started in 2-by-2-inch pots. Two seeds may be planted in deep rose pots or in paper pots. The soil should be fibrous loam with the addition of fine old manure and sharp sand. The seeds are covered 1 inch deep, and the pots placed in a temperature of 55° to 60° F. for germination, after which the plants must be placed in a lower temperature to prevent them from becoming drawn.

The plants must soon have supports, and the best material to use under glass is string. If the rows are in line with the purlin posts a binder twine can be stretched from post to post on either side of the row thus inclosing the plants. These tiers of string will need to be as close as 6 to 8 inches apart at the bottom, but later as the vines grow may be as much as a foot apart. When the purlin posts are not in the row, temporary posts of iron pipe or 2-by-2-inch strips may be used. Wire netting is generally condemned by commercial growers, owing to the labor and expense connected with its erection and removal, and also because they think more crooked-stemmed flowers result.

The vines supported by string can be easily removed at a minimum expense and the house for dry made ready for another crop.

The temperature in the autumn is often too high for sweet peas, and under such conditions the plants often show a tendency to flower when only 2 feet high; but, as a rule, it is usually better to remove all such flowers until the plants gain more strength. As far as possible, the night temperature should be from 40° to 45°, for if a higher temperature is given the plants flower too soon and before they have made a good root-system. When the plants are from 30 inches to 4 feet high and showing buds, the temperature should be gradually raised to 52°. This is the highest temperature required for the Grandiflora varieties. When in bloom, the temperature should be 60° on cloudy days, and 68° on bright ones. The waved, or orchid-flowering, or Grandiflora varieties require the same treatment previous to flowering, after which the night temperature should be 55°, 60° to 65° on cloudy, and 70° to 72° on sunny days.

Picking and packing.

Sweet pea flowers should be picked when the top flower is at least half open, unless the flowers are to be shipped a long distance, when they may be cut in a less fully developed state. The proper time to cut the flowers is in the morning, although this will depend upon the time the shipments can be made. The flowers should be kept two to three hours in water before packing, and this will govern the hour of picking for the florist. The flowers must be packed dry, and if the outdoor flowers must be picked wet, they should be placed while in water in a warm current of air to dry the blooms. The flowers are made into bunches of nineteen to twenty-six spikes, according to quality. These are tied near the base of the stems, which are wrapped with waxed paper. The bunches are packed in shallow boxes with one, or at most two, layers of bunches packed in each box thus preventing the bruising of the flowers. The boxes often employed are 4 by 10 by 12 or 5 by 12 by 24 inches in depth, width, and length. The amount of wrapping on the boxes will depend on the temperature and other conditions at the time of shipment.

Exhibiting.

Exhibitors should keep the flowers off their vines until four or five days before the exhibition, and three days before this event a shade of cheesecloth should be erected over the orange-, scarlet-, and blue-flowered varieties to prevent the scorching of the blooms. This shading must be removed after the exhibition flowers are cut. The spikes are cut so that all the flowers are fully open when they are judged. The ideal spike has a stem 12 to 18 inches long with four flowers. Twenty spikes loosely arranged so that each may be easily seen, is the proper number for a vase. The stems may be kept in the proper position by placing in the vases some 2-inch pieces of stiff reeds or grass stems. Some gypsophila may be used in the vases if permitted by the rules of the competition. Arrange the vases of a collection of varieties so that colors do not clash and the rules of the competition. Arrange the vases of a collection of varieties so that colors do not clash and so as best to exhibit the merit of the blooms. The educational value of the exhibit is enhanced if each vase is neatly labeled with the name of the variety.

Insects and other pests.

Snails sometimes destroy sweet pea seedlings in frames or greenhouses, but can be prevented by scattering lime under the pots. The red-spider is sometimes troublesome in the greenhouse and outdoors, and can be controlled by the usual methods. The green aphis, or "green-fly" attacks sweet peas under glass, but is easily controlled by regular fumigations of tobacco preparations. In the garden a larger green aphis, the clover aphis, is not infrequently found, but spraying with tobacco extract, nicotine, or kerosene emulsion should be carried out as in the greenhouse.
will usually destroy them. Plants that are frequently syringed with cold water are seldom infested with insects.

Fungal pests:

The most prevalent fungal pest affecting sweet peas under glass appears to be *Thielanecia basoica*, or root-rot. Infected plants have little or no root-system, due to the fact that new roots are constantly destroyed. The leaves often turn yellow with white edges, finally dying and falling to the ground. Sometimes one portion of the plant may be dry and dead while the remainder is green, although it does not grow or produce flowers. In fact, it is sometimes a mystery how a diseased plant can continue to live with its very limited root-system. There are several other organisms, but their action is similar and the method of control is the same for all—the removal of infected soil or sterilizing it.

The powdery mildew attacks greenhouse sweet peas at any stage of growth. If the proper temperature is not maintained. The application of sulfur to the heating-pipes will check this disease. Care must be taken not to use the sulfur too strong or the flowers will be injured. Outdoor mildew usually does not appear until late in the season when the plants are in the flowering stage. The disease, which may be allied to or identical with the trouble known as streak in the tobacco, is a rather baffling disease to the growers. When first noticed, the leaves turn yellow with white edges, finally turning brown and stems of the plant. This is often accompanied by a curling of the leaves. The plants become stunted and stunted. The disease can be carried over winter upon the seeds. The prompt destruction of the diseased plant can continue to live with its very limited root-system. It is distinguished by a yellow mottling of the leaves and stems of the plant. This is often accompanied by a curling of the leaves. The plants become stunted in growth and case flowering if they have reached the flowering stage. It is a disputed point whether it is a bacterial disease or not, but it seems certain that the trouble is transmissible by the feeding of aphides. No remedy is known except the obvious one of keeping insects in check and destroying affected plants by fire.

The dropping of the young flower-buds either in the open or under glass is usually due to physiological conditions. Low temperature, lack or excess of plant-food, too much nitrogenous fertilizer, lack or excess of water are among the causes of this trouble. A. C. BEAL.

Growing sweet pea seed in California:

Up to about the year 1885, most of the sweet pea seed was grown in England, France, and Germany, and imported to this country; at that time the first attempt was made to grow the seed in California. This resulted in almost immediate success, and in 1900 more than 600 acres were devoted to the growing of the crop. Most of the sweet peas grown at this time were of the Grandiflora type and yielded an average of 1,100 pounds to the acre, sometimes in a good year even as much as 2,500 pounds. With the introduction of the Countess Spencer type of sweet pea, about 1904, however, the waved forms supplanted the Grandiflora type, the larger part of the acreage being now devoted to the Spencer type. Approximately 2,500 acres are now planted to the sweet pea.

The original Countess Spencer sweet pea was of a shell-pink color, but it was not fixed and many color sports were produced. At present there are about 150 distinct varieties of the Spencer type under about 400 different names, resulting from different growers finding, the same sports, or from varieties which were not improvements on existing varieties of the same colors. The yield of seed to the acre of the Spencer type is much less than from the Grandiflora type, only about 250 pounds to the acre; these being obtained. The yield is due to the structure of the flowers: in the Grandiflora type the keel is closed, not allowing the pollen to escape so that each variety must pollinate itself, and the varieties can be grown close together and the flowers will remain true to color and type. In the Spencer type, however, the keel is open, allowing the pollen to be blown out, and, as a consequence, about 75 per cent of the flowers do not set seed; also the plants must be set far apart in order to keep them true to color and type.

A cross was made between the Spencer sweet pea and the winter-flowering sweet pea, resulting in the winter orchid-flowering sweet pea. This is a shyer seedling than the Spencer, yielding only about seventy-five pounds to the acre. The flowers resemble the summer Spencer except that the growth is dwarf and the foliage more point. If sown in August under glass in the eastern states, they will bloom from November until late in spring. If sown outdoors, they will bloom three to four weeks earlier than the summer type, just before the extreme hot weather.

There are four types of sweet pea now grown in California: the summer Grandiflora, the winter Grandiflora, both of these being grown only on a small scale; the summer Spencer, and the winter orchid-flowering. In addition, the Cupid, which grows 5 to 6 inches high, is occasionally grown, about 30 acres a season being devoted to it.

The raising of the sweet pea seed is usually on a large scale. Large tracts of land are plowed in autumn about 10 inches deep, either by horse-power or large tractors, before the beginning of the rainy season. The field is then carefully disced and pulverized and left to settle. If the rainy season begins as early as October, the fields should be harrowed again after the rain and the seeds planted. However, if the rains do not come until late, the seed must be sown in the dry soil, although they will not germinate so evenly. The most successful sowing is done between November and January. The seed is sown mostly by four- or two-row horse planters, being planted 30 inches apart and 3 inches apart in the rows, and 2 inches deep. Between each named variety, at least 10 feet must be left to prevent crossing.

After the seed is planted, the field must be kept in good condition by hoeing. After each rain the ground between the rows must be broken up. As soon as the plants are up, a horse cultivator may be used which breaks the crust 2 or 3 inches deep and a small scale from the plants; but hand labor must be used to cultivate nearer the plants. This must be done after each heavy rain, sometimes five times being necessary. Irrigation is seldom practised, as 10 inches rainfall is sufficient for a good crop of sweet peas.

By the latter part of March and April the winter or early sweet pea will be in flower, and the summer or late sweet pea begins to bloom in May. Now must begin the process of thinning. No matter how carefully the seeds have been selected, there will be some 'rogues' and these must all be removed. The best among these may be tagged and kept for stock seed to grow later on. All novelties and the stock seed for the next year are usually planted and taken care of by hand.

After the thinning has been done, the plants are left to themselves, no supports being given them, until the seed is ripe. These seeds are not evenly ripened and the cutting must be left to prevent crossing. After the seed is ripe, the cutting must be done when the larger part of the seed is ready to be harvested. The cutting is performed by a specially constructed ripper drawn by two horses and cutting two rows at once. As soon as cut,
the plants are piled in small heaps and left for several
days to dry. They are then put in large piles to cure
which takes from three to four weeks. As soon as all
the seed is perfectly cured and sufficiently dry, the
threshing begins. This is usually performed by gasoline
power, and the clean seed is run directly from the
thrasher into the sacks.

SWEET POTATO. The plant Ipomoea Batatas,
grown for its large edible root-tubers (Fig. 3750). The
origin is not definitely known (see page 1662, Vol. III),
but it is probably tropical American. It is a widely
variable plant in foliage, as shown by the leaf-forms in
Fig. 3751. The top is herbaceous, form a running vine.
Flowers and fruits are rarely seen.

Neither the acreage, production, nor the money value
of the sweet potato crop give an adequate idea of the
economic importance. In those parts of the earth's
surface where it thrives, it forms an important food
staple for the inhabitants, and thus occupies a position
not accorded crops which, though of great money worth,
do not contribute directly to the food-supply of the
territory in which they are grown.

The sweet potato, being native to tropical and sub-
tropical regions, is restricted in its range of cultivation

3750. A good hill of sweet potatoes.

more by climatic than by soil conditions, although its
commercial cultivation is confined almost exclusively
to sandy or loamy soils. It is, in fact, one of the staples
of the southern states which thrives well on lands that
have been considerably depleted by cropping with
other plants, and one which can be made to produce a
profitable return on light sandy soils carrying little
humus, provided an adequate supply of plant-food in the
form of commercial fertilizer is available. The ability
of this plant to thrive and produce under such condi-
tions, together with its great food value, which is con-
siderably higher than that of the Irish potato, has served
to advance it to the position of second 'place among
the truck crops grown in the South and to seventh place
among the standard agricultural crops of the nation.

Botanically the sweet potato belongs to the Con-
volvulace or morning-glory family. The edible part is
the thickened root. It does not possess eyes or scars
as do some other roots and tubers, but it possesses the
ability to develop adventitious buds, which character is
taken advantage of in reproducing the crop by vege-
tative means.

Roots to be used for seed purposes, selected at the
time of harvest, are usually small, from 1 to 1½ inches
in diameter, of uniform shape, and characteristic of the
variety. These roots are cured and stored under con-
ditions most certain to insure an adequate supply of
seed material, which, at the northern limit of the culti-
vation of the crop, is needed for bedding in April to
insure a supply of "draws" for planting during the
second and third weeks in May.
The curing of sweet potatoes at harvest-time is of equal importance with a proper storage room, good ventilation, and the maintenance of a proper storage temperature subsequently. As the sweet potatoes come from the field, they should be placed in the bins in layers distributed evenly over the surface, and during the time the house is being filled and for a period of ten days or more thereafter the temperature of the storage house should be maintained at 85° to 90° F, both night and day. After this drying or curing period, the temperature should be gradually reduced, but at no time during the storage period should it fall below 45° F. The temperature which has proved most satisfactory for holding the roots after the curing period is 50° F. While sweet potatoes can be successfully stored in hampers or crates, most commercial storages are economical, are more convenient for handling than crates or hampers, and during the curing period is 50° F. While sweet potatoes come from the field, they should be placed in the bins in layers distributed evenly over the surface, and during the time the house is being filled and for a period of ten days or more thereafter the temperature of the storage house should be maintained at 85° to 90° F. Both night and day. After this drying or curing period, the temperature should be gradually reduced, but at no time during the storage period should it fall below 45° F. The temperature which has proved most satisfactory for holding the roots after the curing period is 50° F. While sweet potatoes come from the field, they should be placed in the bins in layers distributed evenly over the surface, and during the time the house is being filled and for a period of ten days or more thereafter the temperature of the storage house should be maintained at 85° to 90° F. Both night and day. 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greenish yellow, dark-spotted; corolla-segments membranaceous, lanceolate, rather obdurate, pubescent in 2's, oblong, crested and fringed. S. E. Eu., Caucasus.

**SYMBEGÔNIA*** (name refers to the union of parts of the flower). *Begonia nodosa*. A few small herbs, all natives of New Guinea (Afr.), differing from Begonia in the tubular female fls.; the male fls. have the parts distinct. *B, falco-ellisii*, Warb., for some time the only known member of the genus, appears to be the only species that has appeared in cult., but is apparently not in the trade: erect herb 8 in. or less high, with red-tinged st. and oblique lance-oblong strongly double-serrate green lvs.; female fls. pale yellow, with 5 spreading deciduous lobes and 3 stamens; male fls. of 2 separate sepals, and 12–20 stamens. B.M. 8409. L. H. B.

**SYMBIOSIS** is the intimate association of two or more distinct organisms, with benefit to one only, or to both; commensalism; consorship; copartnership. In this association each organism is called a symbiont. According to the character of the union, several kinds of symbiosis have been recognized: (1) Mutual antagonistic symbiosis (mutual parasitism), when two organisms are foes of each other, as certain bacteria and animals, the latter showing a “natural resistance;” also the mycophytes of certain lichens with higher organisms. (2) Mutualistic symbiosis (true parasitism), when the host is partly or completely killed by the parasite, as the potato and the root fungus (*Phytophthora infestans*); or galls (Myxosporites) produced in the heart of the tree, a knot of plums; and in higher plants, which live at the expense of others, as the mistletoe (green) and the dodder (chlorophyllus). (3) Mutual symbiosis, when there is often reciprocal advantage; (a) nutrition, when one symbiont nourishes the other without apparently receiving any return, as the mycorrhiza and the roots of forest trees (mycosymbiosis); (b) mutualism, when a mutual benefit results from the union of two organisms capable of living separately, as the bacteroid and the roots of the Leguminosae; (c) individualism, when the symbionts are so intimately connected in their growth as to suggest a single individual, as the union of alga and fungus to form a lichen. By some this relationship of alga and fungus in the lichen thallus is regarded as holism, or slavery, where the alga lives entirely indifferent to the fungus. The views of Bruce Fink, who considers the lichen to be a fungus associated with an alga, are widely different from the usually accepted views on the subject. (4) Prototrophy, the wet-nurse relationship, as in the lichen *Lecidein unilocensis*, which eventually gets its nourishment by means of a lodger, a different lichen. (5) Contingent symbiosis, when one symbiont lives in the interior of another for shelter, as *Nostoc* in the tissues of Hepaticae, Lemna, Cycas, Gunnera; and *Amanita* in *Azolla*. Green plants live symbiotically with animals such as *Spongilla*, Hydra, and Convolvula. In Hydra, the green alga, known as *Chlorella*, is found in the endodermal layer and when the colorless eggs of the fresh-water polyp are almost mature a few of the green cells are found migrating into the protoplasm of the egg-cells.

**SYN**...
The snowberries are low or medium-sized shrubs, with slender upright or decumbent stems, spreading more or less by suckers, with small generally oval or ovate leaves and small clustered, rarely solitary, white or pink flowers followed by attractive usually white, rarely pink, dark red or bluish black berries. The flowers are rather insignificant in most species except in *S. oreophilus*, *S. microphyllus* and allied species which bear larger tubular nodding flowers and are rather attractive when in bloom. The chief ornamental feature is the fruits which are usually white and retained far into the winter; among the handsomest are *S. albus* var. *liretus* with heavy clusters of snowy white fruits at the tips of the arching branches, and *S. orbiculatus* with dark red fruits densely clustered along the slender branches and remaining plump and fresh far into the winter, its foliage also remaining unchanged until severe frost sets in. Some species, as *S. albus*, *S. orbiculatus*, and *S. occidentalis*, are quite hardy North, while *S. mollis*, *S. rotundifolius*, and *S. oreophilus* are hardly as far north as Massachusetts; *S. microphyllus* is tender. They are excellent plants for borders of shrubberies and for covering the ground under trees, spreading more or less by suckers; they will thrive in almost any soil from heavy clay to dry gravelly banks. Propagation is readily effected by hardwood and by greenwood cuttings, by division, and also by seeds.

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- *albus*, 3.
- *aurco-retilcatus*, 1.
- *glomeratus*, 1.
- *levigatus*, 3.
- *microphyllus*, 7.


- **S. Heyeri**, Dipp. (var. *aurco-retilcatus*, Zabel). Variegated with yellow.—One of the most desirable species on account of the long-persisting fr. and foliage.
SYMPHYTA (Greek, to grow together, in reference to the supposed healing virtues). Boraginaceae. Comfrey. Erect often hispid herbs, usually hardy in all but the far North, sometimes grown for the variegated foliage of some species.

Roots sometimes tuberous: lvs. alternate or semiterete; the cauline sometimes decurrent; the upper sometimes strongly approximate, almost opposite: cymes terminal, usually single or twice bifid or simple unilateral racemes: fls. yellowish, blue, or purplish, pedicellate; calyx glabrous, tubular-campanulate: lvs. acutely double-dentate; radical long-attenuate to the petiole; fls. generally numerous.

A. St. branched: lvs. singly racemose. 
B. Calyx divided to or below the middle.

C. Lvs. decurrent at or on the st. officinale, Linn. (S. bohemicum, F. W. Schmidt). Perennial, about 3 ft. high: root thick: st. branched, white-pilose: branches decumbent: lvs. slightly pilose, basal and lower cauline ovate-lanceolate, upper oblong-lanceolate, all broadly decurrent at base: fls. white, yellowish, purple, or rose, in drooping cymes. Eu., Asia. Var. argenteum, Hort., is offered in the trade as growing 2 ft. high, with silver-variegated foliage and drooping blue fls. Var. aureum, Hort., is offered in the trade as a golden variegated form growing 2 ft. high. Var. coccineum, Hort. (S. coccineum, Hort. ex Schlecht.), is offered in the trade as a scarlet-feld form. Var. lilacinum, Hort., is offered in the trade. Var. purpureum, Pers. (S. officinale var. bohemicum, Don), has reddish purple fls. Eu. Var. variegatum, Hort., has lvs. widely margined with creamy white. F.S. 18:1901-1902.

cc. Lvs. not decurrent.

D. Calyx-segments obtuse: upper lvs. subpetiolate.

asperum, Lepech. (S. asperrum, Donn.) Packly Comrey. Fig. 3753. Perennial, 2½-5 ft. or even more high: root thick: st. branched, uncinate: lvs. hispid or prickly on both surfaces, ovate or elliptical, acuminate; lower petioled base cordate or subcordate; upper subpetiolate, base cuneate: fls. at first rose then blue, smaller than those of S. officinale. Russia, Caucasus. Pers. B.M. 929.—Has some forage value.

There are horticultural forms with yellow-variegated or -margined lvs. known as S. asperum aureovariegatum and S. asperrum var. variegatum.

Dd. Calyx-segments acute: upper lvs. sessile.

peregrinum, Ledeb. Perennial, about 3½ ft. high: st. erect, tall, branched, prickly, prickles slightly retronse: lower lvs. long-petiolated, elliptic-lanceolate, acuminate, about 10 x 4½ in.; upper lvs. sessile, all

3753. Symphytum asperum. (X 10)

F. Tracy Hubbard.
SYMPHYTUM

softly hispid; petals deciduous: fls. sky-blue; buds pinkish; calyx 5-parted almost to the base, segments triangular-lanceolate; corolla-tube angled, constricted at the middle, upper part somewhat campanulate, mouth 5-cleft. Caucasus. G.C. III. 50: 127.—Closely related to S. officinale, may be a hybrid.

bb. Calyx not divided to the middle.


SYMPLOCOS

oblong, attenuate to the petiole; upper lvs. narrowly and shortly deciduous: fls. paniculate-corymbose, blue; calyx viscidulus and setulose; corolla tubular-funnelform, lobes shortly and broadly ovate. Caucasus.

AA. St. simple or nearly so: fls. generally few.

bb. Lvs. nearly glabrous.


grandiflorum. DC. Perennial, about 1 ft. high: st. rather simple, base glabrate, otherwise reflex-spreading, hispid: lower lvs. long-petioled, subcordate-ovate, acute, deciduous along the petiole; uppermost lvs. opposite, oval, decurrent on the st.: fls. yellowish white, in a few-flowered raceme; calyx lobed below the middle, lobes lanceolate; corolla-lobes broadly adnate at the base. Caucasus.

SYMPLOCÁRPUS (Greek, referring to the aggregate fruit). Aráceae. Spathyzma. Ornamental woody plants grown chiefly for their attractive flowers and fruits.

Deciduous or evergreen trees or shrubs: lvs. alternate, entire or serrate, exstipulate: fls. perfect or sometimes polygamous, in terminal or axillary racemes or panicles, rarely solitary; calyx 5-lobed, imbricate, corolla 5-lobed or 5-parted, often split almost to the base, rarely consisting of 2 whorls; stamens numerous, rarely few, usually connate at the base, and often more or less adnate to the corolla; style filiform; ovary 2-5-loculed, inferior: fr. a drupe with a long 1-5-seeded stone.—About 285 species, widely distributed through the tropical regions except Afr.; only a few outside the tropics. Monograph by Brand in Engler’s Pflanzenreich, hft. 30 (IV. 241), 1907. Several species have medicinal properties; S. tinctoria yields a yellow dye. Of the numerous species only S. paniculata which is

mens generally out in February or March. The buds retain their beauty for months. In April or May they decay and the strong-growing leaves soon attain a height of 1 to 3 feet and a breadth of 1 foot or more. All parts of the plant give a strong skunk-like odor, but only when bruised. Skunk cabbage is offered by dealers in hardy plants, as also by collectors. Its hardiness and bravery have been celebrated by outdoor writers from Thoreau to the present day. The question of its pollination has been much discussed. It was long supposed to be pollinated by the action of the carrion flies which are attracted by its odor. However, Trelease has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later.

S. officinale, Linn. (Spathyzma fétida, Nutt.) SKUNK CABBAGE. Fig. 3754. Lvs. numerous, 1–3 ft. long, 1 ft. wide, ovate, strongly cordate: spathe preceding the lvs., colored as described above: fr. ripe Aug., Sept. Nova Scotia to Minn., south to Fl. and Iowa; also in Asia. B.M. 896 (as Pothos fétida); 324A. V. 23: 186. A.G. 14:367.

WILHELM MILLER.
SYMPOCOS

hardy as far north as Massachusetts, is generally cultivated; it is a shrub or small tree with abundant white flowers in small panicules, appearing in spring, and with bright blue berry-like fruits in autumn. It thrives in well-drained soil and sunny position. The half-evergreen S. tinctoria, which seems not hardy north of its natural habitat, prefers neutral soil and shady situation. The evergreen species are all tender and little known in cultivation. Propagation is by seeds, which usually do not germinate until the second year, and by Greenwood cuttings under glass; also by layers.

SYNADENIUM, Wall. (S. crategoïdes, Buch.-Ham. Lodd. crategoïdes, Deene.). Fig. 3755. Evergreen succulent shrub or small tree, attaining 40 ft., with spreading branches, forming an irregular open head: young branches pubescent: lvs. short-petioled, oval or ovate to oblong-ovate, acute or acuminate, sharply serrate, distinctly veined beneath and more or less pubescent at the veins, rarely glabrous, 1½–3 in. long; fls. white, fragrant, ½–1½ in. across, with spreading, oblong-ovate petals in panicules 1½–3 in. long; fr. usually 1-seeded, oval, blue, about ½ in. long. June. Himalayas to China and Japan. G. F. 5: 59 (adapted in Fig. 3755). M.D.G. 1901: 100, 101. S. I. F. 2: 85. G. 33: 425.


SYNDESMON

3756. Syndesium Grantii. (Xyw).

SYNÉNTRIUM (Greek name, indicating the united involucral glands). Euphorbiaceæ. Thick-branched tropical shrubs, sometimes oll. in collections of succulents, having the generic characters of Euphorbia, except that the glands of the involucre are united so as to form a ring around the lobes.—About 10 species, chiefly in Trop. Afr. Prop. and treated similarly to the succulent euphorbias.

arboréscens, Bois. A shrub, up to 4 ft. high, the st. unbranched: lvs. obovate-ovate, obscurely crenate; midrib keeled and often denticulate: bracts puberulent: involucre yellow. S. Afr. B. M. 7184.

Gréntii, Hook. AFRICAN MILK BUSH. Fig. 3756. A shrub 10 ft. or less high, branched: lvs. obovate-spatulate, 3–4 in. long, obtuse; midrib rounded: cymes dichotomous, with tomentose bracts and red involucral glands. Trop. Afr. B. M. 5633.

SYNÁNTRA (Greek, together and anther, referring to the comate anthers). Labiatae. Hardy fibrous-rooted biennial herb, with the habit of Lamium, suitable for border planting: calyx campanulate, inflated; corolla-tube long, much expanded above and at the throat, the upper lip slightly arched, entire, the lower spreading and 3-dect, with ovate lobes, the middle one broadest and notched; anthers approximate, in pairs under the upper lip, the 2 upper each with 1 fertile and 1 smaller sterile cell, the latter cells cohering together. One species—Anemone thalictroides, Brit. (S. grandiflora, Nutt.). Hairy biennial, 1–2 ft. high, lvs. long-petioled, broadly ovate, cordate, crenate, thin; the floral lvs. gradually reduced to bracts, each with a single, sessile fl.: corolla 1½ in. long, yellowish white. Shady banks of streams, Ohio to Ill., Tenn., and Va.

SYNÁRCRIA (Greek, together and fruit, referring to the head-like clusters of caps.). Myrtaceae. Trees, one of which is intro. into Calif.: lvs. opposite, ovate, evergreen: fls. gathered in globose heads: peduncles 1-headed, lateral axillary or paniculate at the ends of the branches, rather small, white; calyx-tube adnate at base of ovary, turbinate or campanulate, sepal. 4, rarely 5, persistent; petals 4, rarely 5; stamens many, free; ovary inferior, 2–3-celled: caps. adnate to the calyx and inclosed in it.—Two species, Austr.

SYNGLUMIFERA, Niedenzu (S. laurifolia, Ten.). TROP. AMERICAN TREE. Lvs. broadly ovate to elliptic-oblong, obtuse or obtusely acuminate, 2–3 in. long, often appearing as if in whorls of 4: fls. 6–10 in a head, with 2–4 bracts of variable size under the head; calices connate at the base; petals broadly ovate or orbicular, less than 2 lines long; ovary 3-loculed: ovules several to each locale.—According to Von Mueller’s Select Extra-tropical Plants, this tree attains a height of 200 ft., with a trunk often 30 ft. in circumference; it is of quick growth and well adapted for a shade tree. The wood is very durable and almost fireproof and is valuable for piles, railway sleepers, and shipbuilding. It takes a high polish and is used for flooring and cabinetwork. Offered in S. Calif.

F. TRACY HUBBARD.

SYNDÉSMEON (Greek, bound together, because the plant unites characters of Thalictrum and Anemone). Ranunculaceae. ANEMONE. Dainty perennial herb grown in wild borders for its carpet of beautiful leaves and attractive spring flowers.

Glabrous, from a cluster of tuberous roots: basal lvs. 2–3-ternately compound: involucre similar but sessile, the lfts. being stalked: fls. white or pink in an umbel; pedicels slender; sepalis thin, 5–10, petal-like; petals none; stigma sessile, truncate: achenes terete, deeply grooved.—A monotypic genus of E. N. Amer. Under the International Rules, Anemolla was the tenable name (Anemolla thalictroides). Syndesium was used earlier (1832 as against 1839), but in such a way as not to constitute publication as defined by those Rules, although it is tenable under the American Code. The plant should have been treated under Anemolla in this work.

The plants should be grown in partial shade. The soil should be rich and light or sandy. They should be left undisturbed for years. They will then form a carpet of great beauty. Propagation is by division of roots in spring or fall, but such division greatly weakens them and the plants for propagation should be taken from the edges of the beds.

thalictroides, Hoffmg. (Anemolla thalictroides, Linn. Thalictrum anemonoides, Michx. Anemolla thalictroides, Spach). Fig. 3757. Plant 3–6 in. high: lvs. much like those of thalictrum: fls. resembling those of Ane-
SYNESMON


K. C. DAVIS.

SYNECHANTHUS (Greek, continuous and flower, alluding to the arrangement of the infl.). Palmaeae. Unarmed gregarious palms, grown in the warmhouse: trunk slender, an- nulate, often stoloniferous; lvs. terminal, equally pinnati- sect, segms. broad or narrow; membranaceous, acuminate, plicately nerved: spadices several, long- and slender: pendent, the floricere erect; spathes several, tubular, membranaceous, persistent: fls. green or the upper purplish, minute, arranged in 1-2 rows in alternate elongated groups, the superior in the groups male, the inferior female: fr. reddish yellow, shining, ellipsoid, 1-seeded. The three species, Cent. Amer. and Colombia. S. fibrosus, Wendl.

SYNGONIUM (Greek name, said to refer to the cohesion of the ovaries). Araceae. Tropical American woody climbing or creeping plants, with milky juice and at. rooting and fl-bearing at the nodes: lvs. sagittate, becoming with age pedately 5-parted, racemose on long petioles, with a persistent appressed sheath; peduncles short: spathe yellowish or whitish green; tube small, ovoid, persistent; spadix shorter than the spathe: staminodes fls. with 3-4 stamens, pistillate fls. with oblong-ovoid 2- or abortively 1-loculed ovary: seeds in each locule. (Fig. 3757.) In S. persicaria the caps. are %in. across; pedicels slender and short: calyx-lobes lanceolate. Ore. and Wash. Gn. 74, p. 105.

In England this plant is considered a winter bloomer; it flowers there in Feb. or March, occasionally Nov.

SYRINGA (of doubtful meaning; probably from syrinx, pipe, because pipes are made from the straight stems of Philadelphus by removing the pith, and the name Syringa had been originally applied to Philadelphus but was transferred to the lilac. Philadelphus is still popularly called Syringa). Oleaceae. Lilac. Ornamental woody plants grown chiefly for beautiful and showy often fragrant flowers.

Deciduous, rarely evergreen (S. sempervirens), shrubs or small trees: lvs. opposite, entire or rarely pinnate, exoptilulate; fls. in panicles, the superior in the branches many, very slender, forked: fr. orange-red. Cent. Amer. B.M. 6572.

Trunk 4 ft. high, green; lvs. 4 ft. long, erect and spread- ing; lfts. numerous, 1-1½ in. long, spreading and rather pendulous, linear-lanceolate: spadices one-third as long as the lvs., the branches many, very slender, forked: fr. orange-red. Cent. Amer. B.M. 6572.

SYRINA (Greek, together and little door or valve, the valves of the capsule long adhering below to the short placentiferous axis). Scrophulariaceae. Hardy herbaceous perennials, glabrous or pilose: rhizome thick: lvs. radical, petioled, ovate or ovate-lanceolate, or incisely pinnatisect, peduncles scape-like, ample; fls. racemose or spicate, blue or reddish; calyx 4-parted, segms. narrow; corolla-tube very short or almost none. subrotate-campanulate, 4-lobed or none; stamens 2: caps. compressed, obtuse or emarginate, 2-4-veined. About 15 species, natives of W. N. Amer. Syrinx is nearly related to Wulfenia of S. E. Eu. and the Himalayas, but the anther-cells are not confluent and the seeds are discolored in their native region they are summer-blooming plants with small purplish or flesh-colored spikes or racemes. Border plants.

reniformis, Benth. (Wulfenia cordata, Greene). A tufted plant about 1 ft. high: lvs. glabrous, orbicular-reniform, crenately incised, the small lobes sharply toothed, 1-3 in. diam.; petioles 3-6 in. long: infl. a raceme about 5 in. long with about 40 purple-blue fls. which are ¾in. across; pedicels slender and short; calyx-lobes lanceolate. Ore. and Wash. Gn. 74, p. 105.

In England this plant is considered a winter bloomer; it flowers there in Feb. or March, occasionally Nov.

rotundifolia, Gray. Nearly or quite stemless; lvs. tufted, cordate-ovibracular, 1-2 in. diam., long-petioled, densely crenate or crenate-crenate, slightly pubescent: scape 4-6 in.: fls. few in a terminal raceme, blue or purple; calyx-lobes ovate, acute. Shady coniferous woods, Ore.

F. TRACY HUBBARD.

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SYNDESMON

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Trunk 4 ft. high, green; lvs. 4 ft. long, erect and spread- ing; lfts. numerous, 1-1½ in. long, spreading and rather pendulous, linear-lanceolate: spadices one-third as long as the lvs., the branches many, very slender, forked: fr. orange-red. Cent. Amer. B.M. 6572.
The foliage is not much attacked by insects, but a fungus, *Microcortica alni*, late in summer often covers the whole foliage of *S. vulgaris* and also of *S. chinensis* and *S. pekinensis* with a white mealy coat, while *S. oblata* is but rarely troubled with this fungus and the other species never. Much damage is sometimes done by a borer, *Trocchitum denudatum*, which lives in the stems and branches of *S. vulgaris*, but is rarely found in any other species.

After blooming, the inflorescence should be removed if possible and the pruning be done as far as necessary. Pruning in winter or spring would destroy a large part of the flower-buds for the coming season. Lilacs grow in almost any kind of soil, but a rich and moderately moist one is the most suitable. They are easily transplanted at any time from fall to spring. *S. vulgaris* and its numerous varieties are the most popular of the lilacs of our gardens because of their early blooming and profuse blooming; their sweet fragrance, and the variety of colors ranging from dark purple to lilac, pink, and white. The double-flowered varieties keep the blooms longer, but the panicles are less graceful and they usually do not bloom so profusely as the single ones; they also remain mostly dwarfer and have a more compact habit. The faded flowers do not fall off, but remain on the inflorescence; this gives the plant a very unsightly appearance if the faded panicles are not removed. W. J. Stewart suggests a word of warning against lilacs not on their own roots, because of the attacks of borers and the bad habit of suckering in some cases.

Some of the best single-flowered varieties are the following:

**Single-flowered Lilacs.**—White: *Alba* grandiflora; *Alba pyramidalis*; Frau Bertha Dammann, A.F. 12: 1078; Madame Moser; Marie Legraye, one of the very best, B.H. 28: 174; Princess Alexcen; *Alba pyramidalis* is a favorite variety of this class in America.—Blue, lilac, or pink: Ambrose Verschaffelt, pale pink; Dr. Lindley, pinkish lilac, F.S. 14: 1451; Géant de Los batailles, bluish lilac; Geheimrath Heyder, light lilac; Gigantea, bluish red; Glorie des Moulin, pale pink, G.M. 44: 490; Goliath, purplish lilac; Lovaniama, light pink; Macrostachys, light pink; Sibiras, purplish lilac; Trianoniana, bluish lilac.—Red: Aline Moequers, dark red; Charles X (Carol), dark lilac-red, A.F. 12: 1076. F. 1875, p. 70; Marlyensis, sometimes called Rubra de Marley, lilac-red; Rubra insignis, purplish red.—Dark purple: Philémon; Ludwig Spaeth (Andenken an Ludwig Spaeth, Louis Spaeth), very large panicles, the best of the dark varieties; Negro, deep violet-purple; Congo, deep wine red.

**Double-flowered Lilacs.**—White: Madame Abel Châtenay, compact panicles; Madame Casimir-Perier, large graceful panicles, one of the best; Madame Lemoine, large fis. in dense panicles; Obléisque; Virginité, white and pink.—Blue, lilac, or pink: Alphonse Lavallé, bluish lilac, A.F. 12: 1077; Belle de Nancy, fis. pink with white center; Charles Baltet, lilac-pink; Condorcet, blue, A.F. 12: 1074; Doyen Keteleer, lilac-blue; Jean Bart, pinkish violet; Lamarck, pale lilac, large, rather loose panicles; Lemoinei, lilac-pink, B. H. 28: 174; Léon Simon, changing from pinkish to bluish lilac. Gt. 43: 1407; Maxime Cornu, pinkish lilac; Michel Buchner, pale lilac, large and very double fis.; President Carnot, pale blue.—Purple: Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d'Avenguire, violet-purple.

The lilacs have been favorite forcing plants in France for more than a century and are nowadays among the most important cut-flowers during the winter season in France as well as in Germany and England. They are on the market from the end of September until they bloom outdoors. Charles X is considered one of the very best for forcing. *Marlyensis*, Marie Legraye, *Alba chinensis duplex*, Ludvig Spaeth, and other varieties are also good for forcing. Of the double-flowered varieties the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Léon Simon, *S. chinensis duplex*, and others. Either grafted plants or plants on their own roots are used. Both force equally well, but grafted lilacs can be grown into plants well set with flower-buds and suited for forcing in two or three years, while plants grown from cuttings require four to six years. *Marlyensis* is always used on its own roots and propagated either by seeds, cuttings, or division. Special attention must be given to pruning in order to have well-branched plants of good compact habit (see Fig. 15, Vol. III, p. 1295). The lilac has nothing like the commercial importance for forcing in America that it has in Europe, but the appreciation of it for winter bloom is on the increase in this country.

Lilacs are generally forced in pots, being potted usually in July or in the fore part of August, that they may fill the pots with new roots before winter. Some growers pot the plants in spring or in the preceding fall. This practice is of especial advantage if the plants are intended for very early forcing. These early potted plants are then plunged into the ground outdoors, mulched, well watered and regularly manured; after June, when the young growth is almost finished, only enough water is given to prevent withering. When the flower-buds have been formed, more water is given until they have reached their full size. It is essential to keep the plants rather dry in fall, so that the wood may ripen thoroughly and early. When the leaves have fallen off, the plants are shielded away in convenient places, where they are sheltered from severe frost. Sometimes the lilac, especially *S. marlyensis*, is forced from balls of earth which are not potted, but this does not always give satisfactory results.
About three to four weeks is required to force the plants into bloom with the temperature recommended below. The first days after bringing the plants into the forcing-room, a temperature of 65° to 70° may be given, gradually rising to 75° to 80° and maintained as equally as possible until the panicles are fully developed and the first flowers begin to expand; then the temperature is lowered to 60° to 66°, and when the panicles are about half open the plants are transferred to a cool greenhouse. Hardening-off is essential to ensure good keeping qualities of the flowers. The red-flowered varieties are often forced in darkened rooms in order to have the flowers blanched or only slightly colored. The shade of color depends entirely on the time when full light is given and also on the temperature. Show plants in pots should be grown in full light to have the foliage well developed. When the temperature is higher than 76°, frequent syringing is necessary. It is, of course, possible to force lilacs in a lower temperature, and this should be grown in full light to have the foliage well frequent syringing is necessary.

Developed. When the temperature is higher than 76°, not count. Full advice for commercial lilac-forcing will even be advisable if the longer time required does not count. Full advice for commercial lilac-forcing is given by Fr. Harms in "Flieder und Asparagus," a book devoted almost exclusively to lilac-forcing. When the temperature is higher than 76°, not count. Full advice for commercial lilac-forcing will even be advisable if the longer time required does not count. Full advice for commercial lilac-forcing is given by Fr. Harms in "Flieder und Asparagus," a book devoted almost exclusively to lilac-forcing.

interesting experiments recently conducted have shown that the lilac is more readily forced when the temperature is higher than 76°, not count. Full advice for commercial lilac-forcing will even be advisable if the longer time required does not count. Full advice for commercial lilac-forcing is given by Fr. Harms in "Flieder und Asparagus," a book devoted almost exclusively to lilac-forcing.

of these experiments by W. Johannsen is entitled "DasEtherverfahren beim Frühtreiben mit besonderer Berücksichtigung des Flieders." That the ether has a tendency of the albuminoids in the plant has been stated recently by other botanists also.

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Forcing lilacs.—Most of the lilacs used by American commercial florists for forcing are imported. Care should always be taken to procure pot-grown plants, that is, plants that have been grown in pots the previous summer. The florist who wishes to grow his own plants should lift them in the field in April or before the growth starts and pot them without losing much root. Plunge them out-of-doors during summer and give them plenty of water. This treatment will insure a good growth and the check the plants receive from lifting will induce them to form new flower-buds. These plants will force with the greatest certainty. It is well to allow five weeks for the earliest forcing. A strong heat is necessary, beginning at 60° for the first few days and increasing to 75° to 80°, with a daily watering and syringing several times. After the flowers begin to open, the syringing can be discontinued and when fully expedient the plants are better removed to a coolhouse, where they will harden off and be much more serviceable when cut. As the season advances, say March and April, less heat is needed. They will then force in any ordinary house where the night temperature is about 60°. The Persian lilac, on account of its abundance of bloom and delicate truss, is very desirable, but this must be forced almost in the dark to produce white flowers. Marie Legrave is for all purposes the most useful lilac which has been used for forcing. (Wm. Scott.)
Section EUSYRINGA.

Group VILLOSE.

1. Josikrea, Jacq. Shrubb, attaining 12 ft., with upright, stout, terete branches: lvs. broadly elliptic to elliptic-oblong, acute at both ends, finely ciliate, dark green and shining above, glabrous or pubescent on the midrib beneath, 2½-5 in. long: fls. violet, inserted much below the mouth, ½-3 in. long, with nearly upright lobes: fruiting panicles pendulous or nodding, somewhat large, with handsome dark foliage.

2. villosa, Vahl (S. Bretschneideri, Lemoine. S. emodi var. rosea, Cornu.). Figs. 3759, 3760. Bushy shrub, 8 ft. high, with rather stout, upright, terete and warly branches: lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent usually or only near the midrib, rather glabrous beneath, 3-7 in. long: fls. pinkish lilac or whitish, short-pedicelled, in broad or somewhat narrow usually pubescent panicles, 3-7 in. long, rather loose; rachis terete; lobes spreading, tube about ½ in. long: infructescence, tube 3½ in. long, pale violet-purple, with the stamens just below the mouth. May. Japan. 

3. emodi, Wall. (S. villosa var. emodi, Rehbn.). Shrubb, to 15 ft.: branchlets brownish or dark olive-green, dotted with pale lenticles: lvs. elliptic to oblong, acute at both ends, white and glabrous beneath, 6-8 in. long: fls. narrow, 3-6 in. long, with leafy bracts; racemes drooping, with rachis angular; corolla pale lilac or whitish, not pleasantly scented, tube ½ in. long; anthers partly exserted; calyx obscurely lobed. Himalayas. Grass. 31:6. R.H. 1876, p. 308. Gn. 39, p. 106. RB. 28:193. Not quite hardy in Mass. There are varieties with yellow lvs., var. aurea, Simon-Listous, and with yellow-variegated lvs., var. aureo-variegata, Hort.

4. reflexa, Schneid. Shrubb, to 12 ft.: branches gray or purplish gray, dotted with lenticles: lvs. ovate-oblong to lance-oblong, sometimes elliptic-obovate, acuminate, ciliate at the base, glabrous above, villos beneath chiefly along the veins, 3-5 in. long: fls. nearly cylindrical, nonning or pendulous, 5-7 in. long and ½-2 in. across; rachis, pedicels, and calyx sparingly villous or calyx nearly glabrous; corolla pinkish, ½-3 in. long, or nearly upright lobes: fruiting panicles reflexed, slightly warty oblong caps. W. China.

A remarkable species very distinct from all others by the pendulous panicles and particularly handsome before the fls. open because of the carmine color of the buds.

Group VULGARS.

5. pubescens, Turcz. (S. villosa, Deene, not Vahl. S. villosa var. ovatifolia, DC.). Shrubb, 6 ft. high, with slender, somewhat quadran-gangular branches: lvs. roundish ovate to rhombic-ovate or ovate, shortly acuminate, ciliate, dark green and glabrous above, 1-3 in. long: fls. pale lilac, fragrant, short-pedicelled, in ovate, not very large, but numerous panicles; lvs. very slender; anthers violet, inserted much below the mouth. May. N. China. Grass. 1:415; 376. B.R. 1907, p. 262. A remarkable species—Free-flowering shrub of graceful habit, with handsome dark foliage.

6. Julianna, Schneid. Spreading shrub, to 6 ft.: branchlets villous: lvs. elliptic-ovate, acute or acuminate, cuneate at the base, pubescent above, pale and more villous-pubescent beneath, particularly on the veins, 1-2 in. long; fls. pinkish lilac or whitish, not precisely scented, tube ½ in. long, pale violet-purple outside, fragrant, small, the spreading lobes white inside; anthers inserted a little below the mouth. May,
June. W. China. B.M. 8423.—A handsome and distinct species similar to S. pubescens; the deeper color of the fls. is heightened by the purplish violet color of the whole inflo.

7. affinis, L. Henry (S. oblata var. albiflora, Hort.). Slender, loosely branched shrub; lvs. broadly ovate, acuminate, truncate at the base, finely pubescent while young, particularly on vigorous shoots, on flowering branches sometimes glabrous or nearly so, 1/4-1/2 in. long and 1/4-1/2 in. broad; infl. slender and rather loose, 4-5 in. long; calyx distinctly 4-toothed; corolla white, tube 1/2 in. long. May. N. China. Var. Giraldii, Schneid. (S. Giraldii, Lemoine, not S. Giraldiana, Schneid.). Lvs. usually more densely pubescent while young: infl. 5-6 in. long, lvs. purplish-lilac; racich, pedicels, andpyx. green; blooms a week earlier than the other varieties of S. vulgaris; such are "Lamartine" with rose-mauve fls. and "Mirabeau" with rosy lilac fls.

8. oblata, Lindl. Shrub or small tree, 12 ft. high, rather compact: lvs. roundish ovate or reniform, often broader than long, cordate, short-acuminate, bright green, their margins usually reddish while young, 2/1-4/3 in. across: fls. pale lilac to purple-lilac, in dense subglobose or pyramidal panicles, 3-5 in. long; pedicels about as long as the distinctly toothed calyx. May. N. China. G.F. 1:221. A.G. 22:183. G.W. 5, p. 549. B.M. 7896. G. 38:355.—Next to the preceding species the earliest to bloom and handsome in fall with its vinous or russet-red foliage. A hybrid with the following species is S. hyacinthiflora, Rehd. Intermediate between the parents, with broadly ovate lvs. turning purplish in fall. Only known in the double form, var. plena, Lemoine. Many or perhaps most of the newer double-flowered varieties have originated by recurrent crossing of these two varieties of S. vulgaris.

9. vulgaris, Lindl. Figs. 3758, 3761, 3762. Upright shrub or small tree, 20 ft. high: lvs. ovate, truncate or slightly cordate, acuminate, bright green, 2-4 in. long: fls. lilac, blue, purplish, or white, in large panicles. May. S. E. Eu. to Caucasus and Afghanistan; sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. M.D.G. 1899:205. F.E. 22:5. R.H. 1903, pp. 126-128.—The most important of the older original varieties are the following: Var. albiflora, Hort., branchlets yellowish gray: lvs. white; buds yellowish green; blooms a week earlier than the other varieties. A.F. 12:801. Var. cerulea, Ait. Fls. blue, in rather loose panicles. Var. rubra, Loud. Fls. purplish red, in large and rather dense panicles. Here belong also var. maysiana, Hort., and Charles X. Var. violacea, Ait. Fls. violet-lilac, in rather loose panicles. Var. plena, Hort. With double fls. There are several varieties with variegated lvs., but these are hardly worth cultivating.


11. persica, Lindl. Fig. 3763. Shrub, attaining 5-10 ft., with slender, arching branches: lvs. lanceolate, acuminate, 1 1/2-3 in. long: fls. pale lilac or white, in rather loose, broad panicles, about 4-6 in. long; pedicels as long or longer than calyx. May. June. Caucasus to Afghanistan. B.M. 486. Var. albiflora, Loud. (S. steerei, Hort.). Fls. white. Var. rubra, Hort. Fls. red. Var. laciniata, Valth (S. filifolia, S. filicifolia, and S. pinata, Hort.). With pinnately lobed or pinnatifid lvs., of dwarfer habit and with smaller panicles. R.H. 1877, pp. 452, 453; 1883, p. 80; 1901, pp. 40, 41.

Section LIGUSTRINA.

12. pektinensis, Rupe. (Ligustrina amurensis var. pektinensis, Maxim. Ligustrina pektinensis, Regel). Large shrub, attaining 15 ft., with slender, spreading branches, brownish red when young: lvs. ovate to oвate-lanceolate, usually narrowed at the base, acuminate, rather dark green above, pale or grayish green and glabrous beneath, 2-4 in. long, 1 1/2-2 1/2 in. broad; fls. yellowish white in large glabrous panicles, usually in pairs at the ends of branches; stamens about as long as limb. June. N. China. G.F. 3:165; 7:385. M.D.G. 1899:425.—Large shrub, of excellent habit, with handsome foliage retained until late in fall; flowers profusely only when older. Var. pendula, Hort. With very slender, pendulous branches.

13. amurensis, Rupe. (Ligustrina amurensis var. mandshurica, Maxim. Ligustrina amurensis, Regel). Shrub, attaining 12 ft., with spreading or upright branches: lvs. broadly ovate to ovate-lanceolate, usually rounded at the base, acuminate, dark green above, pale or grayish green and glabrous beneath, 2-6 in. long, 1 1/2-2 1/2 in. broad; fls. yellowish white, in large, rather loose glabrous panicles; stamens almost twice as long as limb. June. Manchuria. Gh. 12:396; 45, p. 64. G.F. 3:271. Gn. 12, pp. 629, 642. R.H. 1877, pp. 453-455.—Sometimes cult. under the name of S. sibirica or S. sibirica dōba.

14. japónica, Decne. (Ligustrina amurensis var. japónica, Maxim.). Fig. 3764. Pyramidal tree. attain-
SYRINGA

ing 30 ft., with upright branches; Ivs. broadly ovate to broadly elliptic, rounded or slightly cordate at the base shortly acuminate, pale green beneath, and usually pubescent when young, 3–7 in. long; fls. yellowish white, in very large pubescent panicles often 1 ft. or more long; stamens little longer than limb. June, July.


Very desirable free-flowering tree and quite hardy N. var. argentea, Temple, var. as the Ivs. variegated with silvery white.


SYZYGIUM

(Sym. from the Greek, united, referring to the calyptrae petals). Myrtaceae. Trees and shrubs of the tropics of the Old World, variously defined and by some authors made a section of Eugenia: from Eugenia proper the group differs in the united petals, the calyx truncate or with a 4–5-lobed limb and no staminal disk: fls. small, in compact clusters: fr. small 1- or 2-seeded berries. As defined by Niedenzu, the genus has about 140 species. One or two names under this genus appear in the trade. For S. jambolana, see Eugenia jambolana, p. 1103, Vol. II.

operculatum, Nied. (S. nervosum, DC. Eugenia operculata, Roxbg.). A large evergreen tree with 4-angled or nearly terete branches; Ivs. opposite, broad-ovate or elliptic, rounded or somewhat acuminate at apex and narrowed at base, 3–6 in. long, dark green and glossy, the primary lateral nerves few and separated; fls. in 3's and collected into a more or less thyrsoïd infl. greenish: berry 3⁄4 in. or less diam., juicy, edible. Himalaya.—This name appears recently in Calif.: young plants described as having handsome foliage; said to be an acquisition.

L. H. B.
TABEBUIA (Brazilian name). Bignoniaceae. Ornamental trees grown chiefly for their showy flowers.
Evergreen: lvs. opposite, simple or digitate, entire or serrate; fls. in terminal panicles or racemes, rarely solitary; calyx regularly splitting or unequally 3-5-lobed; corolla funnelform-camppanulate; stamens included; disk annular or cupulate; ovary with the ovules in many series: caps. more or less compressed, usually elongated, glabrous or nearly so. — About 90 species in Trop. and Sub-trop. C. Amer. By Bureau and by Schumann, Tabebuia is limited to the 5 or 6 species with simple lvs., and the species with digitate lvs. are referred to Tecoma, while the Tecoma of this work is called Stenolobium by these authors. See, also, Bignonia.

The tabebuias are upright trees with large evergreen foliage simple or digitate and with large pink, white, or yellow flowers in terminal, usually few-flowered panicles or racemes or sometimes solitary.

They are suited for cultivation in tropical or subtropical countries only and are sometimes grown in southern California and Florida. They grow luxuriantly in rich or well-manured soil and are easily propagated by cuttings and also by air-layers.

a. Lvs. simple.
leucoxyla, DC. (Bignonia leucoxyla, Veill. B. pallida, Lindl.). Fig. 3765. Evergreen tree or shrub: lvs. elliptic-oblong to obovate-oblong, obtuse or sometimes marginal at the apex, glabrous, dark green, with distinct pale midrib, 4-7 in. long; fls. in few-fl. terminal racemes; corolla funnel-shaped, about 2 in. long, with yellow tube and pale lilac limb. Brazil. B.R. 965.

b. Lvs. digitate.

b. Fls. pink.

triphylla, DC. (Bignonia tripaphylla, Linn. Tecoma tripaphylla, Mart.). Evergreen tree: lvs. long-petioled, digitate; lfts. 3-7, usually 5, stalked, oblong-lanceolate, entire, glabrous, 1-2½ in. long; fls. in usually few-fl., loose panicles or 1 or 2; corolla funnelform, with large, spreading limb, rose to pink or nearly white, suffused with pink, 2½ in. long; calyx 2-lipped: caps. linear, 6-8 in. long. W. Indies, Guiana.

rosea, DC. (Tecoma rosea, Bertol.). Evergreen tree: lvs. digitate; lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, entire; fls. in many-fl. terminal panicles; corolla funnelform-camppanulate, with short tube and large spreading lobes, rosy pink; calyx camppanulate, obscurely 2-lobed, almost truncate. Guatemala.

b. Fls. yellow.

chrysantha, Nichols. (Tecoma chrysantha, DC.). Evergreen tree: lvs. digitate; lfts. 5, ovate, acuminate, entire, tomentose, 4-7 in. long, long-tailed; fls. in terminal dense racemes, yellow, funnelform, 2 in. long. Caracas.

T. zeillii, Hems!. (Tecoma zeillii, DC. Bignonia zeillii, Humb. & Bonpl.). Evergreen tree; about 20 ft. high; lvs. digitate, with 7 oblong-obovate lfts., pubescent above, tomentose beneath; fls. in terminal panicles, subcampanulate, orange-red, with yellow spots on the lower lower lobes. Mex.—T. deutschen-Bornhardt, Rose, Known in Mexico as "Primavera" and so called to be one of the most beautiful trees, sometimes 4 ft. diam., and the wood very valuable; fls. beautiful golden yellow, in great abundance, usually appraising before the palmette compound lvs.; lfts. 7, oblong to ovate, acuminate, rounded or truncate at base, serrate.—T. pulcher, Rose. Tree, 18-25 ft., bearing rose; low like-like lvs.: lvs. opposite; lfts. 4, about 2-2½ in. long, oblong, somewhat acuminate, obtuse at base; fls. white and purple, with yellow spots, in close clusters at ends of naked branches; corolla 1½-2 in. long. Mex.—T. pentaphylla, Hems!. (Tecoma pentaphylla, Juss.). Closely related to T. tripaphylla. Tree, to 50 ft.: lfts. usually 5, elliptic, oblong-obovate, obtuse or acute; fls. rosy pink, larger. W. Indies, Cent. Amer., Venezuela. The plant intro. under this name by the Dept. of Agric. under No. 38649 is said to have orange-colored fls., and belongs probably to some other species.—T. serratifolia, Nichols (Tecoma serratifolia, Don). Evergreen tree: lvs. digitate, with 4-5 oblong-obovate acuminate lfts. serrate at the apex, 3-5 in. long; fls. in terminal panicles, tubular-funnelform, yellow. W. Indies.—T. spectabilis, Nichols. (Tecoma spectabilis, Fitch & Lindl.). Evergreen tree: lvs. digitate, with 5-stalked ovate to oblong-obovate, cretately serrate lfts.; fls. in terminal panicles, orange-yellow, funnelform-camppanulate. Colombia. E.S. 9:948.

ALFRED REHDER.

TABERNANETUMANA (named for J. T. Tabernemontanus of Heidelberg, physician and botanist; died 1590). Apocynaceae. Evergreen usually glabrous trees or shrubs, grown in the greenhouse.

Leaves opposite, thin or leathery: cymes rather branched, terminal or dichotomously arranged; fls. white or yellowish, small or rather large; calyx usually short, deep or to the middle 5-lobed or parted; corolla salver-shaped, tube cylindrical, lobes twisted; disk various; ovary with 2 distinct carpels: berries or follicles, 2, globose, oblong, ovoid or recurved-reniform, smooth or 3-ribbed. — About 160 species, widely distributed throughout the tropics. See Gonion for distinctions from that genus.

The East Indian rosebay, T. coronaria, is one of the
best ornamental shrubs for subtropical gardens. This species and *T. Camassi*, referred in this work to *Convolvulaceae*, is grown everywhere in Florida from Jacksonville southward. If they receive proper attention, tiny cuttings soon develop into dense, bushy plants 3 to 5 feet high, covered with delicately scented flowers throughout the summer. Indeed the plants are so densely covered with buds and flowers that it is often difficult to find a sufficient supply of cuttings for propagation. *T. coronaria* has larger leaves than *T. Camassi* and the flowers are much like those of the double white oleander, while *T. Camassi* resembles the shed flowers of the old-fashioned Madonna lilies. Both do well under the same treatment. In order to enjoy the beauty of the East Indian rosebay to its fullest extent, it must be planted in rich, sandy soil, not too wet and not too dry, and in places fully exposed to the sun. Only very strong pot-grown plants should be set out in the garden. This should be done during the rainy season. Avoid breaking the ball in transplanting. It is useless to transplant in November, the time when most evergreens and other plants are most successfully set out. The plants at this season have not time to become established before the first sharp frost comes, and a weakened tabernamontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bauhinias, eucalypti, and so on) are banked about 18 inches to 2 feet high with dry sand, and they always come through without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The tabernamontanas look best in groups by themselves or in front of other glossy leaved evergreens. (H. Nehring.)

*a Fls. white.*

**coronaria,** Wild. **Crape Jasmine. Nero's Crown.** A tender shrub, 6-8 ft. high; lvs. glossy green, oblong to oblanceolate; fls. white, fragrant, 1-2 in. across, in 1-8-fld. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. fibro-plena, with double, somewhat larger, very sweet-scented fls., seems to be far more common in cult. P.M. 16:354. B.M. 1865 (as *Nerium coronarium*).—Cult. in the more southern states and also in greenhouses. Also known as Adam's apple and East Indian rosebay.

**aa Fls. yellow.**

**grandiflora,** Jacq. A small, tender shrub; lvs. oblong-ovate, sharply acuminate, 2-3 in. long, thick: fls. from a tuberous or creeping rhizome, adapted to the warmhouse. **A tender shrub, 6-8 ft. high:** lvs. glossy green, oblong to oblanceolate, 2-3 in. long, thick: fls. white, fragrant, 1-2 in. across, in 1-8-fld. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. fibro-plena, with double, somewhat larger, very sweet-scented fls., seems to be far more common in cult. P.M. 16:354. B.M. 1865 (as *Nerium coronarium*).—Cult. in the more southern states and also in greenhouses. Also known as Adam's apple and East Indian rosebay.

TACSONIA (from the Peruvian name of one of the species). *Passifloraceae.* From Passiflora, *Taconia* differs in having a long-tubular calyx, stamens and petals usually 5, the latter never wanting, corona of tuber; or very short threads, and in a short reflexed crown near the base of the fl.-tube. However, the line of demarcation between the two groups is not well marked and Harms (Engler & Prantl's Pflanzenfamilien) unites *Taconia* with *Passiflora.* Masters (Trans. Linn. Soc. 27) accepts 25 species of true *Taconia*, relegating the intermediate forms largely to *Passiflora*. Other species have been discovered subsequently. The *Taconias* are all S. American, inhabiting the Andes. They are tendril-climbing shrubs or herbs, requiring the treatment given passiflora. *T. manicata* is cult. freely in the open in Cent. and N. Calif. *T. manicata* (Passiflora manicata) is a common and striking red-fls. tall climber in S. Calif. In this work, following Engler & Prantl and also Hooker, the *Taconias* are described under *Passiflora.*

TACCA (Malayan name). Syn., *Adictiox Taccodes,* a family allied to the Dioscorea tribe. Perennial herbs from a tuberous or creeping rhizome, adapted to the warmhouse.

Leaves radical, large, petiolate, sometimes unilobed and palmately lobed; veins variously branched; petioles 8-10 in. long: bracts narrowly ovate to lanceolate, 1 in. long, indescent, rarely finally double. Fls. from the very thin leafy stems, small: pedicels 8-10 in. long: involucral bracts 4, conspicuous, the 2 inner elliptical, narrowed to a petiole, the 2 outer revolute. Malaya. B.M. 4588. F.S. 9:860–861. Gn. 45, p. 418; 49, p. 423.—According to Gn. 45, p. 418 it requires rich, good, open soil, with ample drainage, plenty of water, and a stove temperature. In the winter season the plant should be kept in a state of partial rest.

**aa Lvs. not lobed.**

**crisirita,** Jack. **Adictiox crisirita,** Kunth. Rootstock a short conic caudex, marked with f.-sears: lvs. 1-2 ft. long, oblong acuminate, dark purplish green: scape longer than the lvs.; fls. dark purple, ½ in. across, in a somewhat 1-sided umbel, with numerous pale sterile pedicels 8-10 in. long: involucral bracts 4, conspicuous, the 2 inner elliptical, narrowed to a petiole, the 2 outer revolute. Malaya. B.M. 4588. F.S. 9:860–861. Gn. 45, p. 418; 49, p. 423.—According to Gn. 45, p. 418 it requires rich, good, open soil, with ample drainage, plenty of water, and a stove temperature. In the winter season the plant should be kept in a state of partial rest.

**cc Lvs. much lobed.**

**pinnatifida,** Jack. **Tender perennial herb, about 2 ft. high:** rootstock globose, becoming 1 ft. through; lvs. large, usually 3-branched, the divisions pinnately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate; fls. greenish, 8 lines across, many with the sterile pedicels purplish; berry nearly globular, 1 in. through. Afr., India, and Austral. L.B.C. 7:692. B.M. 7299, 7300.—According to Von Mueller’s Select Extra-tropical Plants, the Fiji arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

TENONIA (Greek, making reference to the very small ribs of the fr.). *Umbelliferae,* One species, a slender smooth glaucous perennial of E. Canada and U.S. *P. integerrima,* known as *P. pinellina integerrima,* Gray, and *Zizia integerrima,* DC. It has little value to the horticulturist, although interesting to the collector of native plants for the hardy border. It is erect, 2-3 ft., slender, open-branched, with long-rayed umbels of small yellow fls. in spring and early summer: lvs. ternately 2-compound, the fls. oval to lanceolate, entire, nearly or quite obtuse.
TAGETES

(TAGetes, an Etruscan god, or perhaps of other derivation). Compositae. MARIGOLD. American perennial and annual flower-garden herb.

Leaves opposite or alternate, pinnately cut or rarely simply serrate; fl.-heads of various sizes, yellow or orange, marked in some species with red: strong-scented plants with opposite or alternate mostly pinnately divided lvs. that bear oil-glands; involucre of united parts forming a cup or tube, naked at base; achene angled or flattened, the pappus of a few entire mostly unequal bristles or scales; rays pistillate; disk-fls. perfect.—Species about 20, from New Mex. and Ariz. to Argentina, mostly annuals. The popular annual species known as “African” and “French” marigolds have been derived respectively from T. erecta and T. patula, both of which are native to Mex. According to Sweet’s Hortus Britannicus, these two species were intro. into cult. in 1596 and 1573.

For garden purposes Tagetes may be divided into two groups, based upon habit of growth. T. erecta and T. lucida are of upright and somewhat open growth; while T. patula and T. signata are spreading and bushy, the lower branches lying close to the ground and often rooting. The French marigolds, T. patula, are valuable bedding plants. Good garden forms are of even height and bushy compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 ft. apart.

This species also makes attractive specimens in small pots in a few weeks from seed. Mixed seed of the double sorts will give a large percentage of good double flowers, while the seed of special named double sorts is remarkably good. Some of the single forms are very fine in full bloom. The African marigolds, T. erecta, are not well suited to bedding purposes, the growth being too open, but for the mixed border or shrubbery they are excellent late-blooming subjects. This species should be grown with plenty of root room, air, and rich soil from start to finish if the largest and most double flowers are desired. The African marigolds are very useful as cut-flowers except under circumstances where their odor is objectionable.

For pot marigold, see Calendula.

A. Fls. generally marked with red.

pátula, Linn. FRENCH MARIGOLD. Fig. 3766. A hardy annual, usually about 1 ft. high and much branched from near the base, forming a compact, bushy plant: lvs. darker green than in T. erecta, pinnately divided; lobes linear-lanceolate, serrate; fls. smaller than in T. erecta and borne on proportionately longer peduncles. Mex. B.M. 150; 3830 (as T. compropinum).—Both the single and double forms are grown. The species is very variable as to the color-markings of the fls. which range from almost pure yellow to nearly pure red. A dwarf variety, nana, Hort., is known. Gn. 65, p. 24; 73, p. 127.

cc. Rays few, usually 5.

signátá, Bartl. An annual branching species: lvs. pinnately divided into usually 12 oblong, linear, sharply serrate segms., the lower teeth awned; rays 5, yellow, roundish-ovate. Mex. R.H. 1896, p. 505. Var. pámula, Hort., a dwarf, bushy form, usually less than 1 ft. high, seems to be the only form in the trade. The fls. are bright yellow and small but numerous.—The species is suited for massing or for borders.

cc. Rays numerous.

erécta, Linn. AFRICAN MARIGOLD. Fig. 3767. A hardy annual growing about 2 ft. high, erect, branched: lvs. pinnately divided, segms. lanceolate-serrate; fls. 2-4 times as large as in T. patula and of one solid color, the typical color, according to DeCandolle, being a lemon-yellow. Mex.—The rays are sometimes rather 2-lipped and in one of the garden forms they are quilled. The color ranges from a light sulfur-yellow to a deep orange, many of the light yellow shades being rare amongst fl. colors. This is the common marigold of old gardens in Amer. Foliage very strong-scented.

bb. Lvs. lanceolate, simply serrate.

Ricída, Cav. SWEET-SCENTED MARIGOLD. A tender perennial plant, entirely distinct from the foregoing annuals in the sessile, lanceolate lvs. and small, usually 2-3-rayed fls. in dense, terminal corymbs. The fls. have a much more agreeable odor than the other species cult. Mex. B.M. 740. R.H. 1895, p. 505. Sometimes used as a substitute for tarragon, which sees.

T. lucida is a species discovered about 1896 by T. S. Brandegee in Calif. It makes a compact bush 4-5 ft. high, bearing a profusion of yellow fls. in winter. Small plants flower well in pots. See G.F. 9:67.

—T. Lémmonii, Gray, also a shrubby nearly smooth plant about 2 ft. high, seems to be grown in Calif. It is distinctly woody but rather slender; lvs. all opposite. 3-7-foliate, the serrulate fls. about 1 in. long; heads about 1 in. diam., showy. Ariz. G. C. III. 37:21.

F. W. BARCLAY.

TAINIA (Greek, hand or fillet, alluding to the shape of the lip). Orchidáceae. Terrestrial warm-house orchids. Sterile st. from a many-sheathed rhizome finally thickened into a pseudobulb; fl. single, terminal, large, long-petioled; flowering scape arising from the rhizome, tall, leafless, base few-sheathed, bearing a simple terminal raceme: fls. pedicellate, sparse, rather large or medium-
TAINIA

 sized; sepals about the same length, narrow, acutish to acuminate; petals similar to the sepals or narrower; labelium affixed to the foot of the column, erect, gibbous at the base, erect and parallel or clasping the column, the middle lobe spreading, short, broad; pollinia 8.—About 14 species, India, S. China, and Malay.

Fuerstenthieliana, Schlecht. Tall: pseudobulbs ovate, about 2 in. long, 1-fld.: if. erect, petiolol, lanceolate, about 2 ft. long; scape slender, erect, 2½–3 ft. tall, bearing a lax 10–15-fld. raceme: fls. about 2 in. across; sepals and petals oblong-ligulate; lip oblong, 3-lobed. Habitat?—Closely allied to T. penangiana.

penangiana, Hook. f. Not pseudobulbs: fls. 8–12 x 1½–2 in., about equaling the slender pedicel: scape twice as long; sepals linear-lanceolate, 2½ in. long, acuminate; petals narrow, 5–7-nerved, spurred shortly conical, obtuse; lip oblong, side lobes subacute, incurved, overlapping the orbicular, acuminate, crispaped midlobe; Penang, Malay Penins. F. TRACY HUBBARD.

TAINIOPSIS (like Tainia). Orchidaceae. Epiphytic plants, probably adapted to the coolhouse. Roots rather stout, with a short decumbent rhizome: pseudobulbs ovoid, slightly 4-angled, finally rugose, at apex 2-fld.: lvs. elliptic-lanceolate, acuminate, narrowed to the petiole, lightly plicate, 1 ft. or more long; scape lateral from near the base of the pseudobulb, erect, slender, more or less exceeding the lvs.: inf. simple or slightly branched, laxy several- or many-fld.: sepals ringent, ligulate, rather obtuse, minutely puberulent outside, glabrous inside, lateral recurved, falcate, base broadened; petals obliquely linear, obtuse, recurved, glabrous, as long as the sepals; labelium curved, mobile, lanceolate-tongue-shaped, apex hastately dilate with the margins incurved; column medium-sized, broadened toward the apex; pollinia 8. One species, Xhassia Mts. and Burma, T. barbata, Schlect. O. 1915:11. F. TRACY HUBBARD.

TALAIMA (S. American name). Magnoliaceae. Evergreen trees, grown occasionally in the greenhouse. Lvs., inf., and seeds as in Magnolia: sepals 3; petals 6 to many, imbricate in 2 rows; stamens numerous; carpels numerous, capitate or spicate, indehiscent; ovary many-ovuled: caps. globose or ovoid, chartaceous, 3-valved.—About 15 species, India, S. China; both hemispheres, being grown both as an ornamental and for its acid fruits, which have many uses. The tamarind became known in Europe during the Middle Ages, doubtless through the Arabs. It is said to have been introduced into Europe by Europeans to be produced by an Indian palm (Dymock). Leaves alternate, equally pinnate, the Ifs. small, indeterminate in number; stipules minute, caducous; fls. irregular, produced in racemes at the ends of the branches; bracts and bracteoles ovate-oblong, colored, caduceous; calyx-tube turbinate, narrow, the segments 4, imbricate, membranaceous, colored; 3 superior petals imbricate, yellowish, veined with red, 2 inferior reduced to bristles hidden at the base of the staminal tube; fertile stamens 3, connate in a sheath, opening above with short, free filaments, anthers oblong, longitudinally dehiscent; ovary many-ovuled, with a stall adnate to the calyx-tube, the style filiform, stigma terminal, subcapitate: fr. an oblong or linear, compressed, indehiscent pod, with a thick, crustaceous epicarp, pulpy mesocarp, and coriaceous endocarp seat between the ovulate-ovulate seeds, compressed and exalbaceous. The genus is distinguished from Schotiaia, the only ally which seems to be cult. in Amer., by its floral characters.

indica, Linn. TAMARIND. TAMARINDO. Fig. 3708. A large tree, attaining to 80 ft. in height when grown on deep soils, with a trunk 25 ft. in circumference; bark brownish gray, somewhat shaggy: lvs. abruptly pin

TAMARINDUS (from the Arabic tamar-Hindi, meaning "Indian date"). Loganiaceae. A tropical genus containing but one species, the well-known tamarind. It is considered to be indigenous to tropical Africa (the upper Nile region) and possibly southern Asia as well. It has long been cultivated throughout the tropics of both hemispheres, being grown both as an ornamental and for its acid fruits, which have many uses. The tamarind became known in Europe during the Middle Ages, doubtless through the Arabs. It is said to have been introduced into Europe by Europeans to be produced by an Indian palm (Dymock). Leaves alternate, equally pinnate, the Ifs. small, indeterminate in number; stipules minute, caducous; fls. irregular, produced in racemes at the ends of the branches; bracts and bracteoles ovate-oblong, colored, caduceous; calyx-tube turbinate, narrow, the segments 4, imbricate, membranaceous, colored; 3 superior petals imbricate, yellowish, veined with red, 2 inferior reduced to bristles hidden at the base of the staminal tube; fertile stamens 3, connate in a sheath, opening above with short, free filaments, anthers oblong, longitudinally dehiscent; ovary many-ovuled, with a stall adnate to the calyx-tube, the style filiform, stigma terminal, subcapitate: fr. an oblong or linear, compressed, indehiscent pod, with a thick, crustaceous epicarp, pulpy mesocarp, and coriaceous endocarp seat between the ovulate-ovulate seeds, compressed and exalbaceous. The genus is distinguished from Schotiaia, the only ally which seems to be cult. in Amer., by its floral characters.

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TAMARINDUS

...a refrigerant, digestive, carminative, laxative, and antiscorbutic, for which latter purpose it is sometimes used in place of lime juice. With the addition of sugar and water, it makes a cooling drink or refresco, especially well known in Latin America. For the preparation of this drink, a sirup is often made from the pulp which can be bottled and used as desired. In some countries tamarinds are an important article of export. In Jamaica the fruit is prepared for shipment by stripping it of its outer shell, and then packing it in sacks, with alternate layers of coarse sugar. When the cask is nearly full, boiling sirup is poured over all, after which the cask is headed up. In the Orient, the pulp, containing the seeds, is pressed into large cakes, which are packed for shipment in sacks made from palm leaves. This product is a familiar sight in the bazaars. It seems to be greatly esteemed as an article of diet by the Indians. As also by the Arabs, large quantities being shipped to Arabia from India.

According to Watt, the natives of India have an aversion to sleeping under the shade of the tree because of the supposed acid exhalation from the leaves. Pittier states, however, that he has slept under a tamarind tree for weeks without suffering the least inconvenience. Gamble writes that the leaves cause the cloth of tents pitched in the shade of the tree. This happens, he says, in wet weather; the leaves fall on the tents, and within a day or two the cloth is decomposed in holes.

The tree is easily propagated by means of seeds, which is the only method commonly used. Seeds can be transported without difficulty, as they retain their viability for a considerable length of time if kept dry. They are best germinated by planting them \( \frac{1}{2} \) inch deep in light, sandy loam. The young plants are rather delicate and must be handled carefully to prevent damping-off. In India, the yield of a mature tree is said to be about 350 pounds of fruit per annum. Little is known of the insect pests which attack the tree; Maxwell-Leffroy mentions two, Cargoborus gonagra, a large gray-brown chrysomelid beetle found in tamarind seeds, and Charaxes Fabius, a large black yellow-spotted butterfly whose larvae feed on the leaves. Both these insects occur in India.

Firminger mentions three varieties of tamarind grown in India, but does not know whether they can be depended on to come true from seed. Masters, in the "Treasury of Botany," states that the East Indian variety has long pods, with six to twelve seeds, while the West Indian variety has shorter pods, containing one to four seeds. Seedlings undoubtedly show considerable variation in the size and quality of their fruit, which accounts for the different varieties which have been noted by many writers. Firminger recommends that seedlings which produce unusually choice fruit be propagated by gootee, or stem-layering, a method which is described under Litchi. More recently (1913) Wester has reported that the tree can be shield-budded successfully the method being similar to that used with avocado. F. W. POPPENOE.

TAMARIS: Tamarind

TAMARIS (ancient Latin name). Tamaricaceae. Tamarisk. Ornamental woody plants, grown chiefly for their showy panicles or racemes of pink or whitish flowers; and also for their very fine graceful foliage.

Deciduous shrubs or trees; lvs. alternate, sessile, often sheathing, small, and scale-like; fls. small, short-pedicelled or sessile, in rather dense racemes, usually collected into terminal panicles; sepals and petals 4-5; stamens usually 4-5, rarely 8-12, sometimes slightly connate at the base; ovary 1-celled, surrounded at the base by a more or less deeply 5- or 10-lobed disk; styles 2-5, clavate or short and thick; fr. a caps., dehiscent into 3-5 valves; seeds many, minute, with a tuft of hairs at the apex. About 75 species from the Medit. region to...
TAMARIX

E. India and Japan. Several species have medicinal properties and yield dye-stuffs. The punctures of an insect, Coccus marnipennis, cause T. marniura to produce "manna."

The tamarisks are very graceful shrubs or small trees with slender branches clothed with minute scale-like leaves. They are good inhabitants of warmer arid regions, and are adapted to dry and alkaline soil. They are excellent for seaside planting and thrive in the very spray of the salt water. Propagation is by seeds, which are very fine and should be only slightly covered, or usually by cuttings of ripened wood in the open ground or by greenwood cuttings under glass.

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KEY TO THE SPECIES.

A. Fls. 4-merous: racemes lateral on last year's branches.
   B. Petals spreading, persistent; styles usually 3
      1. parviflora
   B. Petals deciduous; styles 1
      4. tetrandra

A. Fls. 5-merous.
B. Racemes lateral on last year’s branches.
   B. Racemes forming large terminal panicles, rarely lateral on the current year’s branches.
   C. Lvs. glabrous.
   D. Petals persistent.
   E. Bracts ovate-lanceolate
      4. pentandra
   E. Bracts subulate.
   F. Infl. nodding: tree with spreading branches.
      5. chinensis
   F. Infl. upright: erect shrub.
   G. odsessana
   D. Petals deciduous
      7. gallica
   Cc. Lvs. finely pubescent
      8. hispida

1. parviflora, DC. (T. tetrandra var. parviflora, Boiss. & Kohtsency). Fig. 3769. Shrub or small tree, 15 ft. high, with reddish brown bark and slender spreading branches; lvs. ovate, acuminate, semi-amplexicaul, scarios at the apex when older; fls. pink, very short-pedicelled, in slender racemes about 1 in. long along last year’s branches; petals spreading, persistent; calyx very small, sometimes only 3-parted; styles usually 3, much shorter than ovary. April, May. S. Eu. F.S. B:885. H.1855-401. Gn. 61, p. 273; 71, p. 398.
   - Often confused with the T. tetrandra, also with T. africana and T. gallica and cult. under those names. T. tetrandra var. purpurea probably belongs here.

2. tetrandra, Pall. Shrub or small tree, attaining 12 ft., with stamens in equal, ovate-lanceolate, some-
   what narrowed at the base, with diaphanous margin: fls. light pink or almost white, in racemes 1–2 in. long along last year’s branches; disk purple, deeply 4-lobed; styles usually 4, about as long as ovary. April, May. S. Eu. W. Asia. Doubtful whether in cult. in this country; all plants seen under this name by the writer belong to the preceding species.

3. juniperina, Bunge (T. japonica and T. plumbea, Hort.). Shrub or small tree, attaining 15 ft., with
   slender spreading branches; lvs. green, oblong-lanceolate, acuminate, scarious at the apex; fls. pinkish, in lateral racemes 1½–2½ in. long on last year’s branches; petals slender, shorter than calyx; sepals ovate-lanceolate, little shorter than the persistent petals; disk 5-lobed, with emarginate lobes. Japan, N. China. S.Z. 1:71 (as T. chinensis).

4. pentandra, Pall. (T. Pallast, Desv. T. hispida austrosia, Hort.). Shrub or small tree with usually purple branches; lvs. lanceolate to ovate, acute, gla­
cous or pale green; fls. pink, in large panicles, the racemose dense, 1–2 ft. long; bracts ovate-lanceolate, 
   -ne or acuminate, as long or slightly longer than petals; petals broadly elliptic-oblong, convivent, disk 5-
   lobed, with emarginate lobes; styles slender, about 1 in. long, on short, naked peduncles, spreading and disposed in ample loose panicles; petals about as long as calyx; sepals ovate, much shorter than the persistent petals; disk deeply 10-lobed. July–Sept. China.

5. chinensis, Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches; lvs. bluish green, lanceolate, acuminate, keeled; fls. pink, in large and loose usually nodding panicles, pedicels as long as calyx; sepals ovate, much shorter than the persistent petals; disk slightly spreading; disk 5-lobed, with rounded lobes. July–Sept. Caspian region.

6. odsessana, Stev. Shrub, 4–6 ft. high, with upright, slen­
der branches; lvs. lanceolate, subululate, deciduous; fls. pink; racemes slender, about 1 in. long, on short, naked peduncles, spreading and disposed in ample loose panicles; petals about as long as calyx; sepals oblanceolate; disk 5-lobed, with rounded lobes. July–Sept. Caspian region.

7. gallica, Linn. (T. arborea, Sieber, not Ehrenb. T. canar­
   ine, Willd.). Shrub, or small tree with slender spreading branches; lvs. dull to bluish green, closely imbricated, rhom­bic-ovate, acute or acuminate, keeled, semi-amplexicaul, with scarious margin; fls. white or pinkish, globose in bud, almost sessile, in slender, panicled racemes; petals deciduous; filaments somewhat dilated at the base, inserted between the rounded lobes of the 10-lobed disk; styles 3. May. S. Eu. Medit. region to Himalaya; naturalized in S. Texas and N. Mex. Gn. 34, p. 329. Var. indica, Ehrenb. (T. indica, Willd.). With slender, upright branches; lvs. dull green; racemes longer and slenderer; fls. pink, disk obscurely and nutate 10-lobed. July–Sept. Caspian region.

8. hispida, Willd. (T. kashgaria, Hort.). Shrub, with slender upright branches; lvs. bluish green, cordate and subauriculate at the base, acuminate, somewhat spreading, finely pubescent; fls. pink, almost sessile, in dense racemes 2–5 in. long, disposed in terminal panicles;
**TAMARIX**


**ALFRED REHDER.**

**TAMONEA** (native name). *Melastoma cauliflorum.* This name was revived to cover the names *Cyanophyllum,* *Miconia,* and others from *Cyanophyllum* to *Tamonea,* the other from *Eu., N. Afr., and Temp. Asia.* About 2 species, 1 from Canary Is., the other from *Eu., N. Afr., and Temp. Asia.*

**TANACETUM** (name of doubtful derivation). *Compsas.* Annual or perennial herbs which are odorous: Fls. alternate, variously cut: heads of small to medium-sized yellow fls. disposed in corymbs, or rarely solitary, heterogamous, disk-shaped; female fls. with 3-5-toothed, tubular corollas: achene 5-ribbed or 3-5-angular, with a broad truncate summit, bearing a coroniform pappus or none.—Thirty-five species scattered about the northern hemisphere, of which about 7 are native to *N. Amer.* For cult., see *Tanacetoidea,* 261.—*T. annua, Linn.—*T. brachystyla, Gay, T. africana, Forr.—*T. Boudourea, Gay, T. rubida, Hassen, T. paucosinuata, Gay, and T. articulata, Vahl.—*T. dolica, Webb. Allied to *T. gallica. Shrub, 10 ft. fls. bluish green, somewhat constricted at the base; fls. ovate or in bud; filaments minute, at the base, attached to the acute lobes of the 5-angled disk, W. E., B.E. 2:61.—*T. articulata, Vahl. Tree, attaining 30 ft., with, slender, pointed branches. Fls. glaucous, minute, sheathing; fls. 5-merous, pink, sessile, in terminal pedicels. W. Asia. Not hardy. N.—*T. subtilis, Willd.—*Myricaria dahurica.—*T. gallica, Linn.—*Myricaria germana.—*T. rubida, Batsch. Allied to *T. parviflora. Tree or shrub with red cored branches; lvs. minute, imbricate; bracts ovate, acute, almost as long as calyx; calyx-segms. 4; petals 4, rose; stamens 4, with long filaments and dark purple anthers. Algerian.

**TANAGA (named in honor of M. Tanaka).** *Saxifragaceae.* Herb probably hardy and perennial: plant dicocious, perhaps sometimes monocious, stoloniferous; stolons slender, leafy and rooting: lvs. basal, long-petioled, thick or somewhat fleshy, finally leathery, including the petioles 4-8 in. long; blade oblong-lanceolate or ovate-lanceolate, rounded or somewhat cordinate at base, acute, doubly serrate; scapes very slender, branched, pyramidal, 6-8 in. high: fls. very small, greenish white, shortly pedicelled, solitary in the axis of the bracts; sepalas 5, almost free, oblong-lanceolate; petals none; stamens 10, alternate ones shorter; ovary glabrous, almost entirely free, 2-celled.—One species, Japan, T. radicans, Franch. & Sav. B.M. 7943. G. 33:376; 36:515.

**TANSELO** (from tangerine and pummelo; by syn­
copation: tange-ri.ne [pum­melo]. A new group of cit­
rous fruits originated in 1897 by the writer by cross­
ing the Dancy tangerine with the Bowen grapefruit.

**TANGELO 3309**

The resulting hybrid, named Sampson tangelo by H. J. Webber and the writer (United States Department of Agriculture Yearbook, 1904) does not closely resemble either parent in its fruit characters, being a slightly pear-shaped thin-skinned smooth and shining fruit of medium to large size, pale orange in color, and with a rather acid sprightly flavored very soft and juicy orange-colored pulp. It ripens very late, several months after it begins to color, and sometimes becomes partly dry before complete maturity. When properly grown it is a delicious fruit. It is being grown commercially on a small scale, but its delicate okin and commercial value is being ripened for a special market.

The Thornton is another tangelo, a hybrid of tangerine with a Florida grapefruit. It is a rough thick-skinned round fruit with very pale orange-colored juice and sprightly flavored pulp. It ripens earlier than the Tangelo and is less acid. It is very like a tender good-flavored orange in character. It is beginning to be grown commercially on a small scale.

The success of the first two tangelos produced by artificial hybridization has led to the creation of hun­
dreds of additional hybrids between all the mandarin types of orange (Citrus nobilis) such as the tangerine, willow-leaf mandarin, King, Satsuma, and the like, and the better sorts of grapefruit and pummelo (Citrus grandis). These fruits in general resemble round oranges (Citrus sinensis) more than either of their parents and are exceedingly variable. Sister fruits from seeds of a single cross-pollinated fruit often being very unlike. Among the tangelos there are some of much promise because of their superior flavor and juiciness.

The spread of citrus canker (a bacterial disease caused by Pseudomonas citri) to many of the hot moist orange-growing regions of the world makes it desirable to breed new types of tangelos by hybridizing the canker-resistant mandarin oranges with canker-resistant pummelos such as can be found in the Orient. Such tangelos, if canker-resistant, could perhaps be grown in place of the more susceptible round oranges, just as limequats can be grown in place of the common lime, which is very susceptible to canker.

WALTER T. SWINGLE.

TANGERINE: Orange and Citrus.

TANSY (Tanacetum vulgare, Linn.). A coarse-growing herbaceous perennial naturalized from middle Europe, and a familiar occupant of old gardens, waste places, and roadsides. Its common name is said to be derived from athanasia, immortality, an idea suggested to the ancient Greeks by the characteristic permanent possession it takes of the soil. Its annual upright usually unbranched stems, which rise about 3 feet from the perennial root, bear greatly divided deeply cut compound bitter aromatic leaves and rather dense corymbs of numerous small yellow flower-heads which appear in midsummer. The seed, which is small, is marked by five rather prominent grayish ribs and retains its vitality for about two years. Formerly its leaves were in great favor as a seasoning for various culinary preparations, especially puddings and omelettes, and it is now almost obsolete. By the medical profession, its tonic and stimulant properties and its efficacy in hysterical and dropsical disorders are still recognized, although other medicines are more popular.

In domestic practice it played an early rôle as an anthelmintic and stomachic and is still somewhat popular as a local agent to relieve the pain of muscular rheumatism, bruises, and chronic ulcers. The wild plants usually satisfy all demands, but when no wild supply is at hand seed may be used to start the half-dozen specimens that a family should need. Easily started, readily transplanted or divided, tansy requires no special care in cultivation except to keep it clear of weeds and to prevent its spreading and thus becoming troublesome. It will thrive in almost all soils and situations that are not too wet. For botanical account, see Tanacetum.

M. G. KAINS.

TAPEINOTES (from the Greek, referring to its low stature). Gesneriaceae. Under this generic name, one species is listed abroad, T. Caroliniana, Wawra. The genus is now included in Sinningia and the current name is S. Caroliniana, Benthi, & Hook. (S. barbata, Nichols.). It is a Brazilian plant, adapted to the warmhouse: decumbent or ascending, with oblong to lanceolate-cuneate-serrate lvs. 1 ft. or less long and red beneath; fls. white, red-marked inside, with a contracted and hairy throat and tube swollen at base. B.M. 5823, which represents a striking plant with lvs. brilliant red-purple beneath and curved hairy deflexed white corollas 1½ in. long; described as a small under-shrub.

TAPIoca: Manihot.

TAPIRIPA (from a native name in Guiana). Also spelled Taphra. Anacardiaceae. A name of disputed application. The plant likely to interest horticulturists in this relationship is Cyrtocarpa procera, from Mex., described on p. 945, Vol. II. Of Tapirira itself, distinguished by 4-5 styles, those in the pistillate fls. short, none is probably regularly in cult. As formerly defined, the species are S. American, with a few in Afr. and Asia, 8 or 10 in number. Later authors restrict the genus to S. Amer., mostly to Brazil. Under any definition, the genus is probably adapted to cult. only on our southernmost borders.

TAPIScia (anagram of Pistacia, to which it bears a strong resemblance, though not closely related).
**TAPISCA**

*Staphyleaceae.* An ornamental deciduous tree from China with large alternate odd-pinnate lvs., deciduous stipules and with small yellow fragrant fls. in axillary panicles; calyx tubular-campanulate, 5-lobed; petals 5, spatulate-ovate, little longer than the calyx; stamens 5, exerted; style slender, longer than stamens; ovary superior: fr. a 1-seeded ovoid drupe. It is as yet little known in cult., but probably can be grown successfully in the S. only; it may be recommended chiefly for its bold pinnate foliage and the honey-scented fls. Prop. can probably be effected by cuttings besides by intro. seeds. *T. sinensis,* Oliver. Small tree, to 30 ft., occasionally to 90 ft.: lfts. 5-7, ovate to ovate-oblong, acuminate, cordate at the base, sericulate, glaucescent and nearly glabrous beneath, 3-5 in. long; panicles broad, 2-3 in. long; fls. 1/4 in. long, yellow, fragrant: fr. ovoid, black, 1/2 in. long. June, July. Vent.

**TARAXACUM** (name probably associated with supposed medicinal properties). *Leontodon* of some authors. **Compositae. Dandelion.** Low nearly or quite stemless herbs of cold and temperate regions, mostly of the northern hemisphere. Distinguished by having posed medicinal properties).

3774. Variation in foliage of the common dandelion. (All leaves drawn to the same scale.)

**TARO.** A group of tuberous-rooted edible aroids, of the genus *Colocasia,* scattered throughout the tropics and subtropics of the world; cultivated also in many warm regions of the temperate zones, as Egypt, Syria, China, Japan, and New Zealand, and lately in the southern United States.

The taro has been cultivated from very early times and the Egyptian variety, under the name "colocasia," is mentioned by Pliny as being of great importance in Egypt at that time. The culture of it was said to have been already introduced into Italy. The Egyptian variety, now called qolqas, is *Colocasia antiquorum* (*Arum Colocasia*), Fig. 3775, a quite different plant from that of the varieties most commonly grown in southeastern Asia and the islands of the Pacific. The qolqas is of very inferior quality and is said to be eaten in Egypt only by the laboring classes.

The botany of the taros of the Pacific regions is in an unsatisfactory state, owing largely to the infrequency with which many varieties flower, but most of them evidently belong to *Colocasia esculenta* (by some considered to be a variety of *C. antiquorum* and so treated in Vol. II, page 830). See Fig. 3776.

The culture of taro has probably reached its highest development in the Hawaiian Islands and it is largely through its extensive use there that the plant has become so widely known among travelers and others. The large number of varieties despite the fact that the plants seldom, if ever, set seed, testifies to the antiquity of the culture of this type of taro. MacCaughey and Emerson, in the Hawaiian Forester and Agriculturist
TARO

(vols. 10, 11, 1913–1914), record a list of 262 named varieties of taro, or "kalo," which are said to have been grown on the islands. But few of these are of commercial importance, and many are no doubt lost.

In Hawaii, taro is eaten mostly in the form of poi, a sticky paste made by steaming or boiling the taro, then peeling and "pounding" or grinding it with the addition of a little water. It is usually allowed to ferment for a day or two before being eaten, and is considered to be a very easily digested, wholesome, and nutritious food. The organisms involved in the fermenting process are probably not always the same, but they appear to include a yeast and one or more bacteria. Fermented or sour poi is not alcoholic, but acid. Poi frequently constitutes an important part of the diet of invalids. By others it is usually eaten with meat, especially fish. Taro is also eaten boiled, or parboiled and baked, and in many other ways like the potato. Most varieties are acid in the raw state, however, and these often require longer cooking in order to destroy this property. When properly cooked and served, the better varieties of taro are highly palatable and constitute a most valuable food. The young leaves, before they open, are prized as greens and are called "laau." They are parboiled with baking soda or cooked with fat meat to destroy the acridity.

The cultivation and use of taro in Hawaii appears to be slowing decreasing, although in 1913 it was estimated that the total planting was some what greater than 1,500 acres. It is reckoned as fourth in importance among the crops cultivated, sugar-cane, rice, and pine-apple exceeding it.

Taro-culture is of two general types, water and upland, and a different set of varieties is grown for each. The length of season required to grow a crop is about one year, although some varieties require longer and some mature in less time. Propagation is by a "huli," which consists of the top of a corn or cornel with 7 or 8 inches of the inner pedicels still attached. Planting is undertaken at any time of the year.

In water culture the hulis are placed rather close together, often no more than a square foot being allowed for each plant. The cultural treatment varies greatly and is doubtless influenced by the water-supply, water being often scarce. The soil is pullded in order to prevent too rapid seepage. In some cases the land is rested for several weeks between crops, but more often replanting is made at once. Again, water is sometimes withheld for two to four weeks after planting, while at others the ground is not allowed to dry. At harvest-time the laborers wade into the mud and water and pull up the taro plants by the roots. The roots are then removed from the corms, the outer leaves stripped off, and hulis made from the tops as already described.

The practice in growing upland taro in Hawaii also varies considerably in the spacing of the plants, they being sometimes planted in small groups, at regular intervals, though more commonly in regular rows. The harvesting is performed by hand in much the same manner as described for water taro, a simple tool being used, however, in lifting the plants. Upland taro can be grown only where the rainfall is abundant and well distributed throughout the year, hence its culture is limited to certain localities.

The dasheen.

A variety of this same species of taro, Colocasia esculenta, known as the Trinidad dasheen (Fig. 3777), was introduced into the United States for culture in the South, in 1905, having been previously brought from the island of Trinidad to Porto Rico by O. W. Barrett. This variety, which has come to be known simply as 'dasheen,' is thought to have come originally from China, as its name, a corruption from "de la Chine" or "da Chine," indicates. Varieties similar in appearance but inferior in quality exist, some of them known to be of Chinese origin.

The Trinidad dasheen is considered to be one of the most promising crop plants introduced into the United States in recent years, as it is thoroughly adapted for culture in the moist sandy loams of the South Atlantic and Gulf states and, as grown on such soils, of excellent quality. The crop from each hill when well grown, consists of one or more large central corms, with a large number of lateral cormels or "tubers" (Fig. 3778). The total yield from one hill in good soil ranges from four pounds to as high as thirty pounds in rare cases. These are cooked for table use like potatoes. They are somewhat drier and have a delicate nutty flavor when they have been grown under suitable conditions and are properly prepared. The color of cooked dasheens varies from white or cream to gray or violet. When grown in heavy or poorly drained lands, however, the quality is usually inferior, in both texture and flavor. An average of eleven analyses of the dasheen gives 27.5% per cent of starch and sugars and 3 per cent of protein. The sugar-content is a little higher than in

[Diagram of Inflorescence, showing wide-open limb of spathe and long sterile appendage of spadix characteristic of this species.]

[Diagram of Spadix, showing the following areas, beginning above the base: 1. pistillate flowers; 2, abortive flowers which were compressed by the neck of tube of spathe; 3, staminate flowers; 4, sterile appendage.

[Diagram of Spadix, showing the following areas, beginning above the base: 1, pistillate flowers; 2, abortive flowers which were compressed by the neck of tube of spathe; 3, staminate flowers; 4, sterile appendage.

[Diagram of Inflorescence, showing limb of spathe open to trough-shape and short sterile appendage characteristic of this species.]

[Diagram of Spadix, showing the following areas, beginning above the base: 1, pistillate flowers; 2, abortive flowers which were compressed by the neck of tube of spathe; 3, staminate flowers; 4, sterile appendage.

3775. Taro—Colocasia antiquorum var. esculenta. a, Inflorescence, showing wide-open limb of spathe and long sterile appendage of spadix characteristic of this species. b, Spadix, showing the following areas, beginning above the base: 1, pistillate flowers; 2, abortive flowers which were compressed by the neck of tube of spathe; 3, staminate flowers; 4, sterile appendage.
the white potato, making the dasheen seem slightly sweet by comparison. Like other taros, it is held by many to be easy of digestion as compared with most other starchy foods.

In the United States, the dasheen is at present grown exclusively as an upland crop, that is, not under flooded conditions as other taros are usually grown in Hawaii. The crop requires about seven months of warm frostless weather fully to mature. It has been grown with best results in a moist, but well-drained rich sandy loam. Heavy soils produce a low quality of corm and tuber, and often a poor yield. Muck soils, if they contain a moderate amount of moisture, usually produce a heavy crop of dasheens but of poor quality for table use. Dry soils of any kind are useless for dasheens.

Planting should be made in the early spring, just so that the last spring frost will be past before the plants are up. In central Florida, it is made about the middle of March and farther north, up to early April. Cormels, or "tubers," two to four ounces in weight, are generally used for planting, although smaller ones may be used. Larger tubers, small corms, or the upper parts of larger corms may also be planted when available. The character of soil is of greater importance than the size of tuber planted. The tuber is planted about 2 inches below the surface. The plants are spaced 4 by 3 or 3½ by 3½ feet, on level ground except where there is danger from standing water, when planting should be done on ridges. With level planting the soil is gradually drawn toward the plants in cultivating during the latter half of the season. The large leaves shade the ground almost completely by midseason if the soil conditions are good.

The crop matures in late October and early November in the southern United States. Harvesting is performed with a spade or with team and plow. Dasheens keep well when properly handled and stored. The entire subject is treated at length in bulletins of the United States Department of Agriculture.

ROBERT A. YOUNG.

TARRAGON (Artemisia Dracunculus, which see) is a close relative of wormwood (A. Absinthium). It is a perennial composite herb native of the Caspian Sea region and Siberia, and is cultivated as a culinary herb in western Europe. Its lanceolate entire leaves and small inconspicuous and generally sterile blossoms are borne upon numerous branching stems, 2 to 3 feet tall. Its green parts, which possess a delicate aromatic flavor resembling anise, are widely used for seasoning salads and for flavoring vinegar, pickles, and mustard. The essential oil of tarragon and tarragon vinegar are articles of commerce, the crop being grown extensively in southern France for this purpose. The

TASMANNIA (named after Abel Jansen Tasman, navigator, for whom the island Tasmania is named). Now considered a synonym of Drimys. One species, Drimys aromatica, Moell. (Tasmannia aromatica, R. Br.), is sometimes mentioned in horticultural literature: small tree or a bushy shrub with pinkish fins, elliptic-oblong or oblong-lanceolate lvs. and aromatic pea-size berries. Victoria, Tasmania. B.R. 31:43.

3777. Full-grown plant of dasheen, the variety of taro grown in the United States.

3778. A hill of dasheen. The large central corm, with part of leaf-stems still attached, is surrounded by the cormels, or tubers, just as they grow.
TAVARESIA (derivation unexplained). Aeciphedaceae. Succulent stapelia-like perennials, branching at the base: sts. 6–12-angled, angles tuberculate, toothed, each tuber with 3 bristles: fls. large and showy, in sessile cymes at base of young sts.; calyx 3-parted; corolla large, tubular-funnel-shaped, 5-lobed; crown double, outer shortly tubular at base, then divided into 10 long filiform segms., each terminated by a knob, inner crown of 5 narrow lobes; staminal column arising from base of corolla. Two species. T. and S. Afr. T. Banklyi, N. E. Br. G. W. 15, p. 117.

TAXODIUM (alluding to the similarity of the foliage to that of Taxus). Syn., Glyptostrobus, Schuerbertia. Nothofagus. Ornamental woody plants, grown chiefly for their graceful feathery foliage and wood.

Deciduous or evergreen trees or shrubs: lvs. alternate, linear, usually 2-ranked, falling off in autumn or the second year together with the short lateral branchlets; fls. monocious, small; staminate fls. catkin-like, consisting of spirally arranged anthers, with 4–9 anther-cells and forming terminal panicles; pistillate fls. solitary or in pairs at the ends of branchlets of the previous year, composed of imbricated scales bearing 2 ovules inside at the base; cone globose or nearly so, maturing the first year, consisting of spirally arranged woody scales enlarged at the apex into an irregularly 4-sided disk with a mucro in the middle and toward the base, then divided into 10 short branches: lvs. narrowly linear, acute, thin, light green, usually in N. Am. and 1 in China.

Of the three species, the only one well known in cultivation is the bald cypress. T. distichum, a tall pyramidal deciduous tree with small linear two-ranked leaves and small globose cones. It is hardy as far north as New England and is a very desirable tree for park planting. Its light green feathery foliage and the narrow pyramidal habit which it usually retains in cultivation give it a very distinct appearance. In its native habitat it forms in old age a broad round-topped head sometimes 100 feet across and has the trunk much enlarged at the base by huge often hollow buttresses projecting in all directions and terminating in long horizontal roots. From these roots spring the peculiar cypress knees, pyramidal protuberances composed of a very light, soft, spongy wood and spongy bark. These sometimes attain a height of 10 feet and with age usually become hollow. From the under side of the horizontal roots large anchor-roots are sent perpendicularly into the earth and help to anchor the tree firmly in the swampy yielding soil. The knees are thought by some to be formed for the purpose of strengthening this root-system, since they are chiefly found opposite to the anchor-roots, but their main purpose is probably to bring air to the roots during the several weeks or months when the swamps are covered with water. The knees always grow high enough to rise above the surface of the water (see, also, G. F. 3, pp. 21, 22, 27).

The bald cypress is one of the most valuable timber trees of North America. The wood is brown, light and soft, close and straight-grained, but not strong; it is easily worked, durable in the soil and much used for construction. The bald cypress thrives best in moist sandy soil, but also does well in drier situations. The habit seems to depend somewhat on the degree of moisture; in drier soil the head is more narrow-pyramidal, in moist soil broader and more spreading. Propagated by seeds sown in spring and the varieties by grafting on seedling stock early in spring in the greenhouse; also by cuttings in sand constantly saturated with water or grown in water alone, under glass.

of reddish color. They are particularly beautiful in autumn when loaded with scarlet berries. They are well suited for hedges and easily trimmed into any desired shape. They were formerly much used for fantastic topiary work (see e. g., G.C. II. 3:264, 265).

The best-known species is

**TAXUS** (ancient Latin name of the yew). Taxaceae, formerly named in the Conifera. Yew. Ornamental woody plants, grown for their dark green foliage and the scarlet berry-like fruits.

Evergreen trees or shrubs. Lvs. linear, without resin-dots, pale or yellowish green beneath, usually 2-ranked: fls. usually dioecious, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globose, composed of 4-8 stamens each, with 8 anther-cells attached to the peltate connective for pistillate consisting of a single terminal ovule with several bracts at the base: seed a bony nut surrounded by a fleshy cup-shaped scarlet disk; cotyledons 2.—Six species are known. They are distributed throughout the northern hemisphere and in America south to Mex. They are all very closely allied and have been considered geographical varieties of a single species. The wood is heavy, hard, close-grained, strong, and cattle, but the berries are not.

The yews are evergreen, usually small slow-growing trees or shrubs, with 2-ranked linear dark green leaves, insignificant flowers and showy berry-like red fruits. The best-known species is **T. baccata**, which is hardly as far north as Rhode Island and northwestern New York, and in some forms as far as Massachusetts, while **T. cuspidata** and **T. canadensis** are considerably hardier and thrive as far north as Canada; the other species are little known in cultivation. The yews are very desirable evergreens for park planting; they are densely clothed with dark green foliage and the pistillate plants are particularly beautiful in autumn when loaded with scarlet fruits. They are well suited for hedges and easily trimmed into any desired shape. They were formerly much used for fantastic topiary work (see e. g., C.C. II. 2:264, 265).

That the typical tree-like form of the yew is nowadays not much planted is chiefly due to its slow growth, but its numerous mostly shrubby garden forms are popular plants for small gardens. The yews thrive best in a moderately moist sandy loam and endure shade well. Large plants may be successfully transplanted if it is possible to secure a sufficient ball of earth with the roots. Propagation is by seeds, which do not germinate until the second year, and by cuttings taken early in autumn and kept during the winter in a cool greenhouse or frame; the varieties also often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow more slowly than grafted ones and cuttings of the type rarely grow into trees but usually into low-spreading shrubs (see M.D.G. 1898:565).

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**TAXUS** (ancient Latin name of the yew). Taxaceae, formerly named in the Conifera. Yew. Ornamental woody plants, grown for their dark green foliage and the scarlet berry-like fruits.

Evergreen trees or shrubs. Lvs. linear, without resin-dots, pale or yellowish green beneath, usually 2-ranked: fls. usually dioecious, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globose, composed of 4-8 stamens each, with 8 anther-cells attached to the peltate connective for pistillate consisting of a single terminal ovule with several bracts at the base: seed a bony nut surrounded by a fleshy cup-shaped scarlet disk; cotyledons 2.—Six species are known. They are distributed throughout the northern hemisphere and in Amer. south to Mex. They are all very closely allied and have been considered geographical varieties of a single species. The wood is heavy, hard, close-grained, strong, and cattle, but the berries are not.

The yews are evergreen, usually small slow-growing trees or shrubs, with 2-ranked linear dark green leaves, insignificant flowers and showy berry-like red fruits. The best-known species is **T. baccata**, which is hardly as far north as Rhode Island and northwestern New York, and in some forms as far as Massachusetts, while **T. cuspidata** and **T. canadensis** are considerably hardier and thrive as far north as Canada; the other species are little known in cultivation. The yews are very desirable evergreens for park planting; they are densely clothed with dark green foliage and the pistillate plants are particularly beautiful in autumn when loaded with scarlet fruits. They are well suited for hedges and easily trimmed into any desired shape. They were formerly much used for fantastic topiary work (see e. g., C.C. II. 2:264, 265).

That the typical tree-like form of the yew is nowadays not much planted is chiefly due to its slow growth, but its numerous mostly shrubby garden forms are popular plants for small gardens. The yews thrive best in a moderately moist sandy loam and endure shade well. Large plants may be successfully transplanted if it is possible to secure a sufficient ball of earth with the roots. Propagation is by seeds, which do not germinate until the second year, and by cuttings taken early in autumn and kept during the winter in a cool greenhouse or frame; the varieties also often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow more slowly than grafted ones and cuttings of the type rarely grow into trees but usually into low-spreading shrubs (see M.D.G. 1898:565).

cuspidata, Sieb. & Zucc. (T. baccata var. cuspidata, Carr.). Tree, attaining 50 ft., with a trunk usually 2 ft. diam.; bark bright red; branches ascending; lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous green or pale green beneath. 3/4-1 in. long: fr. with ovoid seed slightly 3-4-angled and 3/4 in. long. Japan. S.I.F. 1:115. Very similar to T. baccata, but branches stouter and lvs. denser and more crowded and of a lighter, more yel-low and W. China.-This variety fruits very profusely.

The plant offered as var. capitata, Rehd. Low form making a dense sometimes almost hemispherical bush with ascending branch-lets: lvs. somewhat shorter and duller, ascending and not or scarcely 2-ranked: slow-growing, rather compact while young, but with age becoming more open. C.L.A. 11:308. F.E. 29:409. Gn.M. 2:111. Var. densa, Rehd. Low form making a dense sometimes almost hemispherical bush with ascending branch-lets: lvs. like those of the preceding form. Var. chinensis, Rehd. & Wilson (T. bac tata var. chinensis, Pilger). Lvs. more falcate, lighter green, 3/4-3/2 in. long, convex above with the midrib very slightly raised: seeds broadly ovoid, slightly compressed, slightly 2-angled. Cent. and W. China.—This variety fruits very profusely. The plant offered as var. cuspidata does not differ from typical T. cuspidata.

canadensis, Marsh. (T. baccata var. minor, Michx. T. baccata var. canadensis, Gray. T. minor, Brit.). Fig. 3781. Prostrate shrub, with wide-spreading slender branches, rarely more than 3 ft. high: lvs. shorter and narrower, less crowded and of a lighter, more yel-lowish green than those of T. baccata, assuming in winter usually a reddish tint: fr. ripens about 2 months earlier than that of T. baccata; seeds depressed, broader than long: fls. monocious (at least usually). Newfoundland to Man., south to Va. and Iowa. B.B. (ed. 2) 1:167. V. 14:252. Gn.M. 2:22.—In cult. it becomes usually a more upright and less straggling shrub.

brevifolia, Nutt. Fig. 3782 (adapted from Pacific R. R. Report). Tree, 40-50 or occasionally 80 ft. high, with slender horizontal or somewhat pendulous branches forming a broad, open, pyramidal head: lvs. distinctly 2-ranked, sharply pointed, dark yellowish green, 7/10 in. long: seeds ovoid, 2-angled. Brit. Col. to Calif. S.S. 10:514.—Probably as hardy as T. baccata.


—T. karinna, Hort. = Ephedrataxus Harringtonia var. instigatorii.

—T. Wallachiana, Zucc. Tree, to 100 ft.: lvs. gradually long-acuminate, 1-1 1/2 in. long. Himalayas, Malay Archipelago, Philippine Isls. Apparently not in cult. ALFRED REHDER.


TEAK: Tectona.

TEASEL: Species of Dipsacus.

TÉCÓMA (abridged from the Mexican name Tecomaxochitl). Including Stenolobium, Bismarckia. Ornamental shrubs, grown for their showy flowers.

Upright plants with herbaceous shoots: lvs. opposite, odd-pinnate, rarely simple; lfts. serrate, membranous: fls. in terminal panicles or racemes; calyx tubular-campanulate; corolla campanulate; stamens included, with diverging anther-claws: disk cupulate, crenate: caps. linear, with leathery valves; seeds narrow-elliptic, with 2 large thin wings.—About 3 species from Fla. and Texas to Argentina. The trumpet-vine, commonly referred to Tecoma, will now be found under Campsis.

The tecomas are upright shrubs with pinnate deciduous or subpersistent foliage and large and showy usually yellow flowers in terminal clusters. They stand but little frost and are well suited for cultivation in Florida and southern California. Propagation is by seeds which are usually freely produced and by green-wood cuttings under glass.

The yellow elder, T. stans, grows exceedingly well on high pine-land and is perfectly at home in Florida, attaining an immense size if well fertilized and mulched, dense masses 15 to 25 feet high and as much through being not at all rare. This tecoma is the glory of the south Florida gardens in autumn, as is the beautiful Bauhinia purpurea in April. No shrub is better adapted for the new settlers in the sandy pine-land gardens. When covered with its large fragrant flowers it is visited by numberless hummingbirds and insects. Owing to its rapid growth and dense foliage from the ground, the yellow elder is highly valued as screen for
TECOMA

TECOMARIA 3317

unsightly fences and buildings. This tecoma ripens its seed so abundantly that hundreds of seedlings come up around the old plant. The value of this shrub, blooming so late in autumn, cannot be overestimated. T. mollis, incorrectly known to the trade as T. stans var. velutina, also does well, but being a native of Guatemala it is much less hardy than the former. The growth is more upright and stiff, the leaflets are much larger, less serrate, and much darker green and the flowers, which are borne in terminal panicles, are smaller and without fragrance and the color is a much lighter yellow. It also flowers several weeks earlier than T. stans. The foliage looks crimped and often blackish, being attacked by a kind of aphid and by several fungi. T. Smithii is said to be a hybrid between T. mollis and Tecoma capensis, raised near Melbourne, Australia, by Edwin Smith. The plant comes true from seed, and seedlings flower when about a year old, beginning to open their large clusters of yellow and reddish trumpets in April and continuing with short intervals until cut down by frost in December. (H. Nehrling.)

A. Fls. pure yellow, funnel-form-campanulate, abruptly contracted above the base.
B. Lvs. glabrous or nearly so.

T. stans, Jess. (Stenolobium stans, Seem.). YELLOW EKAZA. Upright shrub: lvs. odd-pinnate; lfts. 5-11, almost sessile, oblong-ovate to lanceolate, acuminated, serrate, glabrous, 2-5 in. long and ¾-1 ¼ in. broad: fls. in large, terminal racemes or panicles; corolla funnel-form-campanulate, yellow, 1½ in. long; anthers pubescent; calyx with 5 short teeth; caps. linear, 5-7 in. long. Sept.-Dec. S. Fla. to W. Indies and S. Afr. EXOT. T. mollis, Humb. & Bonpl. (T. velutina, Lindl.). Similar to the preceding, but pubescent: lfts. 5-9, oblong-ovate to lanceolate, acuminate, less deeply serrate or almost entire, villous-pubescent on both sides or only beneath, 2-4 in. long: fls. like those of the preceding, but smaller and paler and not fragrant: lfts. obtuse or acutish, serrate, glabrous, 2-5 in. long; calyx with 5 short teeth: caps. linear, 5-7 in. long. Sept.-Dec. S. Fla. to W. Indies and S. Afr. EXOT.

Smithii, W. Wats. Fig. 3783 (adapted from The Garden). Upright shrub: lvs. odd-pinnate; lfts. 11-17, oblong, obtuse or acutish, serrate, 1-2 in. long: fls. in large, compound panicles, sometimes 8 in. long and as broad; corolla tubular-funnel-form, with 5 reflexed rounded lobes, bright yellow tinged with orange, 1½-2 in. long. Sept.-Jan. Intro. from Austral and supposed to be a hybrid of T. mollis and Tecoma capensis. G.C. I1. 14:169. Gn. 48:23. I.H. 43:55, 107. Gt. 44, p. 52. G. M. 36:627. J.H. III. 42:371. Blooming in the greenhouse in winter and well suited for culture in pots. It has been said that it comes true from seed, but plants raised by Franceschi from seed received from the originator had mostly pure yellow fls.

Garrócha, Hieron. Glabrous small shrub: lvs. 3½-5 in. long; rachis narrowly winged; lfts. 7-11, short-stalked, oblong-ovate, acuminate, serrate, 1-2 in. long: fls. in slender racemes forming terminal panicles 4-6 in. long; calyx with long-acuminate teeth; corolla about 2 in. long, yellow with scarlet tube, slender, very gradually narrowed toward the base, limb ¾-1 in. across; anthers slightly exceeding the mouth: caps. 2½-4 in. long. July-Aug. Argentina. A smaller and more graceful plant than T. stans, strikingly handsome with its bright yellow and scarlet fls.


ALFRED REHDER.

TECOMARIA (name derived from Tecoma, alluding to its affinity). Bigmondeaceae. Warm-country plants, grown for their showy bloom. Evergreen shrubs with slender, often serar ominous branches: lvs. opposite, odd-pinnate; lfts. sessile; fls. in terminal panicles or racemes; calyx campanulate, regularly 5-toothed; corolla funnel-form, slightly curved; stamens mostly exerted, with pendulous diverging filaments; disk cupulate; capsules linear, compressed. Five species in Cent. and S. Amer. and in S. Afr.

The tecomarias are half-climbing or nearly upright
shrub with handsome pinnate foliage and yellow, orange, or scarlet flowers in rather dense terminal clusters. They can be grown outdoors only in tropical regions. Of the several species in cultivation only *T. capensis* seems to be planted in southern California and Florida. Moderate pruning in spring insures a more profuse blooming. Propagation is by seeds and by cuttings under glass in spring or in midsummer.

The cape honeysuckle, *T. capensis*, grows most luxuriantly in Florida gardens and in those all along the Gulf coast. It is usually grown on trellises on verandas and piazzas with a southern exposure. Of all the species this is the best and most suitable for verandas, being a dense and compact grower, evergreen, almost constantly in flower, easily kept in health and readily trained into shapely specimens. If the long shoots are cut back severely, the plant can be easily trained into shrub form. These long shoots, usually lying flat on the ground, readily strike root and form an excellent material for propagation. *T. capensis* and *Tecoma Smithii* are the only ones which grow and flower fairly well as pot-plants in northern greenhouses. They need good soil and rather large pots to do well. If not well cared for they lose most of their foliage and look poor and unsightly. (H. Nehrling.)

*capensis*, Scem. (*Tecoma capensis*, Lindl.). *Cape Honeysuckle*. Half-climbing or nearly upright shrub: lvs. odd-pinnate; lfts. 7-9, broadly oval to ovate, acute, serrate, glabrous, ½-2 in. long; fls. in peduncled terminal clusters; corolla tubular, curved, with 4-parted spreading limb, the upper lip emarginate, orange-red to scarlet, about 2 in. long; calyx 5-toothed: caps. 4-5:1, ovate, acuminate, 1-2 in. long, with a narrow tube and obovate segments. India, Malaya, and the Philippines. *T. smithii*, Baker (not known to be in the trade), has longer peduncles, longer and narrower scarcely undulate lvs., and narrow oblong segments. Species largely at New York City in protected places, but usually the plants do not thrive more than a year or two; they ought to do better farther south. Blooms very early in spring. Fls. violet-scented.

F. TRACY HUBBARD.

**TECÔRIA** (Latin for cover, the indusium having shield-shaped coverings). *Polyopodaceae*. A group of ferns, mostly of large and coarse habit, with superior form, often heart-shaped indusia fixed by the sinus, as in Dryopteris, but with veins uniting freely to form arcsides with free included veinlets. About 25 species are known, largely from the E. Indies, a few from Trop. Amer. By some included in Polystichum.

decícrens, Copeland. 1-fl.-stalks narrowly winged from a creeping rootstock: lvs. 2-4 ft. long, 1 ft. or more wide, cut down to a winged rachis and with 4-8 pairs of pinnae 5-12 in. long, 1-2 in. wide; sori large, in 2 regular rows between the principal veins. India to Polynesia.

cícutária, Copeland. Fig. 3784. Caudex stout, erect, scaly above; lvs. 6-8 in. to 1½ ft. long; pinnae horizontal, suboblong, suboblong from a rather broad truncate base, 2-3 in. long; sori on disk of larger pinnae in 2 rows, oblong, those on terminal narrow segments solitary, quite marginal. Trop. Amer.

**TECÔNA** (derived from Tekka, the Malabar name of *T. grandis*). *Symplocos*. Tall trees, stellately tomentose, including the well-known teakwood, sometimes grown in the warmhouse as a curiosity. Lvs. opposite or ternately verticillate, large and entire; cymes dichotomous, many-fl., arranged in a large terminal panicle: lvs. small, white or bluish, sessile; corolla-campanulate, shortly 5-6-cleft, inflated in fr.; corolla-tube short, limb spreading, 5-6-cleft; stamens 5-6; ovary fleshy, 4-celled, each cell 4-seeded, included in the calyx, 4-celled; endocarp bony. —Three species, Asia, India, Burma, Malaya, and Philippines.

*grandis*, Linn. *Teak*. Tree, 80-150 ft. high; branchlets quadrangular: lvs. 8-12 in. (of seedlings sometimes 3 ft.), ovate, cuneate at both ends, close tomentose beneath: fls. white or bluish, numerous, but only a few fertile, in pinicles 18 in. diam.; calyx stellately white-tomentose, 1 in. diam. in fr. when it is ovoid or sub-spherical; corolla scarcely ¼ in. long. India, Malaya.

——The timber of this important tree is much used in ship-building because of its durability, great strength, and the ease with which it can be worked. Not planted in this country except experimentally.

F. TRACY HUBBARD.

**TEEDIA** (named for Teophila Billoiti, daughter of a botanist). *Amaryllidaceae*. *Chilean Crocus*. Bulbous plants, useful for blooming in pots indoors early in the spring. Lvs. radical, few or 1, inclosed in a long scarious sheath at the base; blade spreading, linear or lanceolate; scape included with the lvs. at base in the sheath, otherwise leafless, 1-fl., or laxly few-fl.: fls. blue; perianth campanulate, 6 segments; stamens 3 perfect and 3 staminodia; ovary 3-celled: caps. ovate conical toward the top, loculicidally dehiscent. —Two species, Chile. The botanical position of *Teochilina* is open to discussion, but the inferior ovary seems to take it out of the Liliaceae, with which it has been placed by some writers. The plants are useful for blooming in pots indoors early in spring. *T. violiflora*, Bent., does not appear to be introduced.

**TEÊNÔSIA** (named for J. G. Teede, German botanist). *Scrophulariaceae*. *Glauabrous or pubescent shrubs, grown in the greenhouse. Lvs. opposite, ovate, entire; peduncles in the upper axils, bearing a few-fl. cymose infl.: fls. rose, rather small; calyx deeply 5-cleft, lobes narrow; corolla-tube cylindrical, limb spreading, 5-lobed, lobes subequal, rostrate; stamens 4: berry subglobose, indehiscent. —Two species, S. Afr. The foliage of both species has an objectionable odor.

icida, Rud. *Glauabrous*: at. 4-cornered: lvs. oblong-ovate, acuminate, 2 in. long, decussate; petioles winged
Alternanthera the tube is short or almost none, the anther-bearing stamens sometimes less than 5, and the staminodia much shorter than stamens, 2-3-cuspid at apex.—To this variable species appear to belong the garden names picta, tricolor, aurea, aurana compacta, paronychoides, versicolor aurea, magnifica, and others. Var. typica, Regel (Alternanthera paronychoides, Hort.), is low, 2-3 in. tall, with olive-colored lvs. and the upper ones red at apex. Var. spathulata, Regel (A. spathulata, Lem.), is 6-8 in. tall, the st. and lvs. red. I.H. 12:445.

versicolor, Regel. Fig. 3785. Usually becoming taller, much branched, and apparently less used for carpet-bedding than the others; lvs. round-spatulate, narrowed into a short petiole, the colors mostly in shades of copper-red or blood-red, with patches of green between the veins: fl.-heads sessile, single or in pairs. I.H. 12:449.

ficioidea, Moq. St. herbaceous, repent at base and ascending, angled and striate, glabrous, or puberulent above and in the fl.-axils: lvs. spreading or deflexed, short-stalked, broadly lanceolate, attenuate and some­what mucronate: fl.-heads sessile, single, in pairs or 3's, terminal and axillary; bracts ovate-lanceolate, acu­minate, nearly or quite entire; staminodia much shorter than stamens, 2-3-cuspid at apex.—To this apparently belong the garden names amabilis, spectabilis, sessilis, roezel, Reinhardii.

A. Lvs. essentially spatulate.

Bettzickiana, Regel (originally, in 1862, spelled as here, but changed by the author in 1862 to Bettzichiana). Fig. 3785. Plant described as suffruticose and erect, the st. branched at base and terete, adpressed-pilose but becoming glabrous: lvs. narrow, spatulate, narrowed into long petiole, apex acuminate and some­what mucronate: fl.-heads sessile, single, in pairs or 3's, terminal and axillary; bracts ovate-lanceolate, acu­minate, nearly or quite entire; staminodia much shorter than stamens, 2-3-cuspid at apex. —To this variable species appear to belong the garden names picta, tricolor, aurea, aurana compacta, paronychoides, versicolor aurea, magnifica, and others. Var. typica, Regel (Alternanthera paronychoides, Hort.), is low, 2-3 in. tall, with olive-colored lvs. and the upper ones red at apex. Var. spathulata, Regel (A. spathulata, Lem.), is 6-8 in. tall, the st. and lvs. red. I.H. 12:445.

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3785. Spray of Telanthera ammata; also leaf-outlines of a, T. ammata; b, T. Bettzickiana; c, T. versicolor. (XI)
TELENTHERA

acuminatesubciliate, much longer than outer sepals. Brazil.—The T. ficoides, Hort., may be a form of one of the other species.

TÉLÉKIA: Buphthalmum.

TELEPHIUM (an old Greek name). Carvophyllo-
äsæ, in Engler & Prantl; Die Natürelchen Pflanzen-
-familien, Ficoidæ, in Bentham & Hooker, Genera
Planae, Order. One species, T. Imperati, Linn., is listed abroad as a hardy perennial but it has little to commend it to the cultivator: it is a low plant with woody base and slender prostrate sts., with erect or ascending branches: lvs. many, ½ in. long, alternate or scattered, oval or elliptic, entire: fls. several and inoperculous, in small compact clusters. Perhaps valuable on banks or as a carpet.

The genus Telephium comprises 2 or 3 species in the Medit. region, being diffusely branched and glau-
cous herbs: lvs. alternate, paired or opposite, without distinct midrib or nerves: fls. small, in compact terminal clusters, the 5 petals white but not showy; sepals 5, persistent; stamens 5; ovary ovoid, 3-angled and usually 3-celled, the styles 3 and short: fr. a dry capsule, included in the calyx.

TELFÁRIA (named after Charles Telfair, 1778–
1833). Cucurbitaceæ. Climbing shrubs, occasionally
grown in the warmhouse, of economic value in the tropics. Lvs. digitately compound; lfts. 3–5, oblong,
acuiulate at the base on the outside; tendril lateral and 2-cleft: fls. dicious, medium or large, male pedicels bracteate, pale purple; male raceme, calyx tubinate, lobes lanceolate; corolla rotate, 3-parted, segments obvate-cuneate, elongated, filiform-tendrilled; stamens 3; female solitary, calyx and corolla like male; stamens rudimentary or none; ovary oblong, 3–5-

pedátæ, Hook. (Fenúlla pedítæ, Sims). Root stout, fleshly: st. perennial, 50–100 ft. long: lvs. long-petioled; lfts. 3–5 in. long, acuminate, repand-toothed, glabrous except nerves beneath: fls. pale purple, fringed, male 2
in. across; petals obvate-cuneate; female fls. about 4 in. across; ovary obtusely 10-ribbed: fr. fleshy, sometimes weighs 60 lbs., 200–300-seeded; seed 1 in. broad. Zanibar. B.M. 2851; 2751, 2732.—Intro. into S. Calif. but not successful. The seeds are roundish, about an inch across, and the kernels are sweet to the taste, and are said to be as good as almonds. The negroes of Trop. Afr. boil and eat them. These seeds also yield an abundance of oil which has been said to be equal to olive oil. The fr. becomes 1½–3 ft. long and 8
in. wide. It is oblong in shape, has 10–12 deep furrows, and is always green. Both male and female fls. are 5-
lobed, copiously fringed and purple in color, the females somewhat brownish, with a circular green throat, while the males have a 5-pointed star of green in the middle. The male fls. are about 2 in. across, females 4 in. across, with an ovary 2 in. long. The foliage has an unpleasant smell when bruised.

T. occidentalis. Hook. var. is very similar to T. pedata, but the lfts. are all triple-nerved from near the base (those of T. pedata all at an angle of 45° from the midrib): fls. smaller. Upper Guiana. Said to be cult. for the seeds which the negroes boil and eat.

TÉLLIMA (anagram of Mitella). Saxifragaceæ. Erect rather simple hardy herbaceous perennials, the western American representatives of Mitella, well adapted to the wild-garden.

Plants pilose or glandular: lvs. petioled, subrotund-
cordate, lobed, dentate; stipules none or adnate to the base of the pedicels: fls. pedicelled, nodding, greenish or white; petals red-calyx-tube large, dilated or inflated, campanulate, 5-toothed or 5-lobed; petals 5, usually elongate, entire, 3-fid or pinnatifid, sessile or clawed; stamens 10; ovary semi-superior, conical, 1-
celled: caps. membranaceous, 1-celled, many-seeded.—About 10–12 species, W. N. Amer. Tellima differs from Mitella mainly in the caps., which is 2-beaked in Tellima, not beaked in Mitella.

a. Petals privately cut into long, thread-like segms.

b. Fls. not fragrant.

rhíba, Hort., grows 1 ft. high, has red foliage and yellow fls.

bb. Fls. fragrant.

donátà, Howel. Height 1–2 ft.: lvs. broadly cordate, obscurely lobed and crenately toothed: fls. red. Wet
places near Columbia River.

AA. Petals palmately 3–7-lobed or -parted.

b. Basal lvs. not divided to the base.

affinis, Gray (Lithophryna affinis, Gray). Sts. stout, 1–2 ft. high: lvs. radicil, roundish in outline, crenately lobed, varying into the calyce; calyx mostly parted into 3 broad divisions, which are deeply incised or merely toothed: calyx turbinate; petals 3-lobed at the apex. Orc. to S. Calif.

BB. Basal lvs. divided to near the base.

parviflóra, Hook. (Lithophryna parviflóra, Nutt.). Height ⅛–1 ft.: lvs. mostly 3–parted or -divided, the divisions narrowly cuneate and once or twice 3-lobed into narrow lobes: fls. pink or sometimes white; petals with a slender claw, the limb palmately 3–7-parted. Brit. Col. to Utah and Colo.

T. rubrotín, Hort., is offered in the trade abroad, as a plant growing 1 ft. high with beautiful foliage and very pretty fls. Probably it is T. grandiflóra var. rhíba. F. TRACY HUBBARD.

TELÔPEA (Greek, seen at a distance, of fanciful application). Proteaceæ. Tall shrubs, occasionally
grown in the greenhouse and one species has been experimented with in S. Calif., but so far has not proved very successful. Lvs. alternate, entire or dentate: fls. white; petals red, hermannifolia, 3–7-parted, densely racemose; racemes terminal, subglobose or ovoid; bracts exterior, membranaceous, colored; perianth-
tube elongate, segms. at length more or less separated; disk fleshy, strongly oblique but almost perfectly anu-
late; ovary long-stipitate, fr. oblong, 3–7-celled: fr. elongate, base swollen, many-seeded: seeds edible.—One species, 2
Australian, 1 Tasmanian. An earlier name of the genus is Hylogyne, but Telopæa

speciosissíma, R. Br. (Embothrium speciosissimum, Smith). WARATAH. WARRATAH. Stout glabrous
shrub 6–8 ft. high: lvs. cuneate-oblong, 5–10 in. long, mostly toothed in the upper part, coriaceous: fls. crimson, in a dense ovoid or globular head 3 in. across; involucral bracts colored, the inner ones 2–3 in. long. New S. Wales. B.M. 1128. G.C. II. 17:677; III.
55:348. Gn. 22:400. I.H. 34:29.—One of the showiest
flowers of the southern S. Wales. The heads are 3 in. across and 3–4 in. deep and bear a rough resemblance to a florist’s chrysanthemum. The showiest parts, however, are involucral bracts. This plant is known as waratah. It is one of the most distinct members of its family, for a horticultural account of which see Protea. Seeds of this species are imported into Calif. frequently, but although they germinate readily, the seedlings damping-off still more readily. Probably if the plant were once established it could be easily prop. by layering or by cuttings.

F. TRACY HUBBARD.
TEMPLETONIA

(Templetonia) (J. Templeton, botanist of Belfast, early part of 19th century). *Leguminosae*. Coral Bush. Shrub or rarely subshrub, cultivated in the greenhouse abroad and hardy outdoors in the extreme S., where they may be used as ornamentals. Lvs. alternate, simple, entire or reduced to minute scales; stipules small or none; fls. red, yellow, or purple, axillary, solitary or 2 or 3 together; calyx 5-lobed, lobes unequal; standard obovate or obovate-lanceolate, rarely ovate; petals long, broad teeth, the lowest longest; pod sessile or stipitate, much flattened, ovate-oblong or linear, completely dehiscent.—About 8 species, Austral. Said to do best in a mixture of sandy loam and peat. Prop. by cuttings.

T.EOSINTE: *Fuchsia.*

TEPHROSIA (Greek, *tephros*, ash-colored, hoary; referring to the foliage). *Leguminosae*. Hardy or half-hardy perennial herbs, subshrubs, or rarely shrubs, of low horticultural value.

Leaves uneven-pinnate; lfts. numerous, rarely 1-3, linear; stipules bristle-like or broader and striate; racemes terminal, opposite the lvs. or in the upper axes; fls. in fascicles of 2-6, red, purple, or white; calyx-lobes subequal or the 2 upper longer; petals clawed, standard suborbiculate, outside more or less silky-villous; wings obliquely obovate or oblong; keel incurved, obtuse or rather acute; ovary sessile, many-ovuled; pod linear, rarely ovate, compressed 2-valved.

—About 170 species, natives of the warmer regions of the world.


grandiflora: Pers. (*Galega grandiflora*, Vahl). Rigid shrub 1-2 ft. high, pubescent or nearly glabrous; lvs. short-petioled; lfts. 5-7 pairs, cuneate-oblong or linear-oblong, variably pubescent on both surfaces; fls. fasciculate-corymbose, red, pubescent on the outside 8-10 lines long; pod broad, linear, plano-compressed. S. Afr. B.R. 769.


macrantha, Rob. & Greenm. Fig. 3786. Shrub, 6-10 ft. tall; lvs. odd-pinnate; lfts. about 10-12 pairs, oblong-linear, entire, short-acute or cuspidate; fls. in loose terminal panicles 1 ft. long, shaded purple and white, nearly as large as sweet peas; standard very large, erect, oblong-obovate. Mex. G.F. 7:175 (reduced in Fig. 3736).—A very showy plant, deserving of planting where hardy. Pringle writes that “for weeks it lights up the thickets of hillside ravines with masses of pleasing color.”

F. TRACY HUBBARD.†

TERMINALIA (alluding to the leaves being borne upon the terminus of the shoot). *Combretaceae*. Only one species, *T. Catappa*, the Indian almond or tropical almond, is well known in American horticulture, but several others are important in the Orient, principally for their fruits, known as myrobalans, which are used in dyeing, tanning, and in medicine.

Leaves alternate, or rarely opposite, often crowded toward the ends of the branchlets, usually petiolate and entire; fls. sessile or nearly so, small, hermaphrodite or polygamo-dioecious, usually in elongated spikes but sometimes in heads; calyx-tube ovoid or cylindrical, constricted above the ovary, the limb urn-shaped or campanulate, 5-toothed, usually deciduous; petals none; stamens 10, in 2 series, the 5 inferior opposite the teeth; filaments exserted, subulate or filiform; anthers oblong-linear, entire, short-acute or cuspidate: fls. sessile or nearly so, small, hermaphrodite or polygamo-dioecious, usually in elongated spikes but sometimes in heads; calyx-tube ovoid or cylindrical, constricted above the ovary, the limb urn-shaped or campanulate, 5-toothed, usually deciduous; petals none; stamens 10, in 2 series, the 5 inferior opposite the teeth; filaments exserted, subulate or filiform; anthers oblong-linear, entire, short-acute or cuspidate; pod sessile or stipitate, much flattened, ovate-oblong or linear, completely dehiscent.—About 100 species distributed throughout the tropics, principally in S. Asia, with only a few in Amer.

Catappa, Lindl. TROPICAL ALMOND. INDIAN ALMOND. MYROBALAN. ALMENDRO. AMENDOEIRA. Fig. 3787. A tall, stately tree, up to 80 ft. high, with horizontal branches arising from the primary axis in whorls 3-6 ft. apart; bark smooth, brownish gray; lvs. clustered at the ends of the young branchlets, alternate, entire, oblongate, obtuse to subacuminate at the apex, alternate toward the slightly aeated base, 6-12 in. long, 3-6 in. broad, coriaceous, glabrous above, very finely pubescent below, venation slightly raised on both surfaces but most prominent below; petiole stout, under 1 in. long, flattened above, rusty-pubescent; fls. whitish, upper ones staminate and lower ones perfect, in finely pubescent spikes up to 6 in. long; calyx-segments acute, slightly concave, valvate in bud, finely pubescent; filaments subulate, inserted upon the hairy disk; anthers coriaceous: fls. red, yellow, or purple, axillary, solitary or 2 or 3 together; calyx 5-lobed, lobes unequal; standard very long, emarginate or mucronate, inserted upon the hairy disk; anthers cordate: fls. red (or rarely white); calyx with 4 very short, broad teeth, the lowest longest; pod sessile or stipitate, much flattened, ovate-oblong or linear, completely dehiscent.—About 170 species, natives of the warmer regions of the world.

3786. Tephrosia macrantha. (×½)

3787. Nut of tropical almond. —Terminalia Catappa. (×3½)
winged in transverse section, 11/2-2 in. long, indehiscent, greenish or reddish, glabrous, with a firm, fleshy exocarp and a hard endocarp inclosing the oblong-elliptical seed; testa membranous, the cotyledons with spiral grooves. 

T. orientalis, indigenous to beach forests of the Andaman Isl., but now cult. widely throughout the tropics; Schimper points out that the frs. are adapted for dispersal by ocean currents, the thick husk containing air-cells enabling them to float for a long time. The tropical almond (so-called, but not related to the true almond) is extensively planted in S. Fla., the W. Indies, Cent. and S. Amer., as a street and ornamental tree. Its greatest disadvantage seems to be that it is deciduous during the cold season (shedding its lvs. in November) in Ceylon; according to Macmillan, it is not grown in Calif., but is probably too tender for most locations in that state. Prop. seems to be exclusively by seed.

T. Arjuna, Bedd., a large tree indigenous to Cent. and S. India, and parts of the country, has recently been intro. to the U. S. and is doing finely in S. Fla. The bark is sometimes used in dying and tanning, according to Watt. T. javanica, Thunb., not Sieb., is the best known. Its heads have only 4 fls. They are modified into spines. The original species, T. canescens, Oliver, is a tree with narrow lvs. indigenous to Malayas. Under the name of T. elongata, Blanco, a plant has recently been intro. to the U. S. from the Philippines which is probably T. javanica. It is doing well in S. Fla. and promises to be an unusually handsome ornamental. Barrows says of it "this magnificent large forest tree occurs very commonly, in the provinces of Bataan and Cavite (Philippines). In the rainy season abundant crops of cherry-like frs., about the size of plums, are produced. Each fr. contains 1-3 seeds. The pulp of the fr. or some other acid juice makes a beautifully colored jelly.'" The tree is known as "kalumpit" in the Philippines.

T. edulis, Bedd., a large tree indigenous to Malaya.-Under the name of T. amblycostatum, Lour., is the best known. Its heads have only 4 fls. They are modified into spines. The original species, T. laciniata, Bedd., a large tree indigenous to Cent. and S. India, and parts of the country, has recently been intro. to S. Fla., the W. Indies, Cent. and S. Amer., as a street and ornamental tree. The plant is of easy cult. in a cool greenhouse. No method of prop. by the bulb is known.

T. sinense, Oliver. Tall tree with smooth pale or somewhat greenish-brown lvs. very commonly in the provinces of Bataan and Cavite (Philippines). The tropical almond, although not closely related, but it is easily distinguished by the alternate lvs., solitary, not in clusters; petals 5; stamens numerous; ovary 2-3-celled (sometimes imperfectly so); fr. indehiscent. About 45 species, warmer Asia, Indian Archipelago and Trop. Amer.


T. japonica (from testudo a tortoise, alluding to the supposed resemblance to a tortoise of the above-ground roots). Dioscoridès. The Hottentot's Bread, Tortoise Plant, or Elephant's Foot. Perennial plants bearing a slender twining vine from a large hemispherical rhizome or caudex which is above ground and solid-fleshy or woody; sometimes grown in the greenhouse as curiosities or for illustration to students of botany, but not in common cultivation.

T. orientalis, from Greek words, lvs. alternate, short-stalked, entire, ovate-oblong or oblong, glabrous, feather-veined; fr. clustered; berries about the size of peas. Japan. S. Z. 1:81.

TESTUDINÄR (from testudo a tortoise, alluding to the supposed resemblance to a tortoise of the above-ground roots). Dioscoridès. The Hottentot's Bread, Tortoise Plant, or Elephant's Foot. Perennial plants bearing a slender twining vine from a large hemispherical rhizome or caudex which is above ground and solid-fleshy or woody; sometimes grown in the greenhouse as curiosities or for illustration to students of botany, but not in common cultivation.

T. orientalis, from Greek words, lvs. alternate, short-stalked, entire, ovate-oblong or oblong, glabrous, feather-veined; fr. clustered; berries about the size of peas. Japan. S. Z. 1:81.
TETRAGONIA

TETRAGONIA (Greek, four-angled, referring to the usually four-angled fruit). Aizoaceae. Here is included a garden vegetable of minor importance.

Herbs or subshrubs from the southern hemisphere and Japan; usually decumbent; lvs. alternate, short-petioled, somewhat fleshy; fls. yellow, green, or reddish, axillary, apetalous; calyx 3-5-lobed. — Only 1 species in cult., but 20 or more species are known in E. Asia and the southern hemisphere.

TETRAGONIA expansa, Thunb. New Zealand Spinach. New Zealand Ice-Plant. Fig. 3788. A hardy or half-hardy annual 4-8 in. high, often spreading 4-6 ft.; lvs. triangular, larger ones 4-5 in. long by 2-3 in. broad; fls. small, yellowish green. New Zeal. B.M. 2962.

New Zealand spinach is chiefly useful for furnishing greens during the summer when the common spinach cannot be grown. It tastes something like spinach but is somewhat tougher, as a rule. It is grown to some extent in California both for man and sheep. It readily self-sows. For an early outdoor crop, fresh seed should be sown in rich soil in a warm room in January or early February. The seed may germinate in a week or ten days but frequently requires a month to start. After growing about two weeks the seedlings should be transplanted to thumb-pots and about a month later to 4-inch pots. Growing vigorously in this condition they will be good-sized plants to move into the garden toward the end of April, where they should be set 3 to 4 feet apart each way, and the plants, when grown, will entirely cover the ground. They should be handled with great care in transplanting, otherwise growth will be so checked that it will require several weeks to recuperate. Again, plants should never be allowed to become pot-bound, as this will immediately bring them into flower and fruit and stunt their further growth, as well as greatly shorten their period of productiveness. Well-grown plants should be ready for use by June 1 and, if vigorous growth continues, nearly a peck of greens can be gathered from each plant once a week until heavy autumn frosts. In gathering, only 4 or 5 wecks of the tip ends of the larger plants should be taken. In the South, it is usually dwarf, not generally exceeding 6 to 8 inches. There is another and somewhat easier method of growing the crop, although a given area will be less productive. Inasmuch as the plant is a hardy annual, many seeds which ripen late in autumn will fall to the ground and germinate early in spring, though not early enough for the plants to be injured by spring frosts. These will be large enough for use toward the end of June. Annual crops are thus grown on the same ground several successive seasons with no care except removing old plants and keeping the ground free from weeds.

For the forcing-house crop, seed should be sown during July in seed-beds where the plants remain until the latter part of September, when they should be taken directly to the benches and will be ready for use early in November. It is best to set the plants about 18 inches apart in benches at least 6 inches deep. No further attention is necessary except to give plenty of water, and under good conditions a peck of greens will be produced once a week on 4 square feet from November to May inclusive. A crop may also be grown beneath the benches near the walks, as well as in the grapeviny borders. Space that cannot be used for other purposes may thus be utilized to very good advantage, although the plants will not produce so abundantly.

This crop may also be grown in houses with portable roofs by starting the plants in summer in houses with the roofs removed, the roofs being replaced on the approach of cold weather. The plants will continue producing the entire winter and following spring, when they should be uncovered and will reproduce themselves in the same way as the summer crop.

F. H. C. Ireland.

TETRAGONOLOBUS: Lotus. The following species now in cult. was not treated in Vol. IV, p. 1917. Lotus siliquosus, Linn. (Tetragonolobus siliquosus, Roth). Perennial, trailing, hirsute: rhizome slender, branched: roots spreading: lvs. oblong or oblanceolate; petioles with the stipules shortly adnate: peduncles 1-fld., much longer than the fls.; fls. pale yellow; calyx-segms. lanceolate; pod with straight wings much narrower than the body. Medit. region.

TETRAMICRA: Leptotes.

TETRANEMÁ (Greek, four and filament; the genus is characterized by having 4 stamens). Scrophulariaceae. Perennial herbs, grown in the greenhouse. St. very short or in cult. slightly elongated, ascending: lvs. nearly radical, opposite, obovate or oblong, slightly crenate-dentate, base angulate, glabrous; peduncles axillary, scape-like, longer than the lvs., bearing an umbel-like cyme at the top: fls. short-pedicelled, nodding, purple-violet, variegated paler; calyx 3-parted; corolla declinate, posterior lip shortly 2-lobed, anterior larger, 3-lipped; stamens 4: caps. rather compressed, loculicidally dehiscent.—Two species, Mex. and Guatemal. T. mexicanum, Benth., is the only species cult., known as the "Mexican foxglove" and formerly as Pentaster mexicanus. The pretty fls. are borne in profusion on the summits of slender purple scapes 6-8 in. high. Although essentially a summer bloomer, with good care it may be made to flower most of the year. It is usually regarded as a greenhouse subject, but it makes a good window-plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds. B.M. 4070. B.R. 29:52. H.U. 6, p. 71.

F. TRACY HUBBARD.

TETRAPANAX (four and parax, referring to the four-merous flower structure). Araliaceae. By Bentham & Hooker (Gnetum Plantarium) this genus is included in Fatsia, and is so treated in Vol. III, page 1204. By others, however, it is kept distinct, and the plant known as Fatsia japonica then becomes T. papyrifera, Koch, the only species. The reader may take his choice whether to name the plant in one genus or the other;
the preference probably lies with placing it in Tetrapanax. This genus, if accepted, differs from Fuchsia in its four-merous rather than mostly five-merous flowers, with the numerous ovary, the tomentose-lanate character, and other features. T. papyrifera is an excellent subtropical subject.

Patsia japonica, Deane & Planch., remains in that genus, as treated on page 1294.

TETRASTIGMA (Greek, four and stigma, in reference to the 4-lobed or 4-parted stigma). Viáceae. About 40 species in Trop. and Subtrop. Asia of shrubs climbing by tendrils: lfts. alternate, digitate or pedate; petals 3-5, sometimes reduced to 1; tendrils with adhesive disks or twining; fls. polygamo-dioecious, in axillary cymes or umbels, 4-merous; petals spreading; disk adnate to the base of the ovary; stigma sessile, 4-lobed or 4-parted: berry 2-seeded; seeds ovoid-globose, sulcate on the inner surface. Allied to Cissus and Parthenocissus but easily distinguished by the sessile 4-lobed stigma and from the latter by the 4-merous fls. Of the numerous species only the following are occasionally cult.: T. obtectum and T. serrulatum are probably the hardiest, but tender in the N., and are graceful small-lvd. vines which may be used where vines of more delicate character are desired; the first species clings to walls, the second has twining tendrils. T. Hármandii is a tall-growing vine with larger lvs. and edible berries, suitable only for tropical or subtropical countries. For cult. and prop., see Cissus and Parthenocissus. T. obtectum, Planch. (Cissus obtéca, Wall.). Climbing with disciferous tendrils: branchlets hirsute: lvs. long-stalked, persistent or subpersistent; petioles pubescent; lfts. 5, digitate, sessile, cuneate-obovate to elliptic, acute, remotely crenate-serrate with mucronate teeth, glabrous, or in var. pilosa, Gagnep., pubescent beneath, 4½ in. long: fls. in axillary short-stalked cymes: fls. purple; petals ovate, oblique, not reflexed; ovary glabrous or rarely pubescent with 2 superposed ovules: caps. obovate-elliptic. R.B. 28:121.

bb. Lvs. rarely somewhat verticillate.

TETRATHECA (Greek, four and cell; the anthers are sometimes four-celled). Tremandracem. Slender glabrous or stellate-pubescent, heat-like little shrubs, grown in the greenhouse and out-of-doors in the far 4S. About 20 species, all from Austral. In European greenhouses all the plants of this family are considered difficult of cult. They are treated like many other Australian heat-like plants, being potted in fibrous peat and silver sand and watered carefully at all times. It is said that only soft rain-water should be used.

A. Lvs. terete, leafy.

b. Lvs. mostly verticillate.

thymifolia, Smith. Lvs. almost all verticillate in 3's or 4's, ovate-elliptical or lanceolate: fls. purple; sepals ovate-lanceolate, acute or acuminate, seldom reflexed; ovary glabrous or rarely pubescent, with 2 superposed ovules. B.M. 8028.

TETRATHECA (Greek, four and cell; the anthers are sometimes four-celled). Tremandracem. Slender glabrous or stellate-pubescent, heat-like little shrubs, grown in the greenhouse and out-of-doors in the far 4S.

Leaves alternate, verticillate or scattered, heat-like, entire, flat and toothed or reduced to minute scales: fls. 4-5-merous; stamens apparently in a single series; disk inconspicuous: caps. opening only at the edges.

A. Lvs. entire or the lower somewhat dentate.

b. Lvs. entire or the lower somewhat dentate.

Key to the Species.

A. Floras' whorls condensed into a terminal subglobose head.

b. Lvs. entire....................... 1 montanum

bb. Lvs. crenate.

C. Blades oblong or oblong-linear................ 2 Polium

cc. Blades roundate.................. 3 pyreanum

AA. Floras' whorls not condensed into a terminal head.

b. Calyx erect.

c. Lvs. entire or the lower somewhat dentate.

C. Lvs. entire or the lower somewhat dentate.

dd. Petals shorter than the floral lvs.

bb. Calyx dentate.

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The teucriums are little known in cultivation. They probably present no special difficulties to the gardener.
CXL. *Syringa* (lilac), Madame Lemoine.
Section I. Polium.

1. montanum, Linn. Low subshrub, prostrate, hoary or pubescent; stts., much branched at base, summit shortly ascending or rarely suberect and 2–4 in. high; lvs. oblong-linear, entire, base narrowed to a very short petiole, beneath or both surfaces hoary; floral whors few, condensed into a terminal head, which is hemispherical; fls. white becoming yellow; calyx tubular-campanulate; corolla small. S. Eu. and Orient. — A deciduous shrub. Var. flavescens, Benth. CT.

2. Polium, Linn. Low canescent-tomentose, lanate or rarely pilose-hispid shrubs, 2–6, rarely 12 in. high; basal branches procumbent, ascending or rarely suberect; lvs. cuneate-oblong or linear, sessile, crenate, margin revolute, upper surface very short-tomentose, densely lanate or pilose, color, especially above, yellowish hoary, golden or rarely green; floral lvs. similar; floral whors few, 2–6–fld., condensed in a globose or oblong head, which is solitary or often several corymbose globose-leaves; fls. white, yellow, or purple; calyx tubular-campanulate; corolla-acuminate. S. Eu. and Orient. — A deciduous shrub.

Section II. Chamaedrys.

4. Chamaedrys, Linn. Perennial or shrubby, 1–2 ft. high, base decumbent, branching, pubescent or villos: lvs. short-petioled, ovate or oblong, incised-crenate, base cuneate, both surfaces green and hirsute, especially near the margins and nerves; floral lvs. pilose, oblong-linear, entire, acute; floral whors few, condensed in a small terminal head; fls. yellow (or white); calyx campanulate; corolla-lobe, teeth acuminate-acute; corolla-tube included. S. Eu.

Section III. Scorodonia.

6. Scorodonia, Linn. Erect, hispid perennial, 1–2 ft. high, pubescent or subglabrous: lvs. ovate, 1–2 in. long, obtusely crenate, short-petioled, base rounded or cordate, both surfaces green; floral lvs. minute: raceme somewhat branched, rather paniculate above: fls. yellow; calyx rather villous, broad-campanulate; corolla-tube exserted, pubescent outside, the tube as long as the calyx. Eu. and adventitiously in E. N. Amer.

Section IV. Stachybotrys.

7. canadense, Linn. Erect, perennial herb, 1–3 ft. high, soft-pubescent or canescent; lvs. ovate-lanceolate to oblong-ovate, 2–3 in. long, serrate, base rounded, somewhat canescent beneath, short-petioled; floral lvs. sessile or on short branches, few, condensate and hispid; lvs. base truncate, rounded or cuneate, much branched, villous, sterile branches whip-like; calyx simple: fls. purple to cream-color; calyx short-pedicelled, campanulate, hoary and somewhat villous; corolla-tube elongated. Low ground, Maine to Brit. Col., southward to Pa., Ohio, Mo., New Mex., and Calif. — Useful for low grounds and moist borders.

8. hircanicum, Linn.; also spelled hyrcanicum. Erect perennial herb 1–2 ft. high, slightly branched, pubescent: lvs. ovate-cordate, 1–3 in. long, obtuse, coarsely crenate, base deeply cordate, scarcely pubescent above, softly somewhat canescent beneath; floral lvs. as subulate bracts; spike simple, 3–8 in. long, dense; fls. purple or red; calyx 2–lipped, corolla vines outside. Cau­casus and Persia.

Section V. Teucris.

9. bicolor, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, olanceolate or suberect, about 1 in. in long, obtuse, entire or incised, both surfaces green; floral lvs. usually exceeding the fls.: peduncles axillary, 1–fl., short, upper subraccmose: fls. blue and white; calyx broadly campanulate, green, teeth broad-lanceolate, acute; corolla-tube included. Peru and Chile.—Offered in Calif. at one time, but apparently not successful.

10. orientale, Linn. Erect perennial herb, about 1 ft. high, branched at base, green and glabrous or pubescent, canescent: lvs. 1–2-pinnatisect, lower 1½–2 in. long, segments, linear, entire or incised, both surfaces pale or green; upper lvs. smaller; floral lvs. minute: peduncles lacy racemose, irregularly 1–3–fl.; pedicles much longer than floral lvs.: fls. violet or blue; calyx campanulate, teeth lanceolate; corolla 3 times longer than calyx. Caucasus and Asia Minor.

11. fruticans, Linn. Shrub 2–3 ft. high, divaricate branching: lvs. ovate, entire, obtuse, glabrous above, white or reddish brown, tomentose beneath, petiolated; floral lvs. similar, smaller: racemes terminal or lateral on short branches, few-fl.; pedicules 1–fl., shorter than the calyx: fls. blue; calyx campanulate, tomentose; corolla-lip twice longer than the calyx. Eu. —Recommended for dry places S. It has a long blooming season.

Section VI. Teucrophis.


T. fruticans, Hort., is offered in the trade as a shrub for the rockery, with downy foliage and heads of pale blue fls.; not known botanically; possibly it is an error for T. frutescens, Benth. (Teysmann).}

minute; calyx cup-shaped, 3-toothed; petals thick; stamens 6; ovary of 3 carpels, rarely 1 or 2, free or saccate, with or without fr. globose or depressed-globose, 1-seeded, 1-seeded. One species, Sumatra. T. diltitifrons, Reichb. f. & Zoll. Lvs. 6-7 x 1½ ft., folded; petioles carinate dorsally, obtusely conoid in front, the angles rounded and uminate-prickly: spathes sheathing the tomentose peduncle: fr. as large as an apple. Sumatra.

**Thalictrum** (named after Johann Thabius, a German naturalist; died 1588). *Ranunculaceae*. Perennial marsh or aquatic herbs, some of them hardy, others suitable for the warm- or greenhouse.

Leaves few, large, long-petioled, often canna-like: panicles terminal; fls. in pairs along the branches forming lax spikes, the pairs in a 2-valved spathe; sepals 3, free, equal, membranaceous; petals 3, free or very shortly connate; lobes of the androecium petaloid, very irregular; lip broad, crested within; anthers 1-celled; ovary I-celled, l-ovuled, stigma 2-lipped: caps. oblong-ovoid or globose.—Schumann (Das Pflanzenreich, hft. 11) accepts 7 species in Trop. and warm Temp. America.

_A. Plant covered with a white powder._


**T. aquilegifolium**, Linn., may be a synonym of this, and _T._ _cornutum_, Fras. Stem less; petals longer than in _T._ _dealbata_: lvs. banana-like, 1-3 ft. long, oblong-ovate: scape 5-10 ft. high: panicles 2-4 ft. wide: spikes zigzag, pendulous. Sept., Oct. Ponds, Fla.—This native ornamental-lvd. marsh-plant thrives in garden soil with canna-like and like plants. Does well under cultivation in S. Calif.


obtuse: achenes many, long-stalked, reticulate, with an incurved style. Himalayas, 8,000-12,000 ft. G.C. III. 28:167.—A handsome plant.

4. Delavayi, Franch. Slender. 2-3 ft. high, glabrous; lower lvs. on long, slender petioles, 2-3 times 3-5-parted; lfts. long-stalked, 3-5-lobed, base cuneate, rounded or cordate; fls. pendulous, dichotous; sepals purple or lilac, 3-lobed, long equaling the slender stamens; anthers linear: carpels 10-12; fr. winged at the 3 angles, stipitate. Summer. Mountains of E. China. B.M. 7152. G.C. III. 8:125; 35:450. G. 35:793.

aa. Fr. striate edged or ribbed rather than winged, sessile or essentially so in most species.  

b. Fls. probably perfect.  
c. Filaments widened near the anthers, the latter ovate and obtuse.

d. Achenes sessile on a head, ovate-oblong.


nn. Achenes somewhat stalked, widely spreading, straight on the dorsal margin.

6. sparsiflorum, Turcz. St. erect, sulcate, 2-4 ft. high, branching, usually glabrous: lvs. trinerved, upper ones sessile; lfts. short-stalked, round or ovate, variable in size and shape of base, round-oblong or toothed: fls. in leafy panicles on slender pedicles, perfect; sepals oblong, white, soon reflexed; filaments somewhat widened; anthers very short: achenes short-stalked, obliquely obovate, flattened, dorsal margin straight, 8-10-nerved; styles persistent. N. Asia, through Alaska to Hudson Bay, in mountains to Colo. and Calif.

c. Filaments filiform or at least very slender; anthers linear, acute or mucronate.

d. Stigma hastate or spurred.

7. minus, Linn. (T. purpureum, Schang. T. ozothile, Vill.). Sts. smooth, naked or 1-lvd., only 4-8 in. high, from a sealy rootstock: lvs. tufted at the base, twice 3-5-parted; lfts. coriaceous, orbicular or cuneate at the base, lobed, revolute: fls. in a raceme, perfect; sepals greenish, equaling the yellow stamens; stigma linear: achenes small, obliquely obovoid. Northern and Arctic, and alpine regions of both Old and New Worlds. B.M. 2207.

dd. Stigma not hastate or spurred.

8. minus, Linn. (T. purpureum, Schang. T. ozothile, Vill.). Sts. round, sulcate, 1-2 ft. high; lvs. variable, acute or obtusely lobed, often glaucous; fls. drooping, in loose panicles, perfect; sepals yellow or greenish; fr. ovate-oblong, sessile, striated. Summer. Eu., Asia, N. Afr.—A polymorphic species in the variation of the lfts.

Var. adiantifolium, Hort. (T. adiantifolium, Hort. T. adiantifolium, Bess.). Lfts. resembling those of adiantum fern.—A form much used and admired.

9. Púrdomi, J. J. Clark. Much like T. minus, but fls. larger, sepals acute or acuminate, the pedicels longer and somewhat capillary: glabrous, the branches reddish green: lvs. 2- or 3-pinnate, about 8 in. long, the pinnae 2-3 pairs; lfts. ovate, 3-lobed, membranaceous; fls. small, greenish, pendulous, in lax panicles; sepals 4, ovate-lanceolate, 3-nerved, acute or acuminate; stamens about 14: carpels 5, sessile, 8-ribbed. N. China; very recently described; cult. abroad.

10. flavum, Linn. Stout, 2-4 ft., with furrowed stem; leaves and creeping stoloniferous rootstock; lvs. large, 2-3-compound; lfts. to 1½ in. long, 3-lobed, ovate or obovate: infl. compact and compact, the fls. erect and pale yellow (the anthers bright yellow); sepals small: achenes 6-10, small, 8-ribbed. Eu.

11. glaucum, Desf. (T. spectabile, Hort.). Sts. erect, round, glaucous, 2-5 ft. high: lfs. ovate-orbicular, 3-lobed; lobes deeply toothed: fls. in an erect panicle, perfect; sepals and stamens yellow: frs. 4-6, ovate, striated, sessile. June, July. S. Eu.

nn. Fls. ducious or polygam-o-dioscious.

c. Achenes somewhat inflated, obovoid, and short-stalked.

12. polygamum, Wats. Aromatic, to 3 ft. high, glabrous throughout: lfts. long-stalked, ovate or roundish, serrate, cut or divided, veined beneath: fls. dioecious, in rather close panicles; sepals elliptic or ovate; stamens 15-25, with yellowish anthers: achenes larger, in a dense globose head, short-stalked, obovoid, turbid, tapering into reflexed styles. Sandy streams, coast ranges of Calif. to Columbia River.

cc. Achenes flattened and 2-edged, nearly or quite sessile.

13. occidentale, Gray. St. to 3½ ft. high, bearing 2 or 3 lvs. which are 2-4-ternate and glandular-pubescent: lfs. thin and glaucous, with rounded lobes: achenes long, slender, thin-walled, 2-edged, ribbed, not furrowed. Colo., northward and westward.

14. Fendleri, Engelm. Fig. 3790. Plant 1-3½ ft. high, rather stout and leafy: lvs. 4-5 times pinnatid, on st. lvs. sessile; lfts. rather firm, ovate to orbicular, usually with many shallow rounded or acuminate lobes; bases variable: fls. dioecious, in rather compact panicles; stamens many; anthers long: achenes nearly sessile, obliquely ovate, flattened and 4-edged gibbous, 3-5 ribs on each face. July, Aug. S. Colo., westward and southward.

ccc. Achenes ovoid, sessile or nearly so, striate or ribbed.

dd. Filaments club-shaped or dilated to nearly or quite the width of the anthers.

15. polygamum, Mühl. (T. Cornuti, Auth., not Linn.). Tall Meadow Rue. Erect, 3-8 ft. (or more) high, branching and leafy, smooth or pubescent, not glandular; lvs. 3-4 times ternate or terminally pinnate; lfts. oblong to orbicular, bases variable, 3-5 apical lobes: fls. in a long, leafy panicle, polygamo-dioscious; sepals white; filaments broadened when young; anthers short: achenes ovoid, stipitate, 6-8-nerved, flat, 2-edged, reticulate, with stigmas as long, which become curled. July, Aug. Low or wet grounds, Newfoundland and Canada to Fla., westward to Ohio.

dd. Filaments very slender, usually filiform.

16. dasycarpum, Fisch. & Lall. (T. purpurácens, Auth., not Linn.). Stout and erect with purplish st., 3-7 ft. tall, leafy and branching: lvs. 3-4-ternate; lfts. short-stolon and mostly 3-toothed, pubescent beneath but not waxy or glaucous; fls. mostly dioecious but perhaps in some cases polygamous, with purplish
sepalis and filaments: achenes ovoid, with 6–8 prominent ribs. N. J. to N. D. and S. Dak. and far southwest. — An attractive plant.

14. **Venusia**, Trib. **(T. confine, Fern.)** St. simple, erect, 10–20 in. high, glabrous, glaucous, bearing 2–3 long-petioled lvs. above the base: lvs. 3–4 times 3-parted; lfts. short-stalked, rather firm, rounded and lobed at the apex, veiny beneath: fls. in a simple panicle, dolicious, small; sepalis ovate; stamens 10–20, on slender filaments; anthers oblong, slender-pointed: achenes nearly sessile, 2 lines long, ovoid tapering to a straight base, thick-walled and 2-edged. S. W. S. and Southward in the mountains.

18. **Dioica**, Linn. Rather slender, 1–2 ft. high, glabrous: lvs. 3–4 times 3-parted; lfts. thin, orbicular, several-lobed or revolute, bases variable: fls. in a loose, leafy panicle with slender pedicels, dolicious; stamens much longer than the greenish sepalis; anthers linear, obtuse, exceeding their filaments in length: achenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Early spring.

**MEADOW** *THAMNOPTERIS* (Greek, *busby fern*). **Poly-podiaceae.** A generic name for a small group of simple-leaved ferns which cannot properly be separated from Asplenium, to which they are here referred (page 414). One species (and a probable variety) is all that is known in this country and require about the same treatment as camellia, which see for culture and propagation.

**sinensis**, Linn. *(Camellia Thaë, Link. Camellia the-féra, Griff.)*. **THEA.** Fig. 3791. Shrub, sometimes tree, to 30 ft.: lvs. elliptic-lanceolate or obovate-lanceolate, acuminate, serrate, glabrous, sometimes pubescent beneath, 2–3 in. long: fls. white, fragrant, 1–1 3/4 in. broad; petals usually 5. China, India.—Several varieties have been distinguished, of which the following are the most important: Var. *Bohea, Pierre (T. Bohea, Linn.)*. Lvs. elliptic-oblong, obtuse, flat, dark green, 2 1/2 in. long: fls. usually solitary; sepalis pubescent inside or glabrous, ciliate, petals 5–6; styles conuate below: branches erect. B.M. 998. L.B.C. 3: 226. Var. *viridiss, Pierre (T. viridis, Linn.)*. Lvs. oblong-lanceolate, acute, often concave, light green, 5 in. long: fls. 1–4; sepalis pubescent, ciliate; petals 5–9; styles free: branches spreading. B.M. 3148. L.B.C. 3: 227; 19: 1828. Var. *cantonensis, Pierre (T. cantonensis, Lour.)*. Lvs. oblong-lanceolate; fls. usually terminal, solitary; sepalis pubescent inside; petals 7–9; styles free only near the apex. Var. *assamica, Pierre (T. assamica, Mast.)*. Lvs. oblong-lanceolate, acuminate: fls. 1–4; sepalis glabrous inside; petals 7–9; styles free only at the apex.—The black tea, however, and green tea of commerce are not derived from certain varieties, but are the result of different treatment of the lvs. after gathering. For the cult. of tea in N. Amer., see Vol. II. Cyclo. of Amer. Agric.

**THEA** (the Latinized Chinese name of the tea plant). **Thapsiaceae.** **Thea.** Woody plants; one species grown for its leaves which yield the tea, the others grown for their attractive flowers and foliage.

Evergreen shrubs or small trees: lvs. alternate, short-petioled, serrate: fls. axillary or sometimes terminal, usually solitary, stalked, nodding; sepalis 5–7, persistent; petals 5–7, rarely 9, stamens numerous, more or less connate below; ovary 3–5-celled; styles 3–5, filiform, connate below: fl. a dehiscent capsule with 1 large globose or ovoid seed in each cell.—About 14 species in Trop. and Subtrop. Asia. Camellia, differing in its sessile upright lvs. with many deciduous sepalis, in often united with Thea, but from a horticultural point of view it seems desirable to keep the two separate.

The most important member of the genus is *T. sinensis*, cultivated in nearly all subtropical countries, and in the mountainous regions of the tropics for its leaves which yield the well-known tea and are an article of great commercial importance. The other members of the genus are ornamental shrubs occasionally grown for their handsome white or pink flowers and the attractive evergreen foliage. They are but little
THEOBROMA (Greek, food of the gods). Sterculiaceae. Here belong the trees that produce the seed from which chocolate and cocoa are derived. About a score of small trees in Trop. Amer., with large simple thick and strongly nervèd entire Ivs., and small fls. which in at least some species are borne laterally on the branches rather than in axils: calyx deeply 5-parted or -lobed; petals 5, mostly clawed or narrowed below; fertile stamens 5, opposite the sepals; ovary sessile and 5-celled, many-ovuled, the style filiform: fr. a large woody drupe or pod, with seeds imbedded in the pulp. The species of prime economic importance is T. Cacao, but other species are probably concerned in the production of cocoa, and the natural history of the group is yet confused. The word "cacao" (pronounced "ka-kow") is the name of the plant and the unmanufactured product of it; "cocoa" is the manufactured product, produced from the bean-like seeds, chocolate being the chief commercial commodity. (Coco is a
The common cacao is *Theobroma cacao*, Linn., native apparently in Cent. and S. Amer. It is a wide-branching evergreen tree, reaching 20-25 ft. in height (or somewhat more in the wild), with pubescent twigs and alternate oblong-ovate or elliptic-oblong, entire short-petioled lvs., the blade 6 in. long more or less, rounded at base and abruptly acuminate at apex, with strong midrib and paired or somewhat alternate arching side veins: fls. small, in fascicled directly on the bark of the trunk and main branches, about ¼ in. across when expanded, on slender pedicels ½ in. or more long; calyx rose-colored, with acuminate segments; corolla yellowish, the long petals with a stalk-like claw and expanded blade: fr. or "pod" 1 ft. or less long and mostly 4 in. or less in diam., about 10-ribbed, red, yellow, purplish, or brown, elliptic-ovoid in form, the rind thick, hard, and leathery: cells 5, each with 5-12 "beans" in a row imbedded in a white or pinkish acid pulp; the pods will average about 20-40 good beans; these flat brown or purple beans or seeds, each an inch or more across; constitute the commercial cacao, from which the products are manufactured. For an account of the cult. of cacao, see Cyclo. Amer. Agric., Vol. II, pp. 224-6. There is a large literature on the subject.

The estates devoted to the culture of the plant are usually known as "cacao plantations" and are largely on the increase in all suitable climates, owing to the increased demand for the manufactured article in the different forms in which it is now prepared for consumption. The larger proportion of commercial cacao is produced by *Theobroma Cacao* (Fig. 3793). Other species native to Central America and the West Indies are *T. pentagona*, *T. speciosa*, *T. angustifolia*, and the closely related *Triobroma bicolor*.

In vigor of growth and productive capacity, *Theobroma pentagona* resembles to a very large degree the generally cultivated varieties of *T. Cacao*, but it differs in the flowers, in the size of the beans, and especially in the shape of the pods. The beans are larger in size than those of *T. Cacao*, fully equal if not superior in flavor, and are capable of being worked up in the same way as the commoner species. This kind is known on the mainland as "Alligator" cacao, from the fancied resemblance of its skin to that of an alligator. The outside of the pod is soft and easily broken, and does not afford such good protection to the interior as the harder shell possessed by *T. Cacao*. In Nicaragua, *T. Cacao* and *T. pentagona* are grown together, and the produce is mostly a mixture of the two species. From the presence of *T. pentagona*, it is possible that hybridization has taken place between two species. It has been noted that the pods of *T. Cacao* produce much larger seeds or beans in Nicaragua than in countries where this species is not growing in company with *T. pentagona*: and the beans of the two species are almost impossible to distinguish when cured together. The product of Nicaraguan plantations also requires much less time for fermentation than the produce of Grenada, Trinidad, or Venezuela, some forty-eight hours being the usual period, while more than four times that number of hours will be required for the proper fermentation of the produce of the last-mentioned countries.

The "Monkey cacao" of the mainland is produced by *Theobroma speciosa*. This is never made into market cacao, as it is very inferior in quality and has a disagreeable flavor. The pods are hard, much corrugated, warty, and of a dirty brown color when ripe.

Many names have arisen for the varieties of *Theobroma Cacao* which are in cultivation, as many as forty having been listed by a Trinidad cultivator of large experience. Looking at the matter from a practical point of view, all these are merely strains of the one species, produced by natural cross-fertilization of the older types. According to Batt, Trinidad, 1900, there are but three major strains or classes of *T. Cacao*, respectively, "Criollo," "Forastero," and "Calabacillo." The type of the first is found indigenous in Trinidad and various places on the mainland, its distinctive character being its bottle-necked pod, with a thin skin and finely ribbed exterior, together with its white or whitish seeds or beans, which are mild in flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corrugated or verrucose pod, containing large flattish seeds of a purplish color. It is a tree having greater vitality than "Criollo," and gives a much larger crop. "Forastero" means foreign, and this type is said to have been found on the mainland of South America, whence it was imported to Trinidad by Arragonese Capuchin Fathers about 1757. (De Vertical, "History of Trinidad," 1884.)

"Calabacillo" is the third form, its chief characteristics being the vigor of its growth and its small flat and strongly flavored bean. By some it is considered as a degraded form of Forastero. While the above gives a brief sketch of the chief characters of the principal types, it must be understood that there are varieties intermediate between the forms; in fact, on the larger number of estates it is impossible to find any two trees exactly alike in all their botanical characters, occurring, without doubt, from the unappreciated cross-fertilization which has taken place. Still, each country appears to maintain certain characters more permanent than others, and thus secures for itself a name upon the markets of the world. It is probable that this is due, in a measure, to the unconscious preference taken by some to distinctive features of the produce by the continuous cultivation of a fairly
fixed strain which has arisen. It may also be due in some measure to the influence of climate and environment. Certain it is, however, that there are today strains of cacao which are possessed of distinctive characters, not readily produced by any process of preparation in places other than that in which they are grown. A fine set of illustrations of varieties common to different countries has been published in a work by Huiz, who traveled in the cacao-producing countries on behalf of the German government.

These different brands are bought by manufacturers and blended to suit their particular market, but there are certain kinds possessing special flavor which are readily sold at high prices. The value of the commercial product fluctuates and the price has marked variations due to many causes. Whether this results from increased production or from a deterioration in the quality cannot be ascertained. It is clear that if cultivators grow cacao for seed without regard to the best rules of selection, the quality must deteriorate. What mitigates this fact is that all the cacao world has, up to a recent date, followed the same practice. The process of grafting, to which the cacao tree readily submits, as has been proved in Trinidad, will enable operators to make large fields of the choicer varieties, and it may confidently be expected that in a few years a great improvement will be shown in the various grades placed upon the market. (For further reading, see Wester, Philippine Agric. Rev., 1914, p. 27.) But little cacao is manufactured in the countries where it is grown.

The word "cocoa" is a market corruption of the original Spanish "Cacao," which was adopted by Linnaeus in 1753 and placed by the Linnaean Theobroma. This species is very widely distinct from any of the varieties of T. Cacao and T. pentagona, and assumes the mature or oblong form only on reaching the third or fourth year of growth. The pods are oval, ribbed and netted, hard and woody, with an outer shell 1/4 inch in thickness which can be cut only with a saw. The seeds are oval, much flattened, with a dark, hard, and smooth exterior. The interior is white, and has a somewhat nutty flavor. They are used in sweetmeats in the same way as almonds, but cannot be made into commercial cacao, suitable for the manufacture of chocolates. This species is very widely distinct from any of the varieties of T. Cacao which produce commercial cacao. The produce of T. pentagona which is possessed of distinctive parts of Central America by the names of "Wariba," "Tiger," and "Patashte" cacao. See also Cont. Nat. Herb., vol. 17, pt. 8, for branching and flowering habits of cacao and patashte.

THEOBROMA (probably a personal name). Orchidaceae. One Brazilian orchid, T. gomezoides, Rodr., of botanical interest but very little known in cult. By some it is referred to Gomezia. Rolfe describes it as having "the general habit of some small slender oncidium, about 5-6 in. high, but the fls. are borne in slender arching racemes of about 6-12 each. The sepals and petals are subomnivent, lanceolate, acute, 4-5 lines long, and light green in color, with a broad dark brown line toward the base. The lip is oblong-ovate, acute, somewhat reflexed at the apex, and white, with an orange-buff blotch in the center. It appears to be a free-growing little plant, and its appearance in cult. is interesting.

THEOPHRÁSTÁ (named for Theophrastus, a Greek naturalist and philosopher, 370-285 B.C.). Myrsináceas; by Mex separated in the family Theophrástaceae. Glabrous shrubs, ephedroid.-P. Schott, 1915. (For further reading, see Wester, Philippine Agric. Rev., 1914, p. 27.) But little cacao is manufactured in the countries where it is grown.

Chocolate is the term used for sweetened andhardened preparations of the roasted and ground cacao bean, with the larger proportion of the original fat retained, while the so-called "cocoa" preparations are the same material in fine powder, sweetened or unsweetened, but with a smaller proportion of the cacao fat extracted. This fat, when clarified, is a pure white substance, almost as hard as beeswax, and is used in many pharmaceutical preparations. Chocolate and cocoa are both made from the beans or seeds of Theobroma Cacao and T. pentagona, and differ only in the method of preparation.

The word "cocoa" is a market corruption of the original Spanish "Cacao," which was adopted by Linnaeus in 1753 and placed by the Linnaean Theobroma. The plant known as Theobroma biocolor has recently been made the type of a new genus (Triobroma bicolor, Cook) on account of distinctly different habits of fruiting and flowering and structural differences in the flowers (q.v., F. Cook, Journ. Wash. Acad. 5:287-289, 1915). The leaves are large, and in the juvenile stages of growth are broadly cordate in form, and assume the mature or oblong form only on reaching the third or fourth year of growth. The pods are oval, ribbed and netted, hard and woody, with an outer shell 1/4 inch in thickness which can be cut only with a saw. The seeds are oval, much flattened, with a dark, hard, and smooth exterior. The interior is white, and has a somewhat nutty flavor. They are used in sweetmeats in the same way as almonds, but cannot be made into commercial cacao, suitable for the manufacture of chocolates. This species is very widely distinct from any of the varieties of T. Cacao which produce commercial cacao. The produce of T. pentagona which is possessed of distinctive parts of Central America by the names of "Wariba," "Tiger," and "Patashte" cacao. See also Cont. Nat. Herb., vol. 17, pt. 8, for branching and flowering habits of cacao and patashte.

laceolata, R. Br. (Podalia lupinoides, Willd.). Sts. 6-12 in. high; Ivs. nearly evergreen, the lower and uppermost ones often simple; Ifts. oblong-lanceolate, silky-puberulent on both surfaces; stipules lanceolate, half as long as Ifts.: fls. geminate or somewhat verticillate, bright yellow. Siberia and Alaska. B.M. 1389.

AA. Pod straight or only slightly curved at the apex.

BB. Plant 3-5 ft. high.

c. Stipules longer than the petiole.

d. Racemes terminal.

mollis, Curtis. St. erect, branched, 2-3 ft. high, pubescent: Ifts. obovate-oblong, 1-2 in. long; fls. in long spikes; pod straight, erect, pubescent. May, June. Western states. B.M. 2811. B.B. 1272 (both erroneously as T. falacca).—Sometimes called "buffalo pen" in the West.

c. Stipules shorter than the petiole.

d. Racemes axillary.

fabacea, DC. Resembles T. montana and has possibly been confused with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

AA. Racemes terminal.

BB. Plant 1-3 ft. high.

c. Stipules large, clasping: racemes 6-12 ft. high, with Ivs. 3-4 in. long and oval-oblong, pubescent: leaves narrowed at the base, somewhat silky-puberulent. June, July. Mountains of N. C.

BBB. Plant 1-3 ft. high.

c. Stipules shorter than the petiole.

d. Racemes axillary.

THBHÁDÚUSIA (named for Thiebaud de Berneaud, a French botanist). Ericeæ. Shrubs with the stem, sometimes tall-climbing: Ivs. alternate, persistent and leathery; fls. in numerous many-flowered axillary racemes, scarlet; calyx 5-lobed or 5-toothed; corolla tubular, 5-lobed; stamens 3-4 in. long; pod falcate, linear, pubescent, 2-4 in. long. Mountains of N. C. and Ga. F. W. Barclay. F. Tracy Hubbard.†

THESPÉSIA (Greek, divine; application doubtful). Malaceæ. Trees or tall hedges, grown in the warm-house, and planted in warm regions.


nereftóla, Juss. Known locally in Fla. as "trumpet-flower" and incorrectly as "yellow oleander." A tender shrub: fls. linear, shining, margins revolute; fls. in large clusters; pod 2-4 in. long, yellow, fragrant. W. Indies, Mex. B.M. 2900 (as Cerbera Thevetia).—Cult. in S. Fla. and S. Calif.

F. Tracy Hubbard.†

THLADIANTHA (Greek, Thalassa, sea; 

flora).—T. pulcherrima, Wall., which equals Agapetes variegata.—T. subrufa, Wall.—Agapetes setigera. F. Tracy Hubbard.

THLLÁDÁNÝTHA (Greek, to crush and flower; the author of the genus is said to have named it from pressed specimens). Cucurbitacæ. Herbaceous softly pubescent vines with tuberous roots, some of which are hardy, others adapted to the greenhouse. May be either annuals or perennials.

Leaves ovate-cordate, denticulate, sinuous deep; tendrils simple: fls. dioscorious, rather large, golden yellow; male fls. solitary or racemose, calyx-tube short-campanulate, 5-lobed, corolla rather irregularly campanulate, 5-parted, stamens 5. ovary rudimentary; female fls. solitary, calyx and corolla in the same, stamens rudimentary or none; ovary obovate, pubescent, with 3 placenta: fr. obovate, chesty, indehiscent, many-seeded.

**THLADIA** (Greek, crushed, referring to the strongly flattened pods and seeds). *Cruciferae*. Annual or perennial herbs which are glabrous or glaucous, rarely pilose, some of which are cultivated now and then.

Leaves basally, rosulate, entire or dentate; cauline obovate to oblong, hastate-auriculate; fls. white, rose, or pale purple; sepals with a white margin. Mound species, including Amer.

alpestre, Linn. Perennial, 2-12 in. high but usually glabrous, somewhat glaucous, habit tufted, forming rather thick mats: basal lvs. in a rosette, petioled, obovate; cauline lvs. elongated-lanceolate, base cordate, entire or dentate: peduncle unbranched, terete: fls. white, sometimes somewhat reddish; sepals purplish. Alpine Eu.—Has been offered as a neat little rock plant. It should be given shade and a cool moist soil. The material growing in Colo. and formerly called *T. bellidifolium* is now considered a distinct species, *T. coloratum*, Sargent.


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**THINNAX** (Greek, fan). Palms, tribe *Corypheae*. Thatch Palm. Fan palms well adapted for pot culture. Spinose palms: trunks low or medium, solitary or cephalose, ringed below, clothed above by the fringed
several small short-pedicelled pink £!s.; lateral sepals rower; labellum shorter than the sepals. Austral.

dilated at the base; labellum articulate at the end of the up to 6–8 in. long, erect, bearing above the middle.

sistent truncate bases of the lvs. or leafless: lvs. flat. egms. linear-oblong: spadix elongated; for their bloom jn the warmhouse.

to the hair-shaped seeds) .. Syn.,

glaucescent beneath; segms free for about two-thirds or three­thick. Keys of Fla.-T.

petals united; filaments subulate: fro small, \( \frac{1}{2} \) in. diam. or less.

fls. on rusk-hke pedicels, the sepals and petals only parti­glaucescent beneath; segms free for about two-thirds or three­thick. Keys of Fla.-T.

p. 2446), but It IS doubtful whether they are in the trade. Some

which probably belongs to T. radiata.-T. F. TRACY HUBBARD. A palm With lvs. about 3 ft. diam., and with a short, stiff ligule. Proba­bly belongs, according to Beecari, somewhere near Coccothrinax argentea. This palm was lost to science for 60 years and has now recently been rediscovered. A specimen growing in the Bogotá Botanic Garden has the trunk covered with a fibrous hair-like growth, unlike any W. Indian palms known.-T.

p. 2446), but It IS doubtful whether they are in the trade. Some

thick. Lower

short

fls. rather small; sepals and petals white, spotted basally with red; labellum shorter, white, streaked with red-purple. Q. G. III. C. 32:367.

labellum saccate, white, yelloawish and pubes­cent within: caps. 4–6 in. long, linear. Malay a. B. M. 7754. F. TRACY HUBBARD.

TRHYLLIS (old Greek name, transferred to these plants). Malpighiaceae. Confusion in practice has arisen in the application of this name and Gal­phimia. As expressed by J. N. Rose, "the genus Thryallis was published by Linnaeus in the second edition of his Species Plantarum, basing it upon a single species, T. brasiliensis. In 1829 Martius described two additional species, T. longifolia and T. totofolia. These two species, however, were soon found not to be congeneric with the original species, but instead of being taken out as a new generic type, were allowed to remain as Thryallis, while the true type of that genus was transferred to Galphimia." Kuntze gave the name Thryallis to the Hernaelea to the plants of Martius, and this was restored to its original application, with its legit­mate extension, then the plants described under Gal­phimia, page 1312, become T. brasiliensis, Linn. (G. brasiliensis, Juss.); T. hirsuta, Kuntze (G. hirsuta, Cav.); T. grauea, Kuntze (G. grauea, Cav.). It appears to us that the true type of the genus was never transferred to Thryallis, but to Galphimia, and the generic name Thryallis was published by Linn. in 1753. Since then it has been used by such authors as Sturt and others as a popular name for these plants. Had Kuntze given the name Thryallis, the above plants would have been included in this genus.

TRHYTÔMENE (Greek word said to refer to the low heat-like appearance of the plant). Myrtacea. Glabrous heat-like shrubs, which were at one time popular greenhouse plants, now apparently not so com­monly in cult. Lvs. opposite, small; entire: fls. small, sessile or pedicelled, solitary at the base, becoming racemes at the top. Seeds one, usually con­spicuous above the base, with a resinous tree or shrub). Also spelled

larly reticulate, tomentose: young lvs. white woolly­tomentose; blade equaling the petiole, silvery gray beneath, making one of the

margin, 6–8 ft. high: sheaths ragged, fibrous, irres­

hair-like extension, then the plants described under Gal­phimia, page 1312, become T. brasiliensis, Linn. (G. brasiliensis, Juss.); T. hirsuta, Kuntze (G. hirsuta, Cav.); T. grauea, Kuntze (G. grauea, Cav.). It appears to us that the true type of the genus was never transferred to Thryallis, but to Galphimia, and the generic name Thryallis was published by Linn. in 1753. Since then it has been used by such authors as Sturt and others as a popular name for these plants. Had Kuntze given the name Thryallis, the above plants would have been included in this genus.

3334

THRUJA

THRYTHOMENE

THRYLIS

THUJA

THYIA

THYIUM

THUIA

THUJITA
grained, durable in the soil; it is much used for construction, cabinet-making, and in cooperage. *T. occidentalis* contains a volatile oil, and thuja and is sometimes used medicinally.


1 inch in length. The well-known *T. occidentalis* is hardy North; and also *T. Standishii*, *T. plicata*, and several forms of *T. orientalis* are hardy as far north as Massachusetts. Thujas are favorites for formal gardens. They are all of regular symmetrical habit. Their numerous garden forms vary greatly in habit and in color of foliage. For planting as single specimens in parks they are mostly too stiff and formal, but they are well suited for massing on borders of streams or lakes. The most beautiful and the most rapidly growing species is *T. plicata*. Thuja are well adapted for hedges and windbreaks (see Gn.M. 2:15). They bear pruning well and soon form a dense hedge. They thrive best in somewhat moist, loamy soil and are easily transplanted. Propagation is by seeds sown in spring. The varieties, especially those of *T. occidentalis*, are usually propagated by cuttings taken late in summer and kept during the winter in a cool greenhouse or frame; also by grafting on seedling stock in summer or early in spring in the greenhouse. The varieties of *T. plicata* and *T. orientalis* are usually grafted, since they do not grow readily from cuttings, except the juvenile forms of the latter, as *var. decussata* and *var. maldenii*. Consult *Retinispora*.

A. Cones pendulous, with thin scales apiculate below the apex; seeds winged, compressed; branchlets ramified more or less horizontally, with a distinct upper and under side.

B. Lvs. yellowish or bluish green beneath, glandular; leading shoots compressed.

*occidentalis*, Linn. COMMON ARBOR-VITAE. Erroneously but commonly called *White Cedar* (which is properly *Chamaecyparis*). Figs. 3795-3797. Tree, attaining 60 ft. and more, with short horizontal branches ascending at the end and forming a narrow pyramidal rather compact head; lvs. ovate, acute, usually glandular, bright green above, yellowish green beneath, changing in winter usually to dull brownish green; cones ovate to oval-oblong, about $\frac{1}{3}$ in. long, brownish yellow with

3795. Typical form of Thuja occidentalis. (X 3/5)
THUJA


Ständishii, Carr. (T. japonica, Maxim. T. gigantea var. japonica, Franch. & Sav. Thujaépsis Ständishii, Gord.). Fig. 3801. Similar to the preceding but lower, usually only 20-30 ft. high: branchlets more irregularly set, thicker and less compressed: lvs. of vigorous shoots closely placed together, ending in short rigid points spreading outward, of the lateral branchlets ovate, obtuse, thickish, lighter green above, darker beneath and with whitish, triangular spots, without gland: cones oval, little over ½ in. long; scales 8, oval, usually the 2 middle pairs fertile. Japan. G.C. III. 21:238 (adapted in Fig. 3801). R.H. 1896:160. C.I.A. 11:311. S.I.P. 1:11.

AA. Comes upright, the thickened scales with a prominent horn-like process below the apex; seeds wingless; branchlets ramified in a vertical plane with both sides nearly alike. (Biota. orientalis, Linn. (Biotá orientális, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches: branchlets thin: lvs. rhombic-ovate, acute, bright green, with a small gland on the back: cones globose-ovate, 3⁄4-1 in. long; usually 6 ovate scales, each with a horn-like process, the uppermost pair sterile. From Persia to E. Asia, in Japan probably only cult. There are many garden forms, of which the following are the best known: Var. athrotaxoideae, Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. R.H. 1861:1 p. 239. Var. aurea, Hort. Low,

THUOJPSIS (Greek, Thuja-like). Also spelled Thuyopsis. Pinaceae. Ornamental tree or shrub grown chiefly for its handsome evergreen foliage and the formal habit.

A tree closely related to Thuja and chiefly distinguished by the broader much flattened 'branchlets and branchlets irregularly whorled or scant, wd, horizontally spreading and often nodding at the base; branchlets 4–6 in. broad; lvs. glossy green above, marked with a broad white band beneath, those of the upper and under side obovate-oblong, obtuse, anaticher in appearing than the lateral ones spreading, ovate-lanceolate and curved (hatchet-shaped), obtuse; cone globose-ovoid, about 3/8 in. long; scales 6–10, much thickened at the obtuse pointed apex, the middle ones fertile and with 3–5-winged seeds under each scale. Japan. S.Z. 2:119, 120. G.C. II. 18:556. Gn. M. 2:23. G.Z. 25, p. 139. F.E. 10:517. C.L.A. 7:364. S.I.F. 1:11. Var. atitissima, Ansorge. Vigorous and of almost columnar habit. Var. crisata, Ansorge. Branches compact, very full and somewhat crisped. Var. nana, Sieb. & Zucc. (T. leuconeira, Lindl.). Dwarf form, with more slender and narrower branchlets of a lighter green. Var. picata, Ansorge. Very vigorous with heavy branches which hang over and appear folded. Var. variegata, Fortune. Tips of branchlets creamy white. Var. Hondoai, Makino(T. Hondoai, Henry). Tall tree to 100 ft.; branches more densely ramified; lvs. smaller and whiter beneath; cone sub-globose, with the scales not thickened at the apex. This is the more northern form and probably harder than the type which has been called var. australis by Henry. Recently intro. and now growing at the Arnold Arboretum.

THUNBERGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnaeus; died 1828). Acanthaceae. Mostly tall perennial climbers producing flowers in great profusion; greenhouse, and in the open far South.

Leaves opposite: fls. blue, yellow, purple, or white, solitary and axillary or in racemes; calyx annular and scarcely lobed or toothed or 10–15-toothed, surrounded by 2 large brachts which often inclose also the corolla-tube; corolla trumpet-shaped, with a spreading limb, tube curved or oblique, often compressed, enlarged toward the mouth; stamens 4, didynamous, fixed near the base of the tube, filaments thickened at the base, separate; anther-cells parallel, equal, mostly mucronate at the base; ovary seated on a fleshy disk, 2-loculed, each cell with 2 ovules (rarely only 1). The Thunbergias are distinguished by the contorted corolla, the 4-seeded caps., and the globose seeds. About 25 species, in the tropics of the world, particularly in Afr.
THUNBERGIA

The thunbergias are nearly all vigorous greenhouse climbers resembling amaranthas in habit. In large conservatories where they are not cramped for room they flower freely and display their flowers to the best advantage. Severe pruning, which is necessary in small greenhouses, prevents the production of flowers. The larger species, *T. laurifolia*, *T. affinis*, *T. grandiflora*, *T. mysorensis*, and *T. cocinea* are rapid growers, requiring plenty of feeding and root-room. All do better in open beds than in pots. They may be propagated either from seeds or by cuttings which are taken from the young wood which starts into growth after the plants have been cut back during winter. These produce few flowers the following autumn, but bloom freely the second season. As a rule, the plants flower in late summer or autumn, but the time of flowering may be made to vary according to treatment in some species. *T. alata* and its varieties and *T. fragrans* are often treated as annual garden plants, flowering in late summer. *T. erecta* and *T. affinis*, when grown in pots, form rather compact shrubby plants (see G. 24, p. 314; 30, p. 292; 47, p. 150). In Porto Rico *T. alata* has escaped and is common. Cook writes that there are two forms, one with corolla-limb cream-yellow and other white.

Thunbergias and amaranthas are great favorites in central and southern Florida, being used on verandas, arbors, small trellises, and buildings. Of the blue-flowered kinds *T. grandiflora* is hardiest and commonest. It has large heart-shaped leaves which overlap one another in a charming manner. It blooms from September until Christmas, the flowers being light blue and rather dull. The form of *T. laurifolia* known to the trade as *T. Harrisii*, has nearly sky-blue flowers, of a deeper but brighter hue than the preceding. It is a tall-growing and choice plant, and has ten or more flowers in a raceme, while those of *T. grandiflora* are solitary in the axils. *T. fragrans* is the common white-flowered kind. The form cultivated in Florida is probably *var. vestita*, as the blossoms are not fragrant. *T. alata* is a general favorite. The flowers range from buff and white to orange with a deep purplish brown throat, the last form being the most popular. This species is killed to the ground by sharp frost every winter but sprouts vigorously the following spring. It also comes up from self-sown seed. This species grows only 7 to 8 feet high. All the thunbergias mentioned above are easily raised from cuttings or layers in summer. *T. erecta* is not a climber but has a somewhat straggling habit. It has small dark green leaves and large deep purplish blue gloxinia-like flowers, which are white at the base. There is a pure white variety of it. It blooms all summer and autumn. It is readily raised from cuttings during the rainy season. (H. Nehrling.)

3802. *Thunbergia alata*. (X 3/4)

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<th>Variety</th>
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<tr>
<td>affinis</td>
<td>S. Moore. A rambling shrub, 10-12 ft. high, smooth: branches 4-angled: lvs. short-petioled, elliptic, acute, entire: fls. 2 in. across, deep purple-blue, with a yellow throat. Summer. Trop. Afr. B.M. 975. G.C. III. 2:246. G.M. 32:291.—This plant is closely allied to <em>T. erecta</em>, from which it differs by its entire lvs. and larger fls., which are about twice the size of those of <em>T. erecta</em>. When grown in a pot the plant forms a compact shrub, but when given more room it is a rambling climber.</td>
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<tr>
<td>alata</td>
<td>Bakerii, Hort. Fls. in terminal or axillary racemes (see, also, <em>T. grandiflora</em>).</td>
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<tr>
<td>affinis</td>
<td><em>T. alata</em> var. <em>albiflora</em>, Hort.</td>
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<td>alata</td>
<td><em>T. alata</em> var. <em>coccinea</em>, var.</td>
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s. thunbergii, S. Moore. Sts. prostrate; lvs. about 1 in. long, triangular, glossy green; peduncles axillary, erect, 3 in. long; fls. solitary, about 1 in. across, yellow, each with a pair of inflated and united crimson-stained bracts. British E. Afr. B.M. 9904. — *T. primulina*, Hems. Perennial. silky hairy at first:

3803. Thunbergia grandiflora. (X3)


Var. lutea, Hort. (*Hexacentris lutea*, Hort., Veitch. G.C. 1854, p. 151, not *T. lutea*, T. Anders.), has the fls. pure yellow; a variety with a crimson limb and yellow tube is figured in Paxton’s Flower Garden, 3:88.

10. cocinea, Wall. (*Hexacentris cocinea*, Nees). A very tall climber: st. much branched, 4-angled; lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cuneate angled base, the upper ovate, cordate, all angularly toothed or the upper entire; fls. in terminal or axillary racemes, 1-3 ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B.M. 5124. L.B.C. 12:1193. F.S. 23:2447-48. R.H. 1890, p. 197. G.W. 3, p. 44.

11. elegans, Borzì. *T. cocinea*. The fls. are said to vary from red to intense yellow. Known only from plants in the Palermo Botanic Garden, to which it is supposed to have been intro. from a nursery at Genoa.

THUNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the nineteenth century). *Orchidaceae*. Tall plants with annual leafy stems terminating in a raceme of showy flowers. Formerly united with *Phaius* from which it differs by the terminal inf.: sepals and petals similar, spreading; labellum convolute over the column, spurred, ornamented with several c. columns consisting of lines of fleshy hairs; pollinia 8: fl. subtended by large membranous bracts.—About 6 species in N. India, Burma, and in the S. Himalaya region ascending to a height of 6,000 ft.
The culture of the thunias is very simple. They begin growth naturally at the end of February or early in March. As soon as new growth is visible the plants should be given new material, consisting of fibrous peat or fern-root and sphagnum mixed with loam and some sand and potsherds for drainage. In their native home the plants are said to be epiphytic, and when treated as terrestrial orchids the native habit may be imitated by setting them well above the pot, which should not be too large. For the first four to six weeks until the young roots have made good growth, it is necessary to apply water sparingly. Thunias are very rapid-growing orchids and may be liberally supplied with liquid manure until the end of the flowering season, which occurs about the middle of August. Soon after this the leaves fall. The old stems winter in this condition and serve as food reservoirs for the young growth of the next season, but although they remain on the plant two years they form no leaves the second season. During the resting-period they should be kept in a rather dry atmosphere and be given only enough water to prevent the stems (pseudobulbs) from shriveling. This is one of the few orchids which can be profitably propagated by cutting the old stems into lengths of about 6 inches and rooting them in sand or sphagnum. When rooted the young plants may be potted in the usual way. A temperature of 60° to 65° is favorable during the growing season.

alba, Reichb.f. (Phaius albus, Lindl.). Fig. 3804. Suberect, 2-3 ft., clothed with sheathing, oblong-lanceolate, striate lvs. 6 in. long; raceme drooping at the end of the st., 6-12-fld.: fls. white, 3-4 in. across when fully open; sepals and petals oblong-lanceolate, acuminate; labelium shorter than the segms., not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wavy and finely crisp; color of labelllum white veined with purple in the throat, with 5-9 purple or yellow fringed keels; wings of the column entire. In long; fls. like those of T. alba but of a pale purple color; labelllum large, 3-lobed, deep purple in front, with a yellow crested disk, with 6-7 rows of fringe-like golden yellow hairs; spur short, slender. India, July-Sept. B.M. 6594. G.M. 195:137. F.W. 1871:161. — The most showy species of the genus.

Marshalliana, Reichb. f. (Phaius Marshallii, Nichols.). Closely related to T. alba. Sts. somewhat stronger: segms. pure white, acuminate; labelium evidently 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisp; color of labelllum yellowish white, with 5 orange-fringed keels in the throat; wings of the column toothed. May-Aug. India. R.B. 21:229. S.H. 2, p. 335. Var. ionophila, Reichb. f., has the center of the labelllum bright yellow, paler toward the margin. Var. albula, Reichb. f., has white fls. with sulfur-yellow disk to the lip.

T. Veitchiana = T. Bensoniae × T. Marshalliana. Sepals and petals white, flushed light mauve at tips; front of lip mauve-purple, the base white, purple-lined. Heinrich Hassetering.

_Thymus_ (the old Greek name used by Theophrastus either for this plant or for savory). _Labiate_. _Thymus._ Small shrubs or subshrubs, mostly hardy, and excellently adapted for edging the rockery or fern-root and sphagnum mixed With loam and some sand or potsherds. Small hardy shrub, wholly silky-canescent, whitish or pale yellow, oblong or prostrate habit, ability to persist in dry places and withstand the strong summer sun. Excellent ground cover on banks, in borders, or rockwork. The creeping or prostrate habit, ability to persist in dry places and poor soils, and the colored or wooly foliage of some species make them adaptable to a variety of uses. The common _T. Serpyllum_ is evergreen. _T. vulgaris_ is the thyme of sweet-herb gardens, being prized in cookery. _Thymus_ is easily propagated by means of division, although seedlings may sometimes be used to renew plantations of some of the species, particularly of _T. vulgaris_. Several names occur in American catalogues, all of which seem to be referable to three species, one of
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1. vulgaris, Linn. COMMON THYME. Subshrub, erect, 6 in. high: sts. sometimes decumbent at base: branches stiff and woody, usually white-pubescent: lvs. sessile, 3-6 lines long, linear-ovate-lanceolate, fascicled at the axis; floral lvs. lanceolate, oblong, obtuse: floral lvs. smaller than the type.


3. Chamädrys, Fries. Subshrub, low, forming a tuft: sts. diffuse, ascending: lvs. broad-oblong; petiole usually heart-shaped: flowers white or capitate, purpureus; calyx-teeth of upper lip 3, triangular, of lower lip 2, subulate. N. Eu.—Similar to T. Serpyllum and by most considered a form of that species, but said to differ in having the lvs. less narrowed to the petiole and only the pedestal ciliate; also the lvs. are less prominently veined.

4. Serpyllum, Linn.; also spelled Serpyllus (T. azorícus, Lodd. T. hispátus, Auth. not Bieb. T. micans, LOW). MOTHER OF THYME. CREEPING THYME. Perennial or subshrub, caespitose or creeping: sts. wiry, prostrate and rooting below, ascending-erect above, slightly puberulent: lvs. elliptic, oblong or oblongate, obtuse or acute, base more or less attenuate, seldom shorter than long, short-petioled: floral-whorls sessile, congested into a head of the lower more or less raceme, of upper subulate, teeth of lower lip triangular, glabrous or ciliate, of upper lip 2, lanceolate-subulate, ciliate; corolla-tube rather included. Temperate parts of Eu., Asia, and N. Afr. G.M. 57:807. L.B.C. 16:1550.—A common plant in old gardens, prized as an evergreen edging and as cover for rockwork and waste places; also run wild. The lvs. are sometimes used for seasoning, as are those of T. vulgaris. The nodes are short, making it a very leafy plant. Variable. Var. vulgaris, Hort., is a white-flld. form. G. 45, p. 108. Var. argenteus, Hort., is a form with silver variegated lvs. commonly known in the trade as T. citriodorus argenteus. Var. aureus, Hort., is a form with golden variegated lvs. growing about 8-12 in. high; usually known in the trade as T. aureus, Hort., or T. citriodorus aureus, Hort.; there is also a minor varia­tion known in the trade as T. Serpyllum aureus marginatus. Var. Chambdréi, Boiss. & Heldr., see T. heterotrichus, Var. aureus, Hort., see var. vulgaris. Var. caucasicus, Hort. (T. caucasicus, Hort.), grows about 1%-3 in. high, has dark green lvs. and bright crimson fls. Var. lanuginosus, Hort. (T. lanuginosus, Mill. T. Chamädrys lanuginosus, Hort.), is a low form, about 3 in. high with small roundish lvs. which are gray-pubescent; a good edging plant. Var. montánus, Benth. (T. montánus, Waldet. & Kit. T. Chamädrys, Auth., not Fries), is a form with the branches more erect and the lvs. larger than the type. Var. pulchellus, Hort., has the upper part of the calyx and its teeth purple. G.M. 56:83. Var. splêndens, Hort., is a form with brilliant red (according to some bright purplish red) fls. Var. variegatus, Hort., has white-variegated lvs. possivly the same as var. argenteus. Var. vulgaris, Benth. (T. Serpyllum var. citriodorus, Hort. T. citriodorus, Schreb.). LEMON THYME. Lvs. smaller than the type and strongly veined; the plant has a decided lemon odor.

5. hispátus, Bieb. Perennial or subshrub, cespitose and cushioned or procumbent: flowering branches ascending, hoary-pubescent: lvs. not punctate, sessile or nearly so, linear-subulate, obtuse, both surfaces hoary-tomentose, margins ciliate: fls. closely approximated in an oblong head, rose; calyx subulate, 2-lipped below the middle, teeth of upper lip lanceolate, acuminate, of lower subulate; corolla-tube included. S. E. Eu. and Caucasus.


7. heterotrichus, Griseb. Subshrub, 3-6 in. high: branches ascending, puberulent: lvs. 6-8 lines long, linear-lanceolate, rather obtuse, fascicled in the axis, flat, glabrous; floral lvs. similar: floral whorls approximate in a head-like raceme: fls. violet; calyx pilose, upper lip triform to the middle, its segms. lanceolate-acuminate. Greece and Macedonia. G.W. 12, p. 461.—Treated by some authors as T. Serpyllum var. Chambdréi, Boiss. & Heldr.

8. carnatus, Boiss. Subshrub, about 9 in. high; sts. decumbent at base, otherwise erect, white-pubescent: lvs. minute, fascicled, strongly revolute, fleshy, subterete, oblong, obtuse, glandular-punctate, glabrous,
glauous; floral lvs. ovate, with revolute margins, hirsutellos: heads dense, ovate: fls. white; calyx hirtellous, upper lip 3-toothed to hardly the middle, margin revolute; lower lip with bristle-like teeth. Portugal.

9. villibus, Linn. Subshrub, about 3 in. high: sts. rough branched, erect, pubescent: lvs. narrow-linear, acute, ciliate, fascicated at the axis; floral lvs. broadly ovate, acuminate, villous: floral whorls in an ovate-globose spike; fls. purple; calyx-crimson; calyx villous, teeth of upper lip short, ovate-lanceolate, of lower subulate. Portugal.—Some of the material offered in the trade under this name may be of T. Serpulium.


F. TRACY HUBBARD.

THYRSOPTERIS (Greek, bunch or raceme and fern); the fructification is disposed in racemose bunches). Polypodiaceae. Tree-like fern: lvs. 3 compound, the fertile portions appearing like bunches of stipitate acorn-cups, the sterile portions twice-pinnae and then deeply pinnatifid. One species, Jsl. Juan Fernandez, T. elegans, Kunze. Tree fern about 15 ft. high: lvs. compound, reaching a length of 5-6 ft., one-third of which is naked; sterile portions bipinnate, with lanceolate incised pinnae; fertile parts tripinnae, each pinna becoming a raceme of stalked involucres: sori globose; involucres cup-shaped.

THYRSOSTACHYS (Greek, thyrse and spike). Gramineae. A genus of 2 species of arborescent bamboos native to Upper Burma and Siam, which has been referred to Rothboelia but is probably sufficiently distinct. The st.-sheaths are very broad and persistent, with a long narrow blade. The lvs. are small or moderate-sized. T. siamensis, Gamble, is a tender, deciduous, giant bamboo, with very graceful tufted sts. 25-30 ft. high and 1½-2 in. thick: st.-sheaths waved and truncate at the top, 9-11 x 1½-3 in.; articles short-triangular: blade narrowly triangular: lvs. small, narrow, linear, 3-6 x ½-1½ in. Siam.—Once intro. in S. Calif., but it did not persist. Probably not-now in cult. in this country outside test-garounds.

THYSANOTHUS (Greek, fringed and ear, alluding to the 3 inner perianth-segments, which are fringed). Liliaceae. Perennials, suitable for the rhizome house. Rhizomes sometimes very short, sometimes stout and horizontal: lvs. radical, grass-like, flat or terete: scape leaves, now erect and simple or paniculate above, now much branched or in one species twining: fls. sometimes densely fascicled, with 1 terminal fascicle or few at the top of the scape, sometimes variously panicled; perianth withering, persistent, segments distinct, outer shorter; lanceolate, margin, beautifully fimbriate-ciliate; stamens 6; ovary sessile or short-stipitate, 3-celled: capsules glbose or ovoid.—About 21 species, Austral., one of which is also found in the Philippines and China. The difference in the inner and outer stamens and the absence of the latter in some species may not always be as constant as it would appear at first sight. The following species have been occasionally cult. They thrive in sandy loam and may be increased by offsets.


THYRSACANTHUS (Greek, thyrse and flower). Acanthaceae. Erect, glabrous, pubescent or villous herbs, which are adapted to the warm house. Lvs. opposite, entire, usually large: fls. red, fascicled at the bract-axis, peduncled; fasciciles or cymes arranged in a terminal thyrse, simple raceme or paniculate branched: calyx short, rather 5-parted, segments narrow, acute or acuminate; corolla-tube elongate, straight or somewhat incurved, limb sometimes what 2-lipped, 4-cleft; stamens 2, staminodia 2; disk rather thick: caps. oblong; seeds 4 or fewer by abortion.—About 25 species, Trop. Amer. The oldest and now accepted name of the genus is Odontonema.


F. TRACY HUBBARD.
TIARELLA

TIARELLA (Latin, a little tiara or turban; in reference to the form of the pistil). Saxifragaceae. False Miterwort. Slender erect, hardy perennial herbs, useful for the wild-garden or any shaded spot.

Leaves several, radical, long-petioled, simple or 3-foliolate; stipules small, adnate to the petiole; raceme terminal, somewhat bracteate, simple or compound; fls. white or reddish; calyx-tube short, lobes 5, ovate; petals 5, entire; stamens 10; ovary superior, compressed, 1-celled: caps. membranaceous, 1-celled, 2-valved.—About 8 species, mostly from Japan, 1 from the Himalayas, the remainder from N. Amer. These plants are little grown, but they are useful for colonizing or perhaps for the rock-garden and are particularly attractive in the autumn on account of their brilliant leaf-coloring. Prop. by division.

A. Lvs. simple.

b. Petals oblong.


unifoliata, Hook. Hardy perennial: lvs. thin, rounded or triangular, 3-5-lobed, the lobes crenate-toothed; st-lvs. usually only 1, rarely 2-3: panicle loose; petals small. W. Amer.—The lobing of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

TIBOUCHINA

trifoliata, Linn. Resembling T. unifoliata except in having 3-foliolate lvs. Ore. to Alaska, also N. W. Asia. T. biternata, Vent.—Astilbe biternata. F. W. BARCLAY. F. TRACY HUBBARD.

TIBOUCHINA (native name in Guiana). Including Plerôma. Metastacoseae. Shrubs or subshrubs, rarely herbs, sometimes climbing, usually strigose-pilose or hispid, adapted to the greenhouse or to out-of-doors in the extreme South.

Leaves usually large, leathery, petiolid, ovate or oblong, entire, 3-7-nerved: fls. generally in trichotomous terminal panicles, large, violet or purple, rarely numerous; calyx hirsute or strigose, tube ovoid, campanulate, urn-shaped or elongated, lobes 5, subulate, lanceolate or oblong; petals 5, obovate; stamens 10; ovary free or adhering toward the base to the 5 calyx-lobes, 5-celled: caps. 5-valved.—About 215 species, Trop. Amer., but chiefly from Brazil.

Tibouchinas are among the handsomest of our intermediate greenhouse plants, and can be readily trained in bush form, probably with the exception of T. semidecandra, which is better adapted as a pillar or trellis plant. These plants may be propagated at any time of the year, but early spring is the best season. Small pots should be half filled with sandy loam, the remainder being all sand and the cuttings inserted singly. They should be kept quite close and fairly moist, and they will root in a few weeks. After they are rooted, place them in a greenhouse with a night temperature of about 55°, allowing a rise of 20° in the middle of the day. Pinch the heart out as soon as they begin to grow, and a few days after they have been cut back, move them into a pot about 3 inches larger. A good fibrous loam may now be used for all future pottings, and as the plants get stronger about a third of sheep-manure may be added, also a little sharp sand and charcoal, to keep the soil sweet and porous. Give plenty of light at all times, but avoid strong sunshine. Give plenty of water, and syringe the under side of the foliage to prevent red-spider, which is about the only insect that is trouble-
some. Never allow the plants to become pot-bound until the size desired for flowering is attained. Give strict attention to keeping the plants in shape, by pinching the strong shoots, and tying them to the outer edge of the plants, allowing the weaker ones to grow, and fill up the middle of the plant. In general the plants may be placed out-of-doors, and plunged to the rim of the pot, in a bed of ashes; but never allow the sun to strike them directly, as it will disfigure the foliage. Those plants are excellent for exhibition purposes and consequently decoration. The species T. elegans and T. semidecandra are worthy of general cultivation. (George F. Stewart.)

**semidecandra**, Cogn. (*Lasidandra maculata*, Lind. et Seem. *Pierrotma maculatum*, Hook.). Fig. 3807. A tender shrub: lvs. ovate or oblong-ovate, 2–6 in. long, round at the base, short-petioled, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved: bracts broadly suborbicular, somewhat rounded at the apex and shortly apiculate, margin not translucent; fls. reddish purple to violet, often 5 in. across, solitary or terminal and 1 in the upper axils on the branchlet; stamens purple, style setulose. Brazil. B.M. 4412 (as *P. Kunthiana*); F. 23:2430. G. 15:4. G. W. 23: 209. 24: 259. C. Z. 20: 151. J. L. H. 11:42219. H. 10:72. Var. floribunda is more suited to pot culture and flowers more freely than the type when small. *Lasidandra* or *Pierrotma splendens*, Horta., should be compared with this. The fls. of *T. semidecandra* last but a day or so, but the flowering season lasts for several weeks. Plants may also be used for summer bedding. They are seldom out of bloom. The species is much esteemed in Fla., where it makes a showy shrub 8 ft. high. Plants may also be used for summer bedding. They endure a few degrees of frost with impunity, and even if cut down sprouts readily.


There is a plant offered in the trade under the name of *Pierrotma edulis*, Horta. Bull, described as being a shrub with dark green ovate-lanceolate lvs., densely silky-hairy, the 5 longitudinal veins very prominent beneath. Fls. white, about 13/4 in. across, borne in loose terminal heads. Said to have been intro. from S. Amur. As there are no Tibouchinas known outside of S. Amur, it is not likely that this is correctly placed in *Pierrotma*; the proper identification of the plants is at present impossible.—*T. lepidota*, Hook. (Lasidandra lepidota, Naud.), is a plant which has been much confused. A. 1864: 209.—There is a plant at least formerly cult. under the name of *Pierrotma sarmentosa*, Hook. Small villous shrub with the branches and branchlets serrate: lvs. 3-5 m. long, 2-6 in. across, yellow, or red-spotted on the claw; inner segms. pan­

**TIGRIDIA**

**TIGRIDIA** *(tiger-like, referring to the peculiarly marked flowers). *Iridaceae.* Bulbous plants, grown in the greenhouse and also making very showy summer-blooming subjects.

Bulbs tunicated: st. erect, mostly branched, 1–2½ ft. tall, with a few narrow plicate lvs. at the base and 2 or 3 smaller ones higher up: spathes 1 or 2, leaf-like, being bearing 1 or few blossoms. F. Stewart.

A long cylindrical tube including the style; pistil with 3-loculed ovary, long style with 3 2-parted branches.—About 13 species from Mex., Cent. Amer., Peru, and Chile. *T. Pavonia*, from S. Mex., was in cult. in Eu. in the 16th century. L’Obel described it in 1576. The younger Linneus referred it to the genus Ferraria, and some of the tigridias are yet cult. under that name. Ferraria, however, is a S. African genus, and all the parts of the perianth are nearly equal. *T. Pavonia* is cult. in many forms, and is the only common species in garden. The fls. of all tigridias are fugitive, lasting only for a day.

Tigridias are tender “bulbs” requiring the treatment given gladiolus. Plant in well-prepared soil when set­
ed water comes, 2 to 3 inches deep and 4 to 6 inches apart. The principal blooming fls. is in July and August. Allow the corms to remain in the ground until danger of frost approaches, then store in a dry place where dahlias or gladioli will keep. See that the corms are dry before being placed in storage. Propagation is by cormels and seeds. The best colors are secured in warm weather.

**T. semidecandra**, Cogn. (Lasiandra semidecandra, Lind. & Seem. *Pierrotma maculatum*, Hook.). Fig. 3807. A tender shrub: lvs. ovate or oblong-ovate, 2–6 in. long, round at the base, short-petioled, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved: bracts broadly suborbicular, somewhat rounded at the apex and shortly apiculate, margin not translucent; fls. reddish purple to violet, often 5 in. across, solitary or terminal and 1 in the upper axils on the branchlet; stamens purple, style setulose. Brazil. B.M. 4412 (as *P. Kunthiana*); F. 23:2430. G. 15:4. G. W. 23:209. C. Z. 20:151. J. L. H. 11:42219. H. 10:72. Var. floribunda is more suited to pot culture and flowers more freely than the type when small. *Lasidandra* or *Pierrotma splendens*, Horta., should be compared with this. The fls. of *T. semidecandra* last but a day or so, but the flowering season lasts for several weeks. Plants may also be used for summer bedding. They are seldom out of bloom. The species is much esteemed in Fla., where it makes a showy shrub 8 ft. high. Plants may also be used for summer bedding. They endure a few degrees of frost with impunity, and even if cut down sprouts readily.


There is a plant offered in the trade under the name of *Pierrotma edulis*, Horta. Bull, described as being a shrub with dark green ovate-lanceolate lvs., densely silky-hairy, the 5 longitudinal veins very prominent beneath. Fls. white, about 13/4 in. across, borne in loose terminal heads. Said to have been intro. from S. Amur. As there are no Tibouchinas known outside of S. Amur, it is not likely that this is correctly placed in *Pierrotma*; the proper identification of the plants is at present impossible.—*T. lepidota*, Hook. (Lasidandra lepidota, Naud.), is a plant which has been much confused. A. 1864:209.—There is a plant at least formerly cult. under the name of *Pierrotma sarmentosa*, Hook. Small villous shrub with the branches and branchlets serrate: lvs. 3-5 m. long, 2-6 in. across, yellow, or red-spotted on the claw; inner segms. par­nately or narrowly obovate-cuneate. Brazil. F. Tracy Hubbard.
26:128 (as T. alba). Var. alba immaculata, Hort., is a spotless white variety, a sport from var. alba. Gn. 40, p. 361. Var. flava, Hort., has pale yellow fls., with red-spotted center. Gn. 50:22. Var. canariensis, Hort., is also a pale yellow-flowered form, but named as if an inhabitant of the Canaries. Var. idaea immaculata, Hort., has pure yellow spotless fls. Var. rosea, Hort., has rose-colored fls. with yellow variegated center. Var. lilacea, Hort., has lilac-flowered, spotless center. Gn. 45:28. Var. speciosa, Hort., is a partially dwarf form with deeper red color, the interior of the cup being similar in color to the limb. Described in 1843. G. 36:359. Var. grandiflora, Hort., has fls. much like those of T. Pavonia itself except that they are larger and brighter colored. Gn. 45, p. 263. G. 1:20; 6:263 (as T. grandiflora). Identical with this, or subtypes of it, are the forms known as Wheeleri, coccinea, splendens. Most of the marked departures in colors of T. Pavonia are recent. In catalogues the above names often appear as if they were species names.

3809. Tigridia Pringlei. (X3½)

Distinguished by Sereno Watson, the author of the species, as follows: "Very closely related to T. Pavonia, and if color alone were to decide, it might be considered a variety of it, though differing markedly even in that respect from the old species. The base of the sepals is blotched (rather than spotted) with crimson, with a border of orange, the reflexed blade being of a bright scarlet-red. The petals have the base blotched and coarsely spotted with crimson, with a well-defined, deeper-colored, brownish margin, the blade orange, tinged with scarlet, but not at all spotted as in T. Pavonia. The more essential difference is in the form of the petals, which have a broadly cordate or reniform base, with a much narrower triangular-ovate acute blade. The sepals are also smaller and more oblong in outline."* N. Mex. G. F. 1:389 (adapted in Fig. 3890). B.M. 7089.

AA. Fls. relatively small; the 2 rows of segms. differing less in size; stigmas capitate, or at least not strongly decurrent. (Subgenus Beatonia.)

buccifera, Wats. Fig. 3810. About 1 ft. high, slender, branching, glaucous: lvs. very narrow, strongly plicate; fl. 2 in. across, the cup pale greenish yellow, dotted with purple, the obovate obtuse blade of the outer segms. light purple; inner segms. "folded together in such a manner as to form a sunken longitudinal tube down the center, the dilated sides at the oes- end of the tube approaching each other in the form of 2 check-like prominences.—these are ovoid, white, purple, and yellow, while the small rounded terminal blade is a deep purple." Mountains of Jolisco, Mex. G. F. 2:413 (adapted in Fig. 3810).—Offered in 1889 by Horsford.

T. albina, Hort., is Cypella plumbea.—T. axillata, Hort., is Cypella plumbea.—T. Houtties, Rein. in Hydrogenia Van Houtte.—T. Meligyna, Hort., is also a Hydrogenia (H. Meligyna, Lindl.), but is not in the American trade. B. H. 28:39.——T. oxyloba, Schleid. & Schl. One of the Beatonia section: slender, narrow-leaved; fls. 2 in. across, violet, spotted at the base; inner segm. small, cup-shaped, Mex. B. M. 725. H. U. 3, p. 301. Other kinds of Tigris are likely to appear in cult.

3810. Tigridia buccifera. (Xearly 3½)

TILIA (the classical Latin name). Tiliaceae.—Linden. Lime. Basswood. Whitewood. Ornamental trees, grown for their handsome foliage, good habit, and also for their fragrant flowers.

Deciduous: winter buds large, obtuse, with several imbricate scales, terminal bud wanting: lvs. alternate, petiolate, usually cordate, serrate, with caducous stipules; fls. small, in long-peduncled drooping cymes; the peduncle for about half its length adnate to a membranous ligulate bract; sepals 5; petals 5, often with 5 opposite petaloid staminodes; stamens many, with the filaments forked at the apex; ovary superior, 5-celled; style slender, with 5-lobed stigma: fr. globose or ovoid, nut-like, usually with 1–3 seeds.—About 25 species throughout the temperate regions of the northern hemisphere, in N. Amer. south to the highlands of Mex., except W. N. Amer., and in Asia south to Cent. China. The names of the lindens, and particularly of those in cul., have been much confused, owing to the great variability of some species, the rather slight differences between many of the species and to the presence of many hybrids originated spontaneously and in cult. The light-colored soft and light wood is easily worked and much used for the interior finish of houses, for wood-carving, wooden baskets and other small wooden ware. The tough inner bark is used as a tying material and, particularly in Russia, in the manufac-

T. albina (H. L. B.)
drooping clusters followed by small inconspicuous nutlets. The species in cultivation are nearly all hardy North and not particular as to the soil, but do not thrive well in dry locations or in dry climates. They are much planted as shade and ornamental trees and, particularly in Europe, are favorite avenue and street trees. The best for avenue planting are T. tomentosa, T. euchlora, T. americana, T. cordata; T. tomentosa stands heat and drought better than any of the others, while T. platyphyllos, although often planted for its rapid growth, is likely to suffer in dry seasons or in dry localities.

Propagation is by seed which must be sown soon after ripening or stratified, as it does not germinate until the second year if kept dry and sown in spring. Also increased by layers; in layering usually the method of

"stooling" is employed; this consists of cutting a younger tree close to the ground and of laying down and covering partly with earth the numerous shoots which will appear. Varieties or rarer species are often grafted in spring or budded in August on common stock. Plants raised from layers or grafts remain often one-sided for many years, as the lateral branches usually employed will appear. Varieties or rarer species are often grafted covering partly with earth the numerous shoots which younger tree close to the ground and of laying down and "stooling" is employed; this consists of cutting a

second year if kept dry and sown in spring. Also ripening or stratified, as it does notgerminate until the second year if kept dry and sown in spring. Also increased by layers; in layering usually the method of

INDEX.

AA. Tilia, with stellate hairs or stellate tomentose beneath; fls. with staminodes.

BB. Branchlets glabrous.

CC. Axillary tufts present on the lvs. beneath.

DD. Axillary tufts wanting on the lvs. beneath.

EE. Tomentum of branchlets, buds, and petioles yellowish or brownish: margin of the lvs. coarsely serrate with short-pointed teeth.

FF. Habit upright; petioles shorter than half the blade: fr. slightly 6-angled.

GG. Habit pendulous; petioles longer than half the blade: fr. 5-furrowed.

HH. Tomentum of branchlets, buds, and petioles yellowish or brownish; margin of the lvs. coarsely serrate with short-pointed teeth, often glabreanct with age.

II. Miqueliana

JJ. With axillary tufts of hairs; lvs. orbicular-ovate, grayish, tomentose beneath, brownish on midribs and nerves.

KEY TO THE SPECIES.

A. Lvs. green or glaucous beneath, glabrous or pubescent with simple hairs.

B. Under side of lvs. and branchlets pubescent: fls. without staminodes... 1. platyphyllos

BB. Under side of lvs. glabrous except axillary tufts of hairs.

CC. Axillary tufts present at the base of the lvs. and elsewhere.

D. Margin of the lvs. finely serrate: fls. without staminodes... 1. platyphyllos

EE. Lvs. green beneath; the tertiary veins prominent.

F. Upper surface of lvs. dull green, margin with short-pointed teeth... 2. vulgaris

FF. Upper surface glossy dark green, margin with long-pointed teeth... 3. euchlora

GG. Lvs. glaucous beneath; the tertiary veins not tomentose.

HH. Cyanes 6–11-fid.: fls. without staminodes... 4. cordata

II. Cyanes 8–10-fid.: fls. with staminodes... 5. japonica

JJ. Axillary tufts of hairs wanting at the base, present elsewhere; lvs. 3–6-in. long: fls. with staminodes... 6. mongolica

KK. Margin of lvs. coarsely serrate, lvs. often 3-lobed: fls. with staminodes... 7. americana

LL. Margin of lvs. finely serrate with short-pointed teeth.

MM. Petioles longer than half the blade: fr. 5-furrowed.

NN. Petioles shorter than half the blade:

HH. Habit pendulous; petioles longer than half the blade: fr. 5-furrowed.

II. Miqueliana

JJ. With axillary tufts of hairs; lvs. orbicular-ovate, grayish, tomentose beneath, brownish on midribs and nerves.

1. platyphyllos, Scop. (T. grandijalial, Ehhr. T. europaea, Link, in part). LARGE-LEAVED LIME. Fig. 3811. Trec, to 120 ft.; young branchlets pubescent, older glabrous: lvs. orbicular-ovate, abruptly acuminate, obliquely cordate at the base, regularly serrate, dull green and short-pubescent or glabrous above, light green and pubescent beneath, 3–4 in. long; petioles stout, hairy: fls. in usually 3-fld. pendulous cymes; petals obovate, longer than sepals; stamens 30; style glabrous; fr. globose, ovoid or pyriform, 3–5-ribbed, apiculate, tomentose, thick-shelled. June; the earliest species to bloom. Eu. G.F. 2:256 (adapted in Fig. 3811). H.W. 3:24, 25. R.F.G. 6:316, 317, 318.—Very variable; some of the most important varie-
ties are the following: Var. pyramidalis, Kirchn. (X
narrow pyramidal habit. M.D.G. 1898:101. Var. concolor, Dipp. (var. rubra, Hort.). Young branches red. Var. aurea, Kirchn. Young branches golden yellow. Var. lacinata, Henry (var. asplenifolia, Kirchn. var. blaesifolia, Hort. T. europaea var. lacinata, Loud.). Lvs. deeply and irregularly cut. G.W. 15, p. 662. Var. vitifolia, Simomkai. Lvs. slightly 3-lobed or indistinctly lobed.—This species is the strongest grower and in this country often sold as T. europaea. It is more impotent of drought than most other species and therefore not to be recommended as a street tree.

2. vulgaris, Hayne (T. intermedia, DC. T. europaea, Linn., in part). COMMON LINDEN. Fig. 3812. Tree, to 120 ft.; young branchlets glabrous; lvs. broadly ovate, abruptly acuminate, obliquely cordate or truncate at the base, serrate with short-pointed teeth, dark green above, light green beneath, glabrous except auxiliary tufts of hairs, 3-4 in. long; petiole about half as long as the blade: fls. 5-10, similar to those of the preceding species: fr. ovoid or globose, apiculate, tomentose, thick-shelled. June, July; a week or 10 days later than the preceding species. G.F. 2:257 (adapted in Fig. 3813). H.W 3:41, pp. 21, 22. R.F.G. 6:311, 312. M.D.G. 1904: 188. Var. pyramidalis, Wittm. Of narrow pyramidal habit.

3. euchlora, Koch (T. dasystyla, Kirchn., not Stev. T. rubra var. euchlora, Dipp.). CRIMEAN LINDEN. Tree, to 50 ft.; young branchlets glabrous; green: lvs. orbicular-ovate, abruptly acuminate, obliquely cordate at the base, regularly serrate, the teeth with slender points, dark green above, paler beneath and glabrous except auxiliary tufts of brown hairs, 2-3 in. long; petiole slender, more than half as long as the blade: fls. 3-7, in pendulous cymes; style glabrous: fr. globose, slightly ribbed, apiculate, tomentose, with thin fragile shell. July. Eu. G.F. 2:257 (adapted in Fig. 3813). H.W 3:41, pp. 21, 22. R.F.G. 6:311, 312. M.D.G. 1904: 188. Var. pyramidalis, Wittm. Of narrow pyramidal habit.


5. japónica, Simonkai (T. cordata var. japónica, Miq.). Tree, to 60 ft.; young branchlets slightly pubescent at first: lvs. suborbicular, almost like those of the preceding species, 2-3 in. long; petioles usually longer than half the blade: fls. 7-10, in pendulous cymes; staminodes present: fr. ovoid, not ribbed, tomentose, thin-shelled. July. Japan. S.I.F. 1:72.

6. mongolica, Maxim. Small tree, to 30 ft.; young branchlets glabrous, reddish: lvs. suborbicular, or ovate, acuminate, subcordate or truncate at the base, coarsely serrate and usually 3-lobed, dark green and shining above, glaucous beneath, glabrous except axillary tufts, 1½-2½ in. long; fls. 6-12 in a cyme; the bract stalked; staminodes present; style glabrous: fr. ovoid, mucronulate, tomentose, thick-walled. July. Mongolia, N. China. R.H. 1902, p. 476. S.T.B. 1:61.

—Very distinct with its small coarsely serrate, birch-like lvs. reddish when unfolding; it flows when only a few feet high.

7. americana, Linn. (T. glabra, Vent.). Fig. 3814. Tree, to 120 ft.; young branchlets glabrous, green: lvs. broadly ovate, abruptly acuminate, cordate or truncate at the base, coarsely serrate, the teeth long-pointed, dark green above, light green beneath with tufts of hairs in the axis of the lateral veins, but wanting at the base, 4-6 in. long, turning yellow in autumn; cymes pendulous, many-fld.; bract stalked, tapering toward the base; staminodes present: fr. ovoid or globose, without ribs, tomentose, thick-shelled. July. Canada, south to Va. and Ala., west to N. Dak., Kans., and E. Texas. S.S. 1:24. Mn. 6:153. Var. macrophylla, Hort. (var. mississippiensis, Hort.). A large-lvd. form.

—This species is frequently planted as an avenue tree. Its wood is much used in the manufacture of wooden-
ware, cheap furniture, panels of carriages, and also of paper pulp.

8. neglécia, Spach (T. Michaëzi, Sarg., not Nutt. T. pubescens, Hort., not Vent.). Tree, to 80 ft.: branchlets freely ovate or ovate, acuminate, obliquely coriaceous at the base, rarely truncate, coarsely serrate, with long-pointed, usually incurved teeth, dark green and glabrous or sparingly pubescent above, more or less stellate-pubescent and grayish green beneath with conspicuous axillary tufts, 6-6 in. long, turning yellow in autumn: cymes many-fld.; bract deciduous nearly to the base, tomentulose above; peduncle glabrous: fr. subglobose or ovoid, slightly furrowed, tomentose. July. E. Canada to Ga. and Texas west to Ohio. S.M. 676. — This species has often been confused with T. pubescens and with T. heterophylla.

9. heterophylla, Vent. (T. alba, Michx. T. Michæzi, Nutt.). Tree, to 60 ft.: young branchlets glabrous and red; lvs. broadly ovate to oval-ovate, short-acuminate, obliquely truncate or coriaceous at the base, finely serrate with rather short-pointed teeth, dark green and glabrous above, white-tomentose beneath without axillary tufts, 4-7 in. long; fls. in many-flowered pendulous cymes; bract deciduous often nearly to the flower, rather large; fr. subglobose, tomentulose. June. W. N. Y. to Ala. and Ill. S.S. 1:27. — This is a very handsome linden with its large lvs. silvery white below and is sometimes sold as T. macrophylla.

10. Olivieri, Sakszylovicz. Tree, to 50 ft.: young branchlets reddish brown, glabrous; lvs. ovate, short-acuminate, coriaceous or truncate at the base, supinately dentate, with short gland-tipped teeth, dark green and glabrous above, white-tomentose beneath, with long hairs on the veins, without axillary tufts, 5-5 in. long; petals glabrous; fls. about 20, in pendulous cymes; bract sessile; pedicels short, thickened: fr. globose, tomentose and tuberculate, apiculate, thick-shelled. Cent. China. — This recently intro. species promises to be a handsome ornamental tree.

11. spectabilis, Dipp. (T. alba spectabilis, Hort. T. Blechiana, Hort.). Hybrid of T. americana and T. petiolaris or T. tomentosa. Tree of vigorous growth; branchlets glabrous or slightly pubescent at first; buds pubescent toward the top: lvs. similar to those of T. americana, ovate, slightly grayish tomentose beneath, with long hairs on the veins, without axillary tufts, 4-6 in. long, 3-5 in. wide: inf. and size of fls. like those of T. americana, but petals though less densely than T. tomentosa. Blooms 2 or 3 weeks earlier than T. tomentosa. Of unknown origin; a similar form was raised from seed of T. petiolaris at the Arnold Arboretum in 1900. Var. Möltkei, Reich. (T. Möltkei, Spach). Branchlets and buds quite glabrous; lvs. often without long hairs on the veins, 5-7 in. long. Originated at Spaeth's nursery near Berlin, Germany.

12. tomentosa, Moench (T. argentea, DC. T. alba, Ait. T. alba pyramidalis, Hort.). WHITE LINN. Tree, to 100 ft. with upright branches; young branchlets stellate-tomentose: lvs. nearly orbicular, abruptly acuminate, truncate or coriaceous at the base, serrate or doubly serrate, often lobulate, with short-pointed teeth, sparingly pubescent above, white-tomentose beneath, 3-5 in. across; petals pubescent, less than half of the length of the blade; fls. 7-10, in pendulous tomentose cymes: fr. ovoid, slightly 5-angled, tomentose; shell woody. July. E. Eu., Asia Minor. R.F.G. 6:259-331. H.W. 5:3-43, p. 36. F.E. 14:1154, pl. 38. G.W. 8, p. 617. S.A. 1903:190, 1904:189. — This is a very handsome tree of dense habit with upright branches; it stands heat and drought better than any of the other species. Its fls. and those of the following species have proved poisonous to bees.


14. mandshurica, Rupr. & Maxim. Tree, to about 60 ft.: young branchlets and buds with brownish tomentum: lvs. orbicular-ovate, short-acuminate, usually coriaceous at the base, coarsely serrate with long-pointed teeth, sparingly pubescent above, white-tomentose beneath, 4-6 in. long; petiole about half as long as the blade, tomentose: fls. 7-10, in pendulous cymes covered with brownish tomentum: fr. globose, tomentose, with 5 distinct ribs toward the base or without ribs. N. China, Manchuria, Korea. — Similar to T. tomentosa, from which it differs in the larger lvs. with long-pointed teeth and in the fr. Like the two following species still rare in cult.

15. Miqueliana, Maxim. Tree, to 40 ft.: young branchlets finely tomentose: lvs. ovate or deltoid-ovate, usually much longer than broad, acute or acuminate, obliquely coriaceous at the base, coarsely serrate with broad mucronate teeth, dark green and glabrous or nearly so above, grayish tomentose beneath, without axillary tufts of hairs, 2½-5 in. long; fls. 10-20 in pendulous tomentose cymes; stamina 60-75; style shorter than petals, hairy at the base: fr. subglobose, tomentose, 5-ribbed at the base. Cult. in Japan; native habitat unknown. S.I.F. 1:72.

16. Maximowicziana, Shirasawa (T. Miyabe, Jack. T. Miqueliana, Sarg., not Maxim.). Fig. 3815. Tree, to 100 ft.: young branchlets tomentose: lvs. broadly ovate or orbicular-ovate, abruptly acuminate, obliquely coriaceous at the base, coarsely serrate with broad mucro-
nate teeth, dark green above and pubescent at first, finally glabrous or nearly so, grayish tomentose beneath with brownish axillary tufts of hairs, finally often becoming partly glabrous, 3-6 in. long; petioles less than 1/5 in. of the length of the blade long, 10-15 in. long, pendulous tomentose cymes; style exerted: fr. globose, 5-ribbed, tomentose, thick-walled. *Japan.* S.I.P. 2:50. G.F. 6:113 (adapted in Fig. 3815).

The modern conceptions of tillage probably date from Tull's time, but his was erroneous, nevertheless Tull showed that tillage is necessary to make the soil thrifty and productive wholly aside from its use for killing weeds. He supposed that tillage benefited plants by making the soil so fine that the minute particles could be put into the land, weeds killed, and the crop taken out.

Tillage improves land in many ways. It divides and pulverizes the soil, gives the roots a wider "pasturage," and also the benefits that followed the application of ashes; the minute particles of the ashes are so small as to be absorbed by the roots. Although this explanation of the benefits of tillage was erroneous, nevertheless Tull showed that tillage is necessary to the best agriculture and that it is not merely a means by which seeds can be put into the land, weeds killed, and the crop taken out.

Tillage also causes moisture by deepening the arable soil so that moisture is held, and also by checking evaporation from the surface by means of a thin blanket or mulch of granulated earth that is made by surface-working tools. Water is lost from the soil by underdrainage and by evaporation from the surface. The more finely the soil is granulated, within certain limits, the more water it will hold. Its capillary power is increased. As the water evaporates from the surface, the moisture is drawn up from the under surface so that there is a more or less constant flow into the atmosphere. If any foreign body, as a board or a blanket, is spread on the land, the evaporation is checked. A similar result may follow when the soil is covered with a layer of dry ashes or sand or sawdust. Very similar results are also secured when the surface soil and the under soil is thereby broken. This surface soil itself may be very dry, but it may serve as a blanket or mulch to the soil beneath. In some cases this preservation of moisture by frequent shallow tillage is probably the chief advantage of the tillage of the land in the growing season.

Land that is well tilled has different chemical relations from that which is neglected. Nitridation, decomposition, and other bacterial activities have ceased. The stores of plant-food are rendered available. The soil is made more productive.

The first requisite for the growing of the plant is to have the soil in such condition that the plant can thrive in it. It is only when the land is well tilled and prepared, or when its physical condition is nearly or quite perfect, that the addition of concentrated fertilizers may be expected to produce the best results. Fertilizing, therefore, is a secondary matter; tillage is primary. The ideal tillage is that which is practised by the gardener when he grows plants in pots. The soil is ordinarily sifted or riddled so that unnecessary parts are removed, and most of it is brought into such condition that the plants can utilize the crop. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage in the bottom of his pots or boxes. Often the gardener will produce as much from a handful of soil as a farmer will produce from an acre. L. P. B.
TILLANDSIA (Elias Tillands was professor of medicine at the University of Abo, Sweden; in 1673 he made a catalogue of plants of the vicinity of Abo). Bromeliaceae. Mostly epiphytes and all natives of America, allied to billbergias, orchids, guzmania, pineapple, and the like; ornamental greenhouse subjects.

Perennial herbs, mostly of upright growth (the common T. usneoides being a marked exception), the bases of the narrow entire lvs. often dilated and forming cups that hold water and in which utricularias and other water-plants sometimes grow: fls. usually borne in spikes or heads, singly beneath bracts, perfect, with 3 sepals and 3 petals which are twisted or rolled in the bud, 6 stamens, a superior ovary with filiform style: fr. a 3-valved caps containing hairy or plumose seeds. Vriesia is distinguished by having 1 or 2 scales or figules at the base of the petals on the inside, whereas the petals of Tillandsia are ellip.

Some of the cult. tillandsias belong to still other genera. This is the case with T. zeyr, which is properly Cryptanthus zonatus (Fig. 1120, Vol. II). This is an odd plant, producing crinkled leaves, which is whitish beneath and brown-barred above, and small clusters of white fls. See p. 902, where other kinds of Cryptanthus in the American trade are described. Many species are described in horticultural literature as having been intro. into cult. by suckers; also by seeds. For further cultural notes, consult Billbergia.

A. Plant-body slender and hanging: fls. solitary in lf.-axils.

B. Flower larger and nodding: fls. in terminal clusters, mostly in the Southern regions.

C. Stems short, usually papery: fls. solitary, in the axils of the bracts.

D. Stems erect or filiform recurved 2-ranked lvs.: fls. carried in the wind by means of the soft hairs, and find lodgment on trees, where the plants grow. A few species, however, grow on the ground.

E. Vegetative stems solitary, creeping: fls. usually carried by means of the soft hairs, and find lodgment on trees, where the plants grow. A few species, however, grow on the ground. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept nearly dormant, although not completely dry. They need a warm temperature and plenty of light while growing. Give a soil rich in peat. In some cases sphagnum may be added to advantage. Propagation is by suckers; also by seeds. For further cultural notes, consult Billbergia.

T. recurvata, Linn. SPM[ISH, FLORIDA, or LONG Moss. Figs. 3816, 3817. Whole plant hoary-gray, hanging from the trees, the sta. very slender and often several feet long: lvs. scattered, narrow-linear, 1-3 in. long: fls. solitary in the lf.-axis, small and not showy, the petals yellow and reflexed at the end. Trop. Amer. and in the U. S. from Texas to Fla. and E. Va.; extends southward to S. Brazil. B. M. 6309. Gn. 37, p. 221. Gt. 45, p. 267.

—This is one of the most characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cult., although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the lichen Usnea.

T. usneoides, Linn. SPANISH, FLORIDA, or LONG Moss. Figs. 3816, 3817. Whole plant hoary-gray, hanging from the trees, the sta. very slender and often several feet long; lvs. scattered, narrow-linear, 1-3 in. long: fls. solitary in the lf.-axis, small and not showy, the petals yellow and reflexed at the end. Trop. Amer. and in the U. S. from Texas to Fla. and E. Va.; extends southward to S. Brazil. B. M. 6309. Gn. 37, p. 221. Gt. 45, p. 267.

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AA. Plant-body stiff and nearly or quite erect.

B. Stamens shorter than the petals.

c. Fls. few in the cluster.


E. Stamens much longer and erect: fls. solitary, in the axils of the bracts.

F. Stamens shorter than the petals: fls. solitary in the axils of the bracts.

G. Lvs. rosetulate, about 1 ft. long, dilated at the base, long recurving: spike large, the showy distichous bracts carmine: fls. small, much exerted beyond the bracts, the large wide-spreading segments, bluish purple. Ecuador, Peru. P. R. 16:610; 27:370 (as var. Repellana). G. C. I. 12:461. R. H. 1872:230; 1898: 206 (as var. tricolor). F. M. 1872:44. —A handsome and popular species. This interesting species has also been described as Phytarrhiza Lindeni, Morr.
TILLANDSIA

BB. Stamens longer than the petals.

c. St. thickened and bulb-like at the base.

bulbosa, Hook. Small scurvy plant a few inches high, the st. swollen at the base: lvs. 3-5 in. long, much dilated and clasping at the base and terete above: fls. few, in racemes, long and many, the upper one much exerted but not spreading petals purple. Var. picta, Hook., has the upper lvs. and bracts scarlet. W. Indies to Venezuela. B.M. 4388. F.S. 3: 221.

c. St. not prominently swollen.

D. Lvs. linear or almost filiform from the base or abruptly from a dilated base.

polystachya, Linn. (T. angustifolia, Swartz. T. parviflora, Baker). Lvs. rosetulate, lepidote or scurvy, curved, equaling or exceeding the st.: infl. compound, somewhat paniculate, the lateral fls. shorter than the central ones, the bracts distichous and pointed and little exceeding the calyx: fls. blue. S. Fla. to Brazil.

tenuifolia, Linn. (T. cupanii, Le Conte, not Cham. & Schlcht. T. Bruyantii, Ell. in part). Plant less than 6 in. tall, reddish, clustered: lvs. awl-shaped and erect, nearly terete, concave at the base, scurfy: fls. few in a simple or somewhat compound spike, the blue petals exceeding the bracts and recurving at the apex. Ga. to Brazil.

D. Lvs. gradually narrowed from a broad base.


utriculata, Linn. Plant 2-3 ft. high: lvs. glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base: forming pockets that hold water: infl. branched, the central ones, the bracts and recurving at the apex. St. thickened and bulb-like at the base. St. wt prominent, much dilated and bulb-like at the base. St. simple, very short (about 1 in.), very slender, recurved, about equaling the lvs., with 2 or 3 bracteoles, of which one is a compressed, shining a simple infl.: fl. erect; sepals glabrous; petals violet. S. Amer. Gt. 3: 138. R.H., Baker. V. 1006. H. 105. T. Zehnt., Hort., is properly Guzmania Zahnii, Mez. Tubular, branching from the base, glabrous throughout: lvs. 1 ft. long, about 1 in. broad, crimson stipules are often infl. paniculate, subtended by scarlet bracts: fls. yellow. Costa Ricas. B.M. 6050 (as Cariquatu Zahnii). In 1992, the flowering names are accounted for under Vriæsia: corticulata, fenestrata, glabra, hieroglyphica, perennis, Saundersii, tessellata, sobrina (in part).

L. H. B. GEORGE V. NASH.

TIMOTHY: Phleum pratense.

TINANTIA (named after Tinant, a Belgian botanist.) Commelinoideae. Erect herbs, either hardy or grown in the greenhouse: lvs. medium-sized or large: peduncle terminal, rarely with 1-3 extra in the upper axis: cyme terminal, with 1-3 branches filiform from nearly their base: fls. pedicellate: sepals distinct, green: petals distinct, obvate; stamens 6, all perfect; ovary sessile, 3-3-celled: caps. 3-celled, loculicidally dehiscent.—About 6 species, Trop. Amer. T. flava, Scheid., is a tradesplant-like herb: st. glabrous, 1 ft. high: lvs. ovate-lanceolate, plicate above, glabrous beneath: peduncle villous, 1-3-branched at apex, branches umbellate: fls. blue, with their pedicels conspicuously bracteolate at base. Known also as Tradescantia erecta. T. undata, T. longifolia, B.M. 1340. B.R. 1406. L.B.C. 13: 1200.—Sometimes seen in old gardens but not offered in the trade.

TINNÉA (named in honor of Mlle. Tinné). Lobáltea. Tall perennial herbs or subshrubs, pubescent or woolly, adapted to the warmhouse. Lvs. very entire: floral whorls usually laxly 2-fl., axillary or in a terminal raceme: fls. fuscescent or violet-purple, fragrant; calyx ovoid, 2-lipped; corolla-limb somewhat 2-1ipped; stamens 4, didynamous; ovary shortly 4-lobed: nutlets obovoid-ellipuate.—About 23 species, Afr. T. Sacleuxii, Sprunger. Dwarf shrub with the branches shortly and densely pubescent: lvs. short-petiolate, oblong or ovate, entire, ½-1 in. long: cymes axillary, 2-4-fl., calyx ovate-lanceolate, plicate above, glabrous beneath; peduncle villous, 1-3-branched at apex, branches umbellate: fls. blue, with their pedicels conspicuously bracteolate at base. Known also as Tradescantia erecta. T. undata, T. longifolia, B.M. 1340. B.R. 1406. L.B.C. 13: 1200.—Sometimes seen in old gardens but not offered in the trade.

TIPUANA (name apparently Latinized from a Brazilian name). Leguminosæ. Showy unarmed trees, used ornamentally in the extreme southern U. S. Lvs. unevenly pinnately compound, without stipels; lfts. several, alternate; stipules minute, caducous; fls. showy, yellow or pale purplish, in loosely branched terminal panicles; calyx tuberous, teeth short and broad; standard ovate or suborbicular, not appendaged; wings obliquely obovate or oblong; keel-petals obliquely oblong, obtuse, lightly connate; stamens all connate in a sheath which is split above: pod stipitate, indehiscent, 1-3-seeded, samara-like.—About 4 species, S. Amer. Here belongs the plant recently intro. to S. Calif. as Macherium Tipu, which is said to yield one of the rosewoods of S. Brazil.

speciosa, Benth. (Machærium Tipu, Benth.). Tender yellow-fl. tree: lts. 11-21, oblong, emarginate or entire, ¼ in. long; veins somewhat parallel: standard broadly orbicular; wings very broadly half-ovate, much larger than the keel: pod veiny. S. Amer.

F. TRACT HUBBARD.

TIPULARIA (Latin, Tipula, a genus of insects, alluding to the form of the flower). Showy unarmed trees, used ornamentally in the extreme southern U. S. Lvs. unevenly pinnately compound, without stipels; lfts. several, alternate; stipules minute, caducous; fls. showy, yellow or pale purplish, in loosely branched terminal panicles; calyx tuberous, teeth short and broad; standard ovate or suborbicular, not appendaged; wings obliquely obovate or oblong; keel-petals obliquely oblong, obtuse, lightly connate; stamens all connate in a sheath which is split above: pod stipitate, indehiscent, 1-3-seeded, samara-like.—About 4 species, S. Amer. Here belongs the plant recently intro. to S. Calif. as Macherium Tipu, which is said to yield one of the rosewoods of S. Brazil.

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F. TRACT HUBBARD.
petals similar, spreading; labellum 3-lobed, produced into a long spur behind; column erect, wingless or narrowly winged.—Two species, one Himalayan.


TITONIA (of mythological derivation; Tithonos was the favorite of Aurora). Compositae. Robust half-hardy annuals sometimes shrubby at base; ifs. alternate, petioled, entire or 3-lobed; heads large, on a long thickened peduncle, heterogamous; ray-fls. neuter, disk-fls. perfect and fertile; involucre hemispherical or broadly campanulate; receptacle convex; corolla yellow, ray-fls. ligulate, disk-fls. tubular, 5-toothed; achenes somewhat pilose.—About 10 species, Mex., Cent. Amer., and W. Indies.

diversifolia, Gray (Mirabilis diversifolia, HemsL.). Large shrub with rather stout branches, glabrous or nearly so; ifs. petioled, membranaceous, glabrous or puberulent, ovate or almost orbicular, entire or 3-5-lobed, 9x6 in., rarely 6x4 in. wide; heads orange, up to 6 in. diam., terminal or lateral, usually in 3’s, on short thickened peduncles; achenes club-shaped. S. Mex. and Guatemala.


TOCÓCA (tooco is the native name of T. guianensis). Including Sphärogynae. Melastomaceae. Glabrous or hirsut-pilose shrubs, sometimes beardedit with setae at the axis, grown in the greenhouse for their foliage.

Leaves petioled, large, membranaceous, rarely coriaceous, entire or dentate, 5-nerved; ifs. rather large, arranged in terminal and sometimes also lateral panicles, white or rose; calyx glabrous, pilose or hirsute, tube campanulate, terete or ribbed, limb obtusely 5-lobed: petals 5-6, oblong or obovate; stamens 10-12; ovary 3-5-celled; berry fleshy; seed obovoid or pyramidal.—About 50 species, natives of Brazil, N. Venezuela, and Guiana.

Tooco requires a warm house temperature, with sharp and fairly moist places. Use leaf-mold mixed with fibrous loam, and provide ample drainage. It is best propagated from what are called split joints, or eyes with the leaf rolled up, and inserted in thumb-pots in fine sand with chopped moss; then insert pot in sand or cocoa fiber, with bottom heat of 75° to 80°. Cover with bell-glass or other inclosure to exclude air and to keep a fairly moist (but not wet) condition. In about two months the cuttings will have rooted. The wood for propagating should be well ripened. (H. A. Siebrecht.)

imperialis, Nichols. (Sphärogynae imperialis, Laut.). St. short, erect, or little branched, somewhat shrubby, oppositely, decussate, oval, with 5 longitudinal ribs running from base to apex and many parallel transverse veins connecting them. Peru. T.I. 24:284.—Native of Peru, and intro. to Eu. by Linden in 1871. It is said to be easily grown in a greenhouse.

platyphyllya, BentH. (Sphärogynae latifolia, Naud.). Short-stemmed plant with succulent somewhat tortuous st.: ifs. broadly ovate, minutely denticate-ciliate, 7-nerved: ifs. rosé or red; ovary 3-loculed. Colombia, Venezuela, Costa Rica.—Cogniaux puts this species in the same section characterized by having the ifs. destitute of vesicles and the calyx not winged. In this section it is unique by reason of its herbaceous branches with long bristles, especially at the nodes; the other species of the section have shrubby and glabrous branches. A very beautiful plant, but considered to be difficult to grow. Wilhelm Miller.

TODDÁLIA (Kaká Toddálii, Malabar name of T. acutalea). Rutáceae. Shrubs usually somewhat climbing or arborescent, unarmed or prickly, adapted to the warm and parched canyons of the desert S. Lvs. alternate, 3-lobate; ifs. sessile, lanceolate, leathery, entire or 3-lobed; petals 5-6, imbricate or valvate; male ifs., stamens 2, 4, 5, or 8, ovary rudimentary; female ifs. ovary ovoid, oblong or globose, 2-7-lobed: fr. pea-like, hard, coriaceous, globose, permanently syncarpous.—About 20 species (including Vepris), natives to the Old-World tropics and the Cape. In Toddalia proper the petals are valvate, and the stamens as many as the petals; in the subgenus Vepris the petals are imbricate and the stamens twice as many as the petals.

lanceolata, Lam. (Vepris lanceolata, A. Juss.). Small tree or large shrub, erect, without prickles, entirely glabrous: petals 1-2 in. long; ifs. oblong-lanceolate, 2-3 in. long, acute, entire, waved at the edge, ½-1 in. broad: panicles axillary and terminal, thyrsoid: petals a line long, imbricate; stamens 8, in the male ifs. exserted: fr. of a pea, globose, fleshy, gland dotted. Mauritius, Mozambique, Cape.—Intro. by Reasoner Bros., 1891.

TODÉA (H. J. Tode, a German botanist, 1733–1797). Osmodendraceae. Grape Fern. A group of ferns with fleshy sporangia, as in Osmunda, but having these borne on the backs of ordinary ifs. The last three species, although frequently united with Todéa, more properly form a distinct genus Leptopteris, differing widely in habit from the original Todéa; they form delicate foliage plants resembling the filmy ferns in habit. For cult., see Ferns.

A. Texture leathery: ifs. bipinnate.

bárbara, Moore (T. africana, Willd.). St. short, erect: ifs. in a crown, 3-4 ft. long, 9-12 in. wide; pinnae erect, spreading, sometimes 2 in. wide: sori closely placed, often covering the whole under surface at maturity. S. Afr. to New Zel. G. 37:265.—A very resistant and useful fern. It deserves wider cult.

AA. Texture thin: ifs. with linear divisions.

b. Ips. bipinnatifid.

hymenophylloides, Rich. & Less. (T. pellácia, Hook.). Lvs. 1-2 ft. long, 8-12 in. wide, lowest pinnae about as long as the others: rachis densely covered. New Zel.

supérba, Col. St. erect, woody: ifs. 2-4 ft. long, pinnae often crisped, the lower gradually reduced; rachis densely tomentose. New Zel.

bb. Lvs. bipinnate.

Fraseri, Hook & Grev. St. erect, woody, 18-24 in. high: ifs. 1-2 ft. long, lowest pinna nearly as large as the others; rachis narrowly winged, naked. Austral.

L. M. Underwood.

TOFIÉLDA (named after Tofield, a Yorkshire botanist). Liliaceae. Perennial herbs, mostly hardy; six or more from a short or repent rhizome: ifs. radical or clustered at the base of the st., short-linear, somewhat distichous; caluline ifs. few or none: frs. small, in a terminal spike, subseccisile or short-apedicellate; perianth persistent, segms. oblong or narrow; stamens 6; ovary sessile; caps. 3-lobed.—About 25 species, mostly north temperate and boreal regions but 1 or 2 in the Andes. T. racemosa, BSP. (T. pabens, Michx. Tridántia race­mosa, Small). Sts. slender, 1-2 ft. high, minute glandular; ifs. narrow-linear, 6-12 in. long; perianth rigid, whitish, 2 lines long. Pine barrens, N. J. to Fla. and Ala. B.M. 3859. Of no special horticultural value.
CXII. A good type of commercial tomato.—Brinton Best.
TOLMIA (named for Dr. Tolmie, surgeon of Hudson Bay Co.). Saxifragaceae. Herbaceous, glandular pubescent, hardy; rhizome scaly; stts. simple; calcareous lvs. alternate, radical petioled, cordate-incipient-lorate; stipules, membranaceous; racemes terminal, slender, simple; fls. rather seccund, nodding, green; calyx-tube elongate, funneliform-campanulate; 5-lobe; petals 5, capillary; stamens 3; ovary narrowly oblong, 1-celled; caps. exserted from the calyx, superior, 2-valved, 2-beaked.—One species. Borders and wild-garden.

MÉNISÉSI, T. & Gray (Leptáxia Méniési, Raf.). Perennial herb, 1-2 ft. high, with slender creeping root-stocks and some summer runners; lvs. round-cordate, more or less lobed and crenately toothed, slender-stalked, all alternate, those of the st. 2-4 in number; raceme 8-10 in. long; fls. and caps. nearly 1/2 in. long, greenish or tinged purple. Forests of Mendocino Co., Calif. to Puget Sound.—Prop. naturally by adventitious buds, produced at the apex of the petioles of the radical lvs. and rooting when these fall to the ground.

WILHELM MILLER.

TÔLPI (name unexplained). Compositae. Herbs, annual and perennial, allied to Crepis, with showy yellow heads, suitable for the flower-garden or for borders, but apparently not offered in this country; species about 15, in the Medit. region, and the Canaries and Azores. St. rarely somewhat woody; lvs. mostly radical or on lower part of st., entire, dentate or pinnatifid, the upper ones few and narrow. Heads homogamous; ligulate, the involucre campanulate with narrow bracts in several series; receptacle naked or pitted: achene subterete, 6-8-ribbed, the pappus of 8-10 very slender capillary; stamens 3; ovary narrowly oblong, 1-celled: blooms from midsummer till frost. B.M. 95.

TOLUÍFERA: Myroxylon. The following species now planted as a shade tree in S. Fla. was mentioned under Myroxylon. M. Pereirea, Klotzsch (Toluífera Pereirez, Basil.). Tree: lvs. uneven-pinnate; lfts. 6-9, from 2-3 in. long, 14-16 lines broad, oblong, glabrous, petiole 1-2 1/2 in. long, terete and sparingly puberulent: pod 2 1/2-3 in. long. Cent. Amer.

TOMATO. The plant Lycopersicum esculentum (which see, page 1931, Vol. IV), grown extensively for its edible fruit.

The tomato is probably grown more extensively in North America than elsewhere, and the varieties have reached a high degree of perfection. The American standard or ideal is a tomato that is nearly globular, solid and “smooth” (that is, not wrinkled). (Fig. 3818.)

The flat angled and wrinkled tomatoes (Fig. 3819) are now little grown in this country. These forms are little adapted to canning, in which use enormous quantities of tomatoes are employed, and they do not satisfy the popular desire. The old-time pear, cherry, and plum forms (Fig. 3820) are still grown for curiosity and also for the making of pickles and preserves, but their field culture is relatively not important. The currant tomato, grown for ornament and curiosity, is considered to be Lycopersicum pimpinellifolium. It sometimes hybridizes with the common species (Figs. 2234, 2235, Vol. IV).

The tomato requires a warm soil and climate, a sunny open position, and also a long season. The plants are usually started in hotbeds or glass houses, being transferred to the open as soon as settled weather comes. They are usually set from 4 to 5 feet apart each way and are allowed to grow as they will, finally covering the ground. For the same use, however, the plants are often trained, in order to forward their ripening and to secure larger and better-colored fruits. The best method is to train to a single stem supported by a stake or perpendicular wire or cord (Fig. 3821); or sometimes it is tied to the horizontal strands of a trellis. This single-stem training requires close attention, and if the time cannot be spared for it, the vines may be allowed to lie on an inclined trellis or rack. This rack training keeps the plants from the ground and thereby allows the individual fruits to develop perfectly and also checks the spread of the fruit-rot; but it usually does not give such perfect fruits as the single-stem training, since the number of fruits is limited in the latter. Sometimes a serious difficulty in tomato-growing is a rot of the fruit. This seems to cause most damage following close wet weather when the fruit is ripening. It is thought to be worst on plants that cover the ground thickly with foliage and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop beyond a few pickings; and if the plants are brought into bearing early and are kept in thrifty condition for subsequent bearing, the percentage of total injury is greatly reduced. The tomato is tender to frost. The green fruit remaining when frost kills the plants may be ripened in tight drawers or cupboards, if it is nearly or quite full grown. The tomato is a short-lived perennial, but in cold climates it is grown from seeds as an annual. It may be propagated from cuttings.

L. H. B.

General culture of the tomato.

The tomato plant comes from regions in South America where the conditions of temperature and moisture in its growing season are very constantly favorable for its rapid growth and the ripening of a large yield of fruit. Although it cannot be classed as a tropical and hardly as a semi-tropical plant, it thrives best in a day temperature of 65° to 85° F., makes very slow growth in one below 40° F., and, unless hardend by gradual exposure, will be killed by a short exposure to a temperature of 32°. It is a rapid-growing, short-lived plant and under favorable conditions will mature its first fruit in ninety to one hundred and twenty days from the sowing of the seed and continue in bearing for fifty to ninety days, when it will generally die of exhaustion, though its life may be prolonged (with lessened vigor) either by cuttings or layering. It is emphatically a sun-loving plant and unobstructed sunlight is essential for its most vigorous growth and greatest fruitfulness. An attempt to grow tomatoes of superior or even good quality in an orchard or at a season when the sunlight is likely to be dimmed much of the time by clouds or mists is very likely to be disappointing.

The splendid color often seen in Italian-grown fruits is due to cloudless skies rather than to superior varieties or cultural methods. Under favorable conditions the plant is a vigorous and rapid grower and capable of maturing an enormous crop of fruit, but it requires for even a fair yield very constantly favorable conditions, and any check in its growth from cold or cloudy weather or too deep and harsh cultivation, even if the plant seems fully to recover, will surely materially lessen, the yield of fruit. Many cases have been seen in which cultures within a few miles of each other and on similar soil have matured crops differing greatly in quantity and quality as a result of such difference in cultural practice as to bring one crop into the fruiting-stage in better condition, or at a time when the weather was matured for the fruiting stage of fruit. The plant, however, is very tenacious of life and will often live and produce some fruit under most unfavorable conditions and many who have grown it for years do not know of the amount of fruit a healthy tomato plant is capable of producing. It is doubtful whether the average yield of all the cultures in the United States exceeds 6,000 pounds of marketable fruit to the acre. Yet every
season for the past fifty years many fields have been known where the salable crop was from 30,000 to 40,000 pounds to the acre, with exceptional still larger yields.

Exposure is often an important factor in determining the profit of a crop. Generally a gentle inclination to the southward, with protection of higher land or forest on the side from which cold and damp winds may be expected will give the largest yield of the most marketable fruit, but a sharp inclination to the south, particularly if it be steep or such as to form a hot pocket, rarely produces a maximum crop, although, because of the early ripening of the fruit, it may be a profitable one.

The largest yields recorded were generally grown on red clay loam. Large yields are often secured from soils of very different compositions, from “gumbo” prairie, marsh muck, stiff clay, to a light sand provided the conditions of drainage, fertility, and tilth are favorable, but a maximum crop can never and even a profitable one very seldom be grown on a cold soil, or one which is poorly drained, sodden, sour, or hard and solid from want of cultivation. A good crop of tomatoes very seldom follows one of potatoes or tomatoes.

Tomatoes are rank feeders and the use of fresh stable manures and those carrying a large proportion of nitrogen is likely to result in a rank growth. Tomatoes ripen a small crop of fruit of poor quality. The best yields and quality of fruit will usually be from fields rich from fertilizing in previous years. On unfertile fields where one is obliged to use commercial fertilizers, those comparatively rich in potash will generally prove most profitable. The largest yield and best fruit have generally been from rich clover sods, which were plowed as early as practicable in the spring, rolled, and made friable by repeated surface cultivation.

Although in all but the extreme northern part of the United States, in very high altitudes and in some parts of the Puget Sound country, tomatoes will generally ripen a full crop from seed sown in the open ground, from Washington northward plants so grown will rarely ripen their crop until past midsummer and much of it will miss the long days of sunshine, which are essential for the development of the best quality. On this account it is desirable, in most cases, to start the plants under glass, so as to give them fifty to sixty days’ growth by the time they can be set in the open ground without danger from killing frosts. It is very easy to grow plants to this age, but the character of the growth and the condition in which they go into the fields are most important factors in determining the quantity and quality of the fruit.

Starting the plants under glass is usually accomplished best by sowing the seed in boxes about 4 inches deep and of convenient size for handling, filled with soil made up of two-fifths well-rotted cow-manure, one-fifth old well-rotted cow-manure, and one-fifth coarse sharp-grained sand. Soils used in plant-boxes or beds should always be sterilized by spreading over steam-pipes perforated on the lower side sand by steam until a potato buried about 3 inches in the soil is cooked soft. The seed can be sown rather thickly and covered 1/4 to 1/2 inch deep. The boxes should be well watered and set in the shade until the plants show above the soil, when they should be set in full sunlight and kept at a constant temperature between 65° and 80°, and given water as needed. The plants should develop large seed-leaves and bud within ten to fifteen days, when they should be transplanted into the frames. The soil of the frames should be 3 to 6 inches deep and freshly made up and sterilized as recommended for the plant-boxes. The plants may be set twelve to twenty-four to the square foot, according to the time they are expected to remain before setting in the field. The beds should be closely watched and the sash opened as the air in them becomes warmed by the sun to a temperature above 60° and as promptly closed as it cools below 40°. The plants should be watered as necessary to prevent the plants wilting, but this should be done as far as practical in evening or early morning, rather than during bright sunshine. If necessary the beds may be protected by covering with plants, by covering the sash with sacks, old carpets, straw, or even a sprinkling of earth. An inexperienced person will be surprised to see how effective even a slight covering often is. In case frost does come in, it is best to keep the beds covered until they can warm up without direct sunshine, even if this takes a day or two. Cases have been known in which plants that seemed to be killed were saved by a veil of paper warming up. For a few days before the plants are to be set in field, they should be hardened off by scant watering and fuller exposure both to the sun and night air, and the day before they are to be set should be thoroughly sprayed with bordeaux mixture. The field, particularly if it has been a clover sod, should be prepared and cut two weeks killed by keeping it absolutely free of green vegetation for at least a week before the plants are to be set and the evening before scattering over the surface poisoned bait made by thoroughly mixing one pound of paris green or similar poison with fifty pounds of bran or middlings moistened with sweetened water. The evening after the plants are set, the poison should also be scattered along the rows. Next day the plants should be again sprayed with bordeaux.

Field culture should begin the day after the plants are set and be repeated every four or five days and as soon after every rain as it can be done without puddling the soil. At first the culture should be as close to the plants and as deep as possible, but it should be farther from the plants and shallower each time until it is a mere stirring of the surface in the center of the row, always taking care to disturb the vines as little as possible. The plants should frequently be looked over.
carefully for potato bugs, the most effective way of combating them being by hand-picking the beetles and eggs when they first appear.

When quality and quantity of fruit is second to early ripening, the seed may be sown earlier and the growth of the plants checked by crowding and a scarcity of water; so treated they generally will form a crown cluster of well-developed fruit by the time one dares risk them in the open. They are then set close in the row and rather deep, with the stem and root slanting to the south and will ripen the first cluster very early, although the remainder of the crop will be late and poor.

When quality rather than quantity of fruit is of first importance, staking and pruning is sometimes advantageous, especially if the soil is inclined to be wet. With many growers stakes 2 inches square and 5 to 6 feet long have given the best satisfaction. As soon as the tomato plant forms its first cluster of bloom it divides, and both branches are allowed to grow and then tied to the stakes while all other branches are cut off just beyond the first cluster of blossoms; during the early part of the season this will require daily attention. Staking has been found profitable and is very generally practised in the southern states.

Even when first discovered by Europeans, the plant or plants now commonly called tomatoes existed in many forms differing so materially in habit of plant and character of foliage and fruit that they were classed by botanists as distinct species, and the number of varieties offered has increased with frequent changes until American seedsmen have catalogued tomatoes under at least 513 distinct names, while many other more or less distinct forms are commonly grown abroad, particularly in Italy.

The following are some of the names used in seedsmen's catalogues, many of them standing for distinct forms of vine or fruit, while others are simply variations in stocks.

- **Currant or Grape.**—Bank-growing, but slender small-leaved vine, very productive of long currant-like stems of bright red fruits not over ½ inch in diameter, of little culinary value.
- **Red and Yellow.**—Strong-growing, very productive of cherry-shaped fruits, which are excellent for pickles and preserving.
- **Pear, both Red and Yellow.**—Strong-growing vine, small, long-necked, pear-shaped, two-celled fruits.
- **Plum, both Red and Yellow.**—Long oval-shaped, 2-celled fruits, which are excellent for preserving.
- **Turk's Turban.**—Long oval, bright red fruit, with a peculiar growth on the blossom end.
- **Potato or Broad-leaved (in a number of variations).**—Comparatively small vine, with broad entire leaves.
- **Dwarf Champion.**—Vine very short, compact, leaves thick, crumpled, nearly entire.
- **Peach, both Red and Yellow.**—Fruits covered with down similar to the currant or grape plant.
- **Diodem.**—Fruit bright red, distinctly striped with yellow.
- **White Apple.**—Round smooth whitefleshed fruit of delicate flavor and the best of all varieties for eating from the hand.
- **Golden Queen.**—Fruit bright yellow, often with a distinct red blush.

Each of the above is so distinct in habit of plant foliage or fruit that botanists might perhaps classify them as distinct species, while the following are some of the more distinct of the varietal forms listed by seedsmen under different names.

- **Eratoma.**—Comparatively small weak-growing vine, but maturing very early a large crop of smooth bright red fruit.
- **Bony Burt.**—Vigorous vine, ripening very early and evenly a large crop of uniformly round bright red fruit.
- **Markette.**—Large smooth bright red fruit, with red fine-flavored but not very solid flesh.
Growing of tomatoes in the South.

The growing of tomatoes on a commercial scale in the southern states began just prior to 1900 and has gradually increased until it is now one of the most important crops grown in that section. Especially is this true of Florida, Mississippi, and Texas.

The crop in Florida begins to move in December and continues at intervals during the winter months. The movement in Mississippi and Texas is more concentrated, beginning the latter part of May and closing the last of June. During the height of the tomato season, solid trainloads of tomatoes are shipped out of the two last-named states daily.

In growing the tomato for the northern markets, earliness is of prime importance. For this purpose, the soil of the south should be loose and porous, but not too rich. Especially should an excessive amount of organic matter be avoided. A good average soil, with 1 inch of leaf-mold added gives good results.

The seeds are sown about January 20. They are placed in rows 4 inches apart, ½ inch deep, and from three to four seeds to the inch. Under normal conditions, the seed should begin germinating in six to eight days. The temperature should not be allowed to go over 80°F, during the day, or below 65°F at night. The heat should be so regulated as to produce a slow, steady growth. Too much heat produces rapid, succulent growth, often causing the plants to become weak and spindling, which conclusions are easily affected by adverse weather and more subject to the attacks of diseases.

As soon as the young plants begin to grow, plenty of ventilation should be given and the soil frequently stirred. The soil should be kept moist, but not wet. By the last week in February, the plants begin to crowd in the row, at which time they should be moved to the coldframe.

The coldframe is usually located in the field where the crop is to be grown. The soil in the coldframe should be richer and should contain more organic matter than that in the hotbed. The rows are laid off about 3 to 4 inches apart, and the plants set 4 inches apart in the row. A board with wooden pegs set 4 inches apart may be used to advantage in opening the holes for the plants. It is advisable to set the plants deeper than they stood in the hotbed, and, as soon as transplanted, they should be given a good watering. Special pains should be taken to protect them from sudden changes in temperature. At first they should be carefully covered at night; and if the weather is very threatening, an extra cover, such as cotton bagging, Sudan grass mats, and the like, should be used. Whenever the weather is clear and bright, the top should be lifted during the warm part of the day.

During the latter part of March, when the nights are warm, the cover may be left off entirely, so as gradually to harden the plants. By the first of April, the tomatoes begin to crowd in the row, which is a good indication that they are ready for moving to the open field.

Tomatoes for the early market should be planted on well-drained elevated land, that has some form of protection for the first six weeks or two months of its growth. This necessarily means extra care and expense, which, in turn, means that the grower, in order to succeed, must exercise a higher degree of intelligence than is shown in the production of the average vegetable crop. It has been clearly demonstrated that it does not pay to grow tomatoes on a large scale, nor does it pay to grow them when most of the help has to be hired. The best results are obtained when a single family through its own labor and expense, which, in turn, means that the grower, in order to succeed, must exercise a higher degree of intelligence than is shown in the production of the average vegetable crop. The labor should be well broken with a turning plow, then disked, harrowed, and laid off in 4-foot rows. A furrow should be run down each row and fertilizer applied and mixed in with the soil. Just before taking the plants from the coldframe, the soil should be given a thorough wetting. Then one end of the coldframe should be knocked out and the soil should be removed to a depth of 2 inches, up to within a few inches of the first row of plants. A sharp spade or mason's trowel is then used and a 4-inch square is cut around each plant, after which the block of soil containing the tomato is carefully lifted and placed in a flat box or on a wide board, which is then
set in a wagon. The wagon should be made to straddle one row and the plants lifted out from the rear and placed from 2 to 3 feet apart in the three adjoining rows. Special pains should be taken when the plants are placed in the furrow to prevent the soil from breaking away from the roots, as they will wilt easily at this stage. Moist soil should be driven by hand and pressed around each plant. A sweep or small turning plow should then be run around each row so as to fill in the remainder of the furrow.

Tomatoes should receive frequent and thorough cultivation from the time they are set in the open field until the first fruits begin to ripen. A crust should never be allowed to form on the soil, nor should weeds be allowed to grow. A five-tooth cultivator is one of the best implements that can be used in cultivation.

When moved to the open field, the plants are often beginning to show their first cluster of blooms and are also beginning to force out shoots from the axils of the leaves. The plants should be gone over carefully every few days and suckers should be removed before they have grown longer than 1 inch. It is a serious mistake to neglect removing shoots and suckers, even for a few days.

When three or four fruit-clusters have set, the terminal bud is pinched out, and thereafter no new growth whatever should be allowed. This severe pruning undoubtedly reduces the amount of fruit to the acre, but it is a considerable aid in the development of quality and earliness.

The staking, like the pruning, should begin soon after the plants are set in the field. A 4-foot stake, 1 by 2 inches, should be driven down within a few inches of the plant, and coarse twine wrapped around the plant and tied to the stake. Two or three tyings should be made during the development of the plant. The staking holds the vines and fruit off the ground, prevents rott ing of the fruit in wet weather, and allows the sun and air to strike the fruit, thus inducing earliness, while, at the same time, reducing the danger from diseases.

Tomatoes in the southern states north of Florida begin to ripen about the middle of May. As soon as the ripening period arrives, the tomato patch should be gone over every day during the shipping-season. As soon as the fruit shows a deep creamy white color, with a faint blush of pink, it is ready for harvesting. At the first of the season, the fruit may be allowed to take on a deeper color than later on.

Tomatoes are gathered in one-half-bushel baskets, lined with coarse ducking, and carried to the packing-sheds, which are generally located in the field, and then packed in four-basket crates, averaging twenty pounds, or one-third bushel each. As a rule, there are two grades: fancy and choice. The fancy are packed with the stem end down and average about twelve to the basket. The choice are packed on the side and average about fifteen to the basket. The six-basket crate is now becoming popular in some sections.

The bulk of the crop is shipped in refrigerator cars, well iced. It is now becoming the custom, when distant markets are to be reached, to harvest the fruit as soon as it is mature, but while still quite green in color. Each tomato is wrapped with soft paper and packed in flats or six-basket carriers and shipped in refrigerator cars, with the ventilators open, but without ice. This is known as the "green-wrapped" pack. It requires 896 four-basket crates to fill a car. A fair average yield is 250 boxes to the acre, although a few growers sometimes produce as high as 600. A good average price for a season is 60 cents a crate.

A medium to large tomato, one that is smooth and does not crack easily, is the best for early shipping. The Acme has been the leading variety for many years, while the Earlana, Stone, and Beauty, are grown on a small scale in some sections.

3823. A prolific tomato, the result of training to a single stem.

There is no standard fertilizer for tomatoes. Tomato soils of Texas are relatively rich in potash; so, as a rule, it is not necessary to use more than 1 per cent of this ingredient. Most of the Texas growers use a fertilizer containing from 8 to 10 per cent of phosphoric acid, 2 per cent of nitrogen, and 1 per cent of potash. A fertilizer containing from 400 to 600 pounds of equal parts of acid phosphate and cottonseed meal to the acre gives very satisfactory results. In the states east of the Mississippi River, the amount of potash is considerably increased; the total amount of fertilizer used to the acre is also considerably greater. From 800 to 1,000 pounds of fertilizer to the acre, containing 6 per cent phosphoric acid, 7 per cent potash, and 3 per cent of nitrogen, seems to be satisfactory. Fifteen or twenty loads of manure to the acre, applied broadcast, two or three months in advance of planting the crop, will always give good results.

The damping-off fungi often attacks the young plants while they are in the hotbed. These fungi work on the stem of the plant, just where it enters the soil, causing it to shrivel and the top to fall over. Wet soil and a damp sultry atmosphere are conditions that favor the development of this disease. Frequent stirring of the soil and thorough ventilation will go a long way toward preventing the appearance of this trouble. A thin coating of tobacco dust or a mixture of three parts of lime to one of sulfur, spread over the soil after the seed is planted, will also help to hold the disease in check.

The blossom-end rot is a very destructive disease. It makes its appearance when the fruit first begins to ripen, thereby destroying the earliest and most profita-
Tomato-growing under glass.

The tomato ranks next to the cucumber and egg as a vegetable forcing crop. It is grown extensively under glass near all of the large cities of the North from the Mississippi River to the Atlantic coast. In some instances houses are devoted wholly to tomatoes, while in the larger number of cases other crops are grown in rotation with tomatoes. A very common practice is to use the same glass and the same fruit as before before the fruit is full grown, there is danger in using any poison as a spray.

E. J. Kyle.

Tomato-wilt sometimes causes considerable damage. This is a large green worm that enters the fruit near the stem-end. As soon as the fruit is infested, it is entirely worthless and should be removed and fed to hogs or destroyed. The boll-worm can be partially controlled by spraying with arsenate of lead; but, as it seldom makes its appearance before the fruit is full grown, there is danger in using any poison as a spray.

Tomato-wilt is a microscopic worm which attacks the roots of a tomato plant and causes small bead-like knots to form. Ground infested with this pest should be avoided and whenever there is danger of infestation, cowspeas should not be planted on the preceding tomatoes, as most varieties of peas encourage the development of the nematode.

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E. J. Kyle.

The nematode is a microscopic worm which attacks the roots of a tomato plant and causes small bead-like knots to form. Ground infested with this pest should be avoided and whenever there is danger of infestation, cowspeas should not be planted on the preceding tomatoes, as most varieties of peas encourage the development of the nematode.

In the starting of tomato plants for forcing, there should be uninterrupted growth from germination until the plants have attained full size in the beds. It is customary to sow the seed for the full crop soon after June 30, and for the spring crop from January 15 to February 1. If a very early spring crop is wanted, the seed should be sown January 1 or even earlier. The seedlings may be planted in beds or flats at the first transplanting and the second shift should be made to pots large enough to care for the plants without crowding. A third shift to 4- to 6-inch pots is often made, and with good management this should result in very fine plants.

Most of the large commercial growers employ solid beds. Raised benches are used in some sections, especially when carnations precede the tomatoes. Solid beds require no expense for construction and maintenance and it is less difficult to maintain uniform soil-moisture conditions. It is an advantage when bottom heat is desired and this should be considered if the crop is to be grown at midwinter. If lettuce is grown until the tomatoes are planted early in the spring, solid beds will be found entirely satisfactory. Large pots are used inside the houses, but they are not practicable on a large commercial scale.

Some persons have an idea that the tomato does well in poor soils. This is an erroneous impression, for high yields are obtained only in rich soils. It is true that the proportion of plant-food must be well balanced. An excess of nitrogen, with copious watering and high temperatures, causes a rank growth of plants and a low yield. But the soil must be well provided with the mineral elements and enough moisture must meet the needs of the plant. If lettuce is grown until March, and enough manure employed to obtain good crops, the soil should be in ideal condition for tomatoes. It must be borne in mind that the greenhouse soil is a kind of manufactured soil, and it is important to give special attention to the supply of fiber or organic matter. The productivity of greenhouse soils, whatever the crop may be, depends more on their physical properties than on their chemical composition. Stable manure, used in ample quantity for lettuce, will make the best preparation for tomatoes and no additional manure will be needed to applied to the tomatoes, except as a mulch. Special fertilizers have not been found necessary, and seldom are an advantage, when stable manure has been used in sufficient amount to keep the soil in proper physical condition. While sandy loams are preferable for growing tomatoes under glass, any of the common soils, clays included, will give good results when properly handled.

There is the greatest diversity of practice among growers concerning planting distances. Some prefer to plant close together in rows with liberal spacing between rows. For example, a highly successful gardener sets the plants 14 inches apart in rows 30 inches apart. Some plant 2 feet apart each way with alleys at convenient distances. In large commercial houses, liberal spacing between rows is a great advantage in training the plants, pollinating the flowers, and picking the fruit.

It is possible to do a little intercropping between the tomato plants. Lettuce and radishes are sometimes grown between the rows, by starting the crops immediately after the tomato plants have been set. The practice is only fairly satisfactory because the tomato plants shade the lettuce and radishes so that the latter crops are seldom very good.

While tomato plants may be trained to two or more stems, the almost universal practice under glass is to grow single stems. (Figs. 3822, 3823.) This is easily accomplished by removing with thumb and finger all lateral branches as fast as they appear. The stems may be supported in any convenient way. Small strings, are usually employed. A common practice is to use fairly heavy string or twine for the uprights which are tied to wires running lengthwise in the house.

Tomatoes under glass may be tilled, if it is preferred, but the better practice is to mulch the ground.
with 3 or 4 inches of fresh horse-manure which has been steamed in thin layers a few days before being applied. The mulch should be applied after most of the fruit has been set. If applied too soon, an excessive vine growth and sparse setting of fruit may result. A mulch of manure keeps the soil in a loose and friable condition; it conserves moisture more perfectly than the most thorough tillage; it furnishes plant-food every time water is applied; it prevents weed growth and saves labor in rendering tillage unnecessary.

The temperature of the house at night should not fall below 60°. From 10° to 15° higher during the day will provide excellent growing conditions. If there is bright sunshine and the ventilators are open, there need be no fear if the temperature should rise to 100°. Some fresh air should be admitted every day, but good judgment should be exercised in ventilating the houses. Excessive watering must be avoided. High temperatures, over-watering, and poor ventilation are responsible for many failures.

Some attention must be given to the pollination of the flowers. Various methods are followed. Some careful growers use a little camel's-hair brush on each flower that is likely to contain ripe pollen-grains, and the grains of pollen are thus carried from flower to flower just as bees and other insects might perform this work out-of-doors. Jarring the plants daily is usually sufficient to get a good set of the spring and early summer crops. Whatever the method employed, the work should be done, if possible, when there is bright sunshine and the atmosphere of the house is as dry as possible.

Greenhouse tomatoes have certain enemies which must be controlled if a satisfactory crop of fruit is desired. Steam sterilization of the soil previous to setting the plants is practicable in most large greenhouses. This is by far the most effective means of destroying the nematodes which cause an abnormal development of the roots and interfere with the nutrition of the plants. Steam sterilization also helps to prevent some of the diseases to which the tomato is subject. Blight, mold, and the cedema are among the most serious diseases. Frequent and thorough application of bordeaux mixture is valuable in controlling various diseases. The white-fly is the most destructive insect pest. It may be controlled by fumigating with hydrocyanic gas.

Some of the most successful growers are able to obtain yields of ten pounds to the plant for the spring crop. This, however, is considerably above the average when the entire country is taken into account. Six pounds to the plant, for the spring crop, and four pounds to the winter crop is considered satisfactory. An average of 10 cents a pound for the spring crop makes it a profitable undertaking, and 30 cents a pound is not too much for the winter crop.

The greenhouse tomato should be of the highest quality and special care should be exercised in marketing it. Small packages holding about five pounds are preferable. The tomatoes should be clean and wrapped in paper bearing the name of the grower. The grower should be able to guarantee every specimen which is packed in the number 1 grade.

R. L. Watts.


TOMMASINIA: Angelica. The following species, in the lists under Tommasinia, should be entered with Angelica in Vol. 1, p. 287. Angelica verticillaris, Linn. (Tommasinia verticillaris, Berton). Peucedanum verticillare, (Koch). Advertised in this country as a lawn plant. It is a hardy perennial, about 1 ft. tall, with many small yellow-green fls.: lvs. 3-parallel, the lfts. ovate, acute-serrate and the lateral ones often 2-lobed and the terminal one 3-lobed, the petiole much dilated at base. Piedmont region, S. Eu.


TORENIA (named for Olaf Toren, clergyman; traveled in China 1750-1752 and discovered T. asiatica). Scrophulariaceae. Glabrous, pubescent or hisrate annual or perennial herbs, mostly low, branching and somewhat decumbent, grown sometimes in the greenhouse for winter bloom, but mostly grown as garden annuals.

Leaves opposite, entire, crenate or serrate: racemes short, few-fl., terminal or false-axillary: calyx tubular, plicate or 3-5-winged, apex obliquely 3-5-toothed or 2-lobed; corolla-tube cylindrical above, 2-lipped; stamens 4, perfect, in pairs of unequal length: caps. oblong.—About 33 species, Trop. and E. extra-Trop. Asia and Trop. Afr.

Torenias are of easy cultivation and are very useful in the window-boxes and borders, or even for large masses. The flowers are not large but the plants are floriferous and keep in good leaf and flowers from spring to frost. T. Fournierii has the best habit for a bedding plant, but it may be bordered with P. flava. They are easily raised from seed, sown indoors or in the open, but may also be grown from cuttings.

In Florida T. Fournierii is an excellent substitute for the pansy, which is cultivated only with difficulty so far south. Young plants come up by the hundreds around the old plants from self-sown seed during the rainy season. The species can also be propagated with great ease by cuttings. The torenia shows its full beauty when planted in beds or borders or in masses in front of small evergreen shrubs. It flowers abundantly throughout the summer, and even late in fall isolated flowers may be found.

The best results are obtained by treating it as an annual. Any good and rich light soil seems to meet its requirements. It succeeds almost everywhere but prefers shade and moisture. It even grows luxuriantly in wet places along ditches and water-courses where forget-me-nots grow in the North. If such localities, however, are very shady, the flowers, though much larger, are neither produced so abundantly nor are they colored so brightly as in sunny situations. On the other hand, it is sometimes found in such dry positions, where only cacti and yuccas manage to live, that one can scarcely understand how it is able to succeed. In good soil the torenia attains a height of 8 to 10 inches, and when planted about 8 inches apart soon covers the ground entirely. There is already a great variety in colors, but the typical plant has beautiful light blue and royal purple flowers, with a bright yellow throat, in texture rivaling the most exquisite velvet. (H. Nehrling.)

a. Fls. mainly yellow.

flava, Buch.-Ham. (T. Ballioni, Godefr.). Usually decumbent and creeping: lvs. 1-2 in. long, ovate to oblong, coarsely crenate; petiole half as long as the blade or less; fls. axillary and solitary or scattered at the ends of the branches in pairs on an erect rachis; corolla-

AA. Fls. mainly blue or white.

- b. Lvs. cordate-lanceolate.

**Fournieria**, Lind. (T. eidentula, Hort., not Benth.).

Low, bushy, usually annual, becoming nearly 1 ft. high; st. 4-angled; lvs. petioled, cordate-lanceolate, 1-1 1/2 in. long, crenate-serrate; petiole 6 mm. long; corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lip not cut, pale blue, the anterior 3-lobed; lobes round-obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. I.H. 23:249. R.H. 1876, p. 465.

B.M. 6747. G. 1:58. Var. alba, Hort. (var. White Wings), has pure white fls. A.F. 5:401. G.M. 36:57. Var. compacta, Hort., is a more compact form than the type and rather larger-flld. G.W. 10, p. 610. Var. grandiflora, Hort., has somewhat larger fls. and is more free-flowering. Var. speciosa, Hort., is a showy form offered in the trade, probably very similar to var. grandiflora.

BB. Lvs. ovate or deltoid-ovate.

**asiiatica**, Linn. Fig. 3824. Annual, erect or diffuse; st. quadrangular; lvs. ovate or ovate-lanceolate, long-accuminate, serrate, obtuse, not cordate at the base, rough to the touch; peduncles axillary, single-flld.; corolla large; tube dark purple; limb 4-lobed, of a delicate pale purple-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4240. Var. pulcherrima, Hort., has larger, dark violet-blue fls. with a spot on the upper lip. G.Z. 4:96.

**atropurpurea**, Ridley. Lvs. ovate or ovate-deltoid, 2 1/2-3 x 1 1/4-2 in., short-petioled, serrate: fls. usually solitary on peduncles at the ends of the branches; calyx narrow, wingless; corolla dark purple, 1-1 1/2 in. long, tube narrow at the base, much exserted, and curved above, limb about 1 in. across with 4 rounded lobes. Malay Penins. B.M. 8365.

**Torr. and Hem.**

**T. taxifolia**, Am. (T. edentula, Hort., not Benth.).

Large, free-flowering. Var. speciosa, Hort., is a showy form offered in the trade, probably very similar to var. grandiflora.

BB. Lvs. ovate or deltoid-ovate.

**asiiatica**, Linn. Fig. 3824. Annual, erect or diffuse; st. quadrangular: lvs. ovate or ovate-lanceolate, long-accuminate, serrate, obtuse, not cordate at the base, rough to the touch; peduncles axillary, single-flld.; corolla large; tube dark purple; limb 4-lobed, of a delicate pale purple-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4240. Var. pulcherrima, Hort., has larger, dark violet-blue fls. with a spot on the upper lip. G.Z. 4:96.

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Large, free-flowering. Var. speciosa, Hort., is a showy form offe...

**TOWNSENDIA** (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). *Compositae*. Low many-stemmed herbs, nearly all of which are natives of the Rocky Mountains; sometimes planted.

Leaves linear or spatulate, entire: heads rather large, resembling those of *Aster*; rays in 1 series, from violet to rose-purple or white and blooming from early spring to summer. About 17 species. The annual or biennial species have larger heads than most of the perennials. Judging from the literature, the largest-fld. of the perennials are *T. condensata*, *T. Wilcoxiana*, and *T. Rothrockii*, 3 species which seem not to be in cult. as yet. The species mentioned below are presumably among the most desirable of the genus. They are offered by collectors of Colo. wild flowers. As a genus, Townsendia is distinguished mainly by its achene, which is commonly beset with bristly duplex hairs, having a forked or glochidiate-capitate apex. Townsendia is practically unknown to floriculture. For fuller account, see Gray's *Synoptical Flora of North America* and Coulter and Nelson's *Manual of Rocky Mountain Botany*.

**grandiflora**, Nutt. Biennial or perennial, 9-18 in. high; its spreading from the base, sometimes branching also above; upper lvs. often linear: bracts of involucre conspicuously attenuate-acute and sericeous-margined: heads large; rays ½-2½ in. long, bright blue or violet. Summer. Foothills W. Neb. to Colo. and New Mex.

**exscapa**, Porter. Nearly stemless perennial with sessile heads surrounded and surmounted by the linear lvs.: heads ½-1½ in. across; rays white or purplish-tinted; involucral bracts narrowly lanceolate, mostly acute, not pappus-bristles very setose. April, May. Dry hills, plains, or mountains, Sask. to Rockies, south to New Mex. and Ariz.—Known as "Easter daisy" in Colo.

*T. condensata*, Parry. Very handsome: lvs. spatulate-obovate, crowded around the large, broad, sessile heads: rays 100 or more, narrow. Wyo.—T. Rothrockii, Gray. Lvs. spatulate, radiate around the solitary head which is closely sessile at surface of ground, or at length with 1 or 2 additional heads from same crown. Colo.—*T. Wilcoxiana*, Wood. A small stemless herb; lvs. in rosettes, spatulate-lanceolate, on short scapes. June. Dry plains and hills, Okla. to Colo.

**TOXICODENDRON** (Greek, poison tree): *Hyrcanaceae*. Stout many-stemmed herbs, the typical species tall-climbing, grown in the greenhouse and a favorite out-of-doors in the South.

Leaves opposite, distantly feather-veined; cymes lax, terminal or pseudo-axillary; fls. white; calyx small, 5-parted, with 5-10 scales or glands inside at the base; corolla saucer-shaped, tube cylindrical, 5-lobed, lobes oblong, twisted to the left, overlapping towards the right; disk annulate, truncate or 5-lobed; ovary 2-carpelled; foliodes elongate, slender, terete.—About 10 species, E. Asia and Malay.

**TRACHELOSPERMUM** is a *most satisfactory greenhouse shrub* for a general collection. It requires no special treatment, except that the plants should be kept on the dry side during the winter. It requires several years to work up a good-sized specimen. Young plants should be given greenhouse treatment and encouraged to grow. Large well-established specimens thrive in a coolhouse. In summer the pots may be plunged outdoors in a partially shaded position. The species is propagated by cuttings of half-ripped wood taken with a heel in spring. The *star jasmine* is one of the many good old standard greenhouse plants that are too little seen nowadays. The specimens require considerable room, and the gardener is sometimes compelled to keep them in a cold pit until the chrysanthemum season is over, although this treatment is not to be advised. It is a tender evergreen shrubby climber from China, with fragrant white five-lobed flowers. It is a favorite in the South, where it is grown out-of-doors and known as the "confederate jasmine." In northern conservatories it is generally known under its synonym, Rhynchospermum. Handsome specimens may be grown in large tubs, making dense bushes 3 to 4 feet high and as much in diameter. (Robert Shore.)

**jasminoides**, Linn. (Rhynchospermum jasminoides, Lindl.). *STAR JASMINE*. Also called "Confederate," "Malayan" or "African" jasmine. Fig. 3826. Tender, evergreen, climbing shrub: lvs. short-stalked, ovate-lanceolate, acuminate, glabrous; pedicels much longer than lvs.; calyx-lobes reflexed; corolla-tube contracted

England, but young plants are more floriferous than old ones. Seed may be sown in March. The plant is easily prop. by cuttings. According to Gn. 47, p. 303, plants from cuttings are dwarfer than seedlings.
below the middle; several jagged scales at base of corolla; 5 large glands at base of ovary; 2 united, 3 free.


**TRACHYCARPUS** (Greek, rough or harsh and fruit). *Palmaeae*, tribe *Coriphaeae*. Indoor and outdoor palms, one of which is widely grown and very hardy.

Tall unarmed palms: lvs. suborbicular or reniform, folded, many-cut; segms. narrow; rachis none: spadices many between the lvs., stout, branched; spathes many, sheathing, coriaceous, tomentose, compressed; bracts minute: fls. small, polygamous; sepal 3, ovate; petals 3, broadly ovate, valvate; ovary 6; carpels 3: drupes 1–3, globose or oblong.—About 4 species, Himalayas, China, and Japan. Monographed by Beccari in Webbia 1:41–72 (1905).

Fortune's palm (*T. excelsa* or *T. Fortunei*) is grown both indoors and out in America wherever palms are grown, although it is not one of the most popular species with northern florists. It is grown throughout California and even as far north as Oregon. It is commonly known by the name of Chinese windmill palm in southern California. There are two types of *trachycarpus*, those which have the trunks covered with old leaf-sheaths—the Himalayan type—and those which have smooth polished trunks—the far-eastern species.

*excelsa*, H. Wendl. (*T. Fortunei*, H. Wendl. *Chamaerops excelsa*, Thumb. *C. Fortunei*, Hook. f.). Fortune's Palm. Fig. 3827. Trunk robust, clothed with old leaf-sheaths: lvs. nearly orbicular; segms. numerous, ensiform: fls. clustered 2–4 on a tubercle: fr. transversely globose-reniform, deeply umbilicate. Upper Burma, China, and Japan; will grow in the open in Ga., withstanding 10° F.—This description follows Beccari, who refers *T. Fortunei* to *t. excelsa*. Hooker in founding *T. Fortunei* (B.M. 5221) speaks of it as a more robust tree than *T. excelsa*. The latter (which is from Japan) is said to have smaller and stiffer lvs., less deeply divided (usually only about midway to stilt segms.), while *T. Fortunei* (China) has lvs. divided much below the middle (as in Fig. 3827), and the segms. more falcate at least in older lvs. This group needs further study botanically, and also horticulturally in this country.


**TRACHYMENE**

**TRACHYMENE** (Greek, rough and pod; the upper surface of the pod is tuberculate—roughened). *Lecynanthus*. Unarmed trees: lvs. with 2 lfts. which are coriaceous; stipules caducous: fls. white, panicked at the ends of the branches; calyx-tube disk-bearing, narrow-turbinate, segms. 4; petals 5, sometimes the 3 upper clawed and suborbicular, the 2 lower minutely scale-like, sometimes all subequal and clawed; stamens 10, free; ovary short-stipitate; pod ovoid-oblong, thick coriaceous, warty-rugose, indehiscent.—Three species, Trop. Afr., Mascarene IsIs., and Trop. Asia. *T. verrucosum*, Oliver (*T. Hornemannium*, Hayne). Tree wholly glabrous excepting the tawny or silky pubescent infn.: lfts. 1-paired, obliquely oblong or elliptical, acuminate or apiculate: panicles overtopping the lvs.: calyx-segms. obvate-elliptical or oblong: petals posterior and lateral subequal, anterior equal or rudimentary: pod 1–2-seeded, oblong or obovoid, 1½–2 in. long. Mozambique and Madagascar. G.W. 51, p. 633. *T. verrucosum* has the anterior petals nearly equal the rest; *T. Hornemannium* has them rudimentary.

**TRACHYMENE** (Greek, rough membrane, alluding to the fr.). *Umbelifera*. Hisrate or rarely glabrous annual or perennial herbs, used as garden annuals; lvs. ternately dissected or rarely undivided; stipules none: umbels simple: fls. white or blue: calyx-teeth minute or obsolete, rarely 1–2, subulate; petals entire, obtuse; disk flat: fr. laterally compressed, usually flat.—About 25 species, mostly Australian but a few from Bornoe, New Caledonia, and Celebes.

*Cardella*, R. Graham (*Didiscus cardella*, DC.). Fig. 3828. An erect annual about 2 ft. high, somewhat
TRACHYMENE


F. W. BARCLAY.

TRADESCÁNTIA (named for John Tradescant, gardener to Charles I; died about 1635). Commelinaeae. Spermatophyta. Perennial hardy herbs, varying greatly in habit from erect and bushy to trailing and rooting at the nodes, grown for their ornamental value both out-of-doors and in the greenhouse.

Stems simple or densely trancched: lvs. various; cymes simple, sometimes umbrellate or densely panicaete; fis. more or less pedicelled, few or numerous, rarely solitary, red, blue, or white; sepals distinct, concave, green or colored; petals distinct, obovate or orbicular; stamens 6, all usually perfect; ovary 3-celled with 2 superposed ovules: capsule loculecidally dehiscent.—About 90 species, all American, ranging from Manitoba to Argentina. The genus was monographed in 1881 by C. B. Clarke (DC. Monogr. Phaner. 5). The genus Zebrina, usually confounded with this by gardeners, differs among other things, in having a tubular perianth.

To horticulturists, tradescantias are known as hardy herbs, coolhouse plants, and greenhouse plants. T. virginiana is the best known of the hardy species, withstanding the climate of the northern states. The wandering Jew of greenhouses and hanging-baskets, usually known as T. tricolor, is partly T. fluminensis and partly Zebrina pendula. T. Regine is perhaps the best known greenhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The glasshouse species are known warmhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The glasshouse species are essentially foliage plants. Several species have hand-somely striped leaves. All tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

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- Gomeschi, 1.
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- 2 superposed ovules: caps. loculicidally dehiscent.
- 6 stamens all alike, borne several together in a sessile cluster subtended by 2 unequal
- 3 in. or more across, borne in the midst of the lvs. on very short pedicels; stamens 6.
- 1 in. long; sepals ovate, without distinct petiole, ciliate at the very base, the sheaths 1-2
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5. naviculários, Ortg. Stoloniferous: st. creeping, geniculate-ascending, glabrous: lvs. sessile, ovate, acute, glabrous: fls. bright rose, in terminal umbels which are sessile; sepals spreading, keeled; petals broadly ovate. Peru. Gt. 26:901.

6. reflexas, Raf. Slender, glabrous or nearly so: lvs. narrow, linear-attenuate from a lanceolate base; umbels terminal; bracts soon deflexed; fls. blue; sepals ovate-lanceolate, glabrous or with a tuft of hairs. Wet places, Ohio to Mich., Minn., Iowa, Texas, and S. C.


8. occidentális, Smythe (T. virginíaca var. occidentális, Brit.). Slender, 1 ft. high: lvs. narrowly linear, involute, base often enlarged and scurfy: fls. blue or roseate; sepals glandular-pubescent. Iowa to Neb., Texas, and New Mex.

9. gencílida, Jacq. (T. hypopóthos, Koch & Boué). Procumbent, sts. geniculate, elongate, pilose: lvs. ovate-

10. elongáta, Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1-2 ft.; lvs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath: peduncles 1-5, terminal: fls. rose, purplish colored, the sepals green. Trop. Amer.

EE. Fls. rose or purplish.

FF. Staminodes unequal, 5 long and 3 short.


GG. Lvs. lanceolate to ovate-lanceolate.

12. Warscewicziana, Kunth & Bouché (Dickoria trudowskiana. Warscewicziana, Planch.). Fig. 3831. Dickoria-like, having a stout caudex or trunk, marked by scars and finally branching: lvs. green, atrophious, 1 ft. or less long, clustered at the top of the st., recurving, lanceolate-acuminate; fls. bluish-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5185. R.H. 1860, p. 136.

HH. Plant without a stout caudex, more or less decumbent at base.

13. dracémoides, Greenm. Roots fascicled, tuberous: lvs. erect or nearly so, 8-20 in. high, simple or sparingly branched: lvs. lanceolate-attenuate to ovate-acuminate: 4-6 x 3/4-1 1/2 in., villous-pubescent, strongly ciliate: infl. an open, oblong racemose panicle; fls. rose; sepals oblong, apex rounded; petals obovate. Mex.


3831. Tradescantia Warscewicziana.
TRAGIA (from Hieronymus Bock [or Tragus], a German botanist, 1498–1554). Euphorbiaceae. Herbs, sometimes twining and often with stinging hairs, rarely cult.: lvs. alternate, toothed or lobed; fls. monocious, racemose, apostalous, inconspicuous; stamens simple, generally 3; styles united above the base, with the apex free; ovules 1 in each of the 3 cells.—About 50 species of tropical and temperate regions; related to Plukenetia and Dalechampia. T. cannabina, Linn., of Trop. Asia, is used for fiber to some extent. T. solandri, Linn., of T. Eu., is a native of the W. Indies, has stinging hairs. Probably not cult. Several species of Tragia are native in the U. S.

J. B. S. Nottage.

TRAGOPÔGON (Greek for goat’s beard). Compositae. Goat’s Beard. Erect biennial or perennial herbs with narrow grass-like leaves and heads of yellow or purple flowers, belonging to the ligulate section of the composite family (tribe Cichoriaceae).

Mostly weedy plants with a tap-root; florets perfect, with slender style-branches and sagittate anthers; pappus composed of bristles in a single series; involucre cylindric or nearly so, with approximately equal-length bracts in a single row.—Between 30 and 40 species, native to S. Eu., N. Afr., and Cent. and S. Asia. One of them is cult. for its edible tap-root (salsify) and another is now a frequent weed in this country. The fls. of these open only in the morning.

a. Fls. purple.

porrifolius, Linn. Salsify. Vegetable Oyster. Oyster Plant. Figs. 3532, 3832. Tall strict biennial, sometimes 4 ft. high when in bloom, glabrous: lvs. keeled, tapering from a broad often clasping base; fls. showy, closing at noon or before, the outer rays exceeded by the involucral scales; peduncle thickened and hollow beneath the heads. S. Eu.—Naturalized in many parts of the country, often becoming a persistent weed. See Salsify.

AA. Fls. yellow.

pratensis, Linn. Goat’s Beard. More or less branched, 3 ft. or less tall: lvs. as in the preceding: outer rays exceeding the involucral scales; rays yellow, showy, about 2½ in. wide: peduncle scarcely swollen. A weed, from Eu.

L. H. B.

TRAGOPRURUM LANCEOLATUM var. LATIFOLIUM: Atriplex Mueckelii. 

TRAILING ARBUTUS: Epigaea.

TRAINING: Pruning.

TRANSPIRATION is the term applied to the escape of water from leaves and other parts of the plant in the form of vapor.

There is no closed “circulation” of sap in plants comparable to the streaming of blood in animals. Water which generally contains various mineral soil constituents in solution enters the roots, and most of it passes upward through the stems directly to the leaves, where it is evaporated. In plants of a succulent character, the intake often exceeds the loss, and a large amount of surplus liquid may be accumulated in various organs, from whence it may pass to the leaves in times of drought.

The movement of water set up by transpiration carries water and the contained salts to the centers of food formation in the leaves, and the evaporation process facilitates exchange of gases with the air. Transpiration also tends to equalize temperatures. That an enormous amount of water is performed by the plant in transpiration may be seen when it is known that a single sunflower plant will evaporate a pint of water from its leaves in a single day, and about seventy times this much in the course of its development. A birch tree with 200,000 leaves will transpire from 700 to 1,000 pounds of water daily in the summer. A single oak tree will throw 120 or 130 tons of water into the air during the course of a season, and an acre of beet trees containing 400 to 600 specimens will transpire about 2,000,000 pounds in a single summer. It is estimated that 98 per cent of the energy derived from sunlight by leaves is expended in the work of transpiration.

To determine the exact amount of water transpired by a plant, a specimen not more than a yard in height, growing in a pot, may be used. Set the pot on a square of oilcloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring-glss, and balance. Allow the plant to remain in the warm sunshine for eight hours. Then note the amount of water which must be poured into the glass to reach the original level and restore the balance: this will represent the amount of transpiration.

To demonstrate that water actually does come from the leaf, cut off a small leafy shoot of any convenient plant and thrust the base of the stem through a piece of cardboard into a tumbler of water: seal the opening around the stem with wax or gelatine: then cover the exposed part of the shoot with another tumbler and set in a warm light place. Moisture which could have come only from the leaves will soon gather on the glass. Some transpiration occurs over the entire surface of the plant, although only about one-thirtieth as much is given off by the stem as from the same amount of leaf-surface.

The structure of the leaves is such as to facilitate transpiration. The interior of the leaf is made up of a great number of loosely arranged cells which evacuate water into the air between them. The air in the leaf communicates with the atmosphere through openings called stomata, which are generally placed on the lower side of the leaf. Consequently the watery vapor diffuses out through the stomatal opening. Near the outer end of the stomatal chimneys are guard-cells which undergo alterations in form that change the size of the opening of the guard-cells and modify the rate of water loss. The position and shape of the guard-cells are affected by the age of the leaf, turgidity of the tissues, wind, and sunlight. The rate of transpiration may also be affected by cutinization or other alterations in the cell-walls through which evaporation into the stomatal chambers takes place, or by the presence of colloids retentive of water in the cells.

Species characteristic of arid regions generally have limited waterproofed surfaces with a comparatively small number of stomata. This modification is exemplified by the cacti, which transpire not more than one three-hundredth as much water as a broad-leaved plant of the same volume; and such succulents may lose as little as one forty-thousandth of their total weight by transpiration in a day.
TRANPLANTING is a general term to designate the removal of living plants whereby they may become established in new quarters.

Transplanting may be performed when the plant is in a dormant condition, as in winter, or when it is still actively growing. Small herbaceous plants are usually the only ones that are transplanted when in a growing condition, and this only when the plants are living under special garden conditions where they may have the best of attention as to watering and shading. Considered from the standpoint of the plant, transplanting is always a violent operation, for it destroys a considerable part of the root-system, loosens the plant's attachment to the soil, and arrests for the time being a large part of its progressive vital activities. To overcome these dangers, the earth into which the plant is set should be well prepared and moist, so that the plant may quickly reestablish itself; part of the top usually should be removed to lessen transpiration, and with succulent and growing plants some shade should be provided for a time. The deeper and finer the soil, the greater the quantity of moisture it holds, the more successful the transplanting operation will be, other things being equal. The operation is also more successful in humid regions, as in the Atlantic states, than it is in dry regions, as on the plains and westward. In the more arid parts of the country transplanting is performed as little as possible, whereas in the eastern part great quantities of annual and other garden plants are transferred from seedbeds to the open ground.

The successful transplanting of any plant depends in part on the condition of the plant itself. The younger the plant, as a rule, the better it withstands the operation. Herbaceous or growing plants that are relatively short and stocky and compact, transplant better than those that are long, "leggy," and weak. The stocky and compact plants are better able to withstand the vicissitudes of inclement weather when they are transferred from a protected place to the open air, and they probably also have more recuperative power to make new roots and to attach themselves to the earth. Many plants may be "hardened off" or gradually acclimated to sun and air before they are transplanted. The more frequently a given plant is transplanted the more readily it endures the removal. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent removal, providing a long interval does not take place between the operations.

The success of transplanting also depends to some extent on the weather at the time the removal is performed. If cool, cloudy, and damp weather follows the transplanting, the plants are much more likely to live. Plants usually establish themselves more quickly on freshly turned soil, because it contains a relatively large amount of moisture. To bring the earth into contact with the roots, it should be firmed closely about the plants. This packing of the soil tends to bring the subterranean moisture upward where it may supply the roots; it also tends to increase evaporation from the surface of the soil and thereby to waste the water, although much of the moisture is utilized by the plant as it passes upward. To prevent the escape of moisture from the surface of the soil, it is customary to cover the ground with a mulch, from 1 to 3 inches in depth, of litter, sawdust, leaves, or coarse manure. When practicable the water may be saved by keeping the surface well tilled, thereby providing a mulch of earth. See Tillage.

In dry weather it may be advisable to water newly set plants, particularly if they are green and growing fast, as tomatoes, cabbages, and other annuals. The water may be applied in a hole or depression about the plant or at one side of it, rather than on the surface; and the following morning the loose fresh earth should be drawn over the hole in order to provide a surface mulch and to prevent the soil from packing. Of course, this particular pains cannot be taken in large field operations.

All kinds of plants can be transplanted, but some of them remove with great difficulty. In these cases the skill which is born of experience with these particular plants must be invoked for success. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and the hickories. In these instances the plant may be severed a year or two before it is to be removed, and the crown or top of the plant may be cut back so as to sever the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust underneath the plant. In other cases the difficulty is the inability of the plant to make new feeding roots quickly, and one of the situations in which this occurs is the transplanting of large trees. Such plants often may be treated like the tap-rooted plants; that is, the long cord-like roots may be severed at some distance from the crown a year or two before the plants are to be removed. In other cases the inability to be transplanted is probably due to the excessive rate of transpiration from the foliage. Such plants are particularly valuable in large areas where great quantities of plants are to be set, and also in hard and dry land where it is difficult to make the proper openings with the hand and also to supply the plant with sufficient water.

For most small plants that are to be reset in small quantity, the dibber is a most useful implement to expedite the operation. See Potting. Special transplanting-boxes are on the market, to be used instead of the small flats and pots, for purposes of economy. These boxes are usually made of thin basket stuff and are thrown away when the plants are taken from them for transplanting. See transplanting-boxes.

Plants grown in pots or small shallow boxes transplant more readily than those raised in the open soil. Particularly is this true of pot-grown plants, for the bevel or slope of the pot allows the ball of earth to be "knocked out" readily. See Potting. Special transplanting-boxes are on the market, to be used instead of the small flats and pots, for purposes of economy. These boxes are usually made of thin basket stuff and are thrown away when the plants are taken from them for transplanting. See transplanting-boxes. (Fig. 3833.) The seeds are sown directly in these boxes.

In the case of large trees and shrubs, success often may be attained by transplanting in the winter, when a ball of frozen earth may be removed. It is usually better to give the transplanting of large trees into the hands of an expert than to attempt to perform it with
unskilled help and inefficient appliances. Only a certain proportion of the efforts in transplanting very large trees are really successful. The trees may live for several years and yet never fully recover or make satisfactory subjects. The surest and best results are usually secured only when the trees are nursery-grown and have been transplanted two or three times within a few years of their final removal. There are some species that remove from the wild with relative ease when they are of large size, among which are elms, maples, pine oak, basswood; but the large number of species do not readily re-erupt from the operation. See Arboriculture, Vol. I, page 302.

It is sometimes said that a plant cannot recover from the transplanting operation, that the severing of the roots inflicts injuries that are not outgrown, and that a new type of root growth is never established. These fears appear to be groundless. In many cases the plant does not regain itself, but these instances are probably due to lack of skill in the operation rather than to any inherent difficulty in the transplanting process itself. But even if the transplanting process were found to be theoretically injurious, nevertheless it must be employed in the practice of modern horticulture.

L. H. B.

TRANSPORTATION of horticultural products. Commercially, fruits and vegetables are grown primarily for profit. Whether the business of fruit- or vegetable-growing results in profit or in actual loss to the grower depends on a great many factors. Among the more important are quality and quantity of produce, distance from markets, cost of transportation, the condition in which the produce reaches the markets, and the supply and demand. In present-day fruit-growing, especially when the localities of production are often thousands of miles distant from the larger markets, there is no factor of greater importance than rapid and efficient transportation. The fruit-grower is, or should be, aware of the necessity of safe and rapid transportation, together with the delivery of perishable produce at the markets in sound attractive condition. Soundness and freedom from decay or deterioration are fundamental to profitable marketing, therefore to successful fruit-growing. All the labor and moneys invested in production are wasted if the produce cannot be transported and delivered in good condition.

Transportation is the link that connects the producer with his market, his zone of distribution being determined largely by the cost of transportation and absolutely by the distance over which the produce can be shipped in sound marketable condition. This distance will necessarily vary with the variety of fruit, the localities in which grown, cultural methods, care exercised in handling and preparing it for shipment, the promptness with which it is cooled, and the temperatures maintained in transit. The factors above mentioned are the more fundamental ones governing the condition of horticultural produce in transportation. It is clear, therefore, that successful transportation depends not only on conditions in transit but on the prehandling of the produce prior to shipment. The responsibility for the condition of these products when delivered at the market is a common one as between producers, shippers, and carriers. The very best refrigeration that is practicable cannot be expected to deliver perishable products in sound merchandising condition that have been badly handled prior to loading or shipment. Nor can such produce properly handled be delivered in good marketable condition without adequate refrigeration in transit during warm weather or sufficient protection against freezing in the cold weather.

The railways of the United States annually pay out millions of dollars in claims on account of breakage, decay and deterioration, freezing, and other damage in transit of perishable produce. This does not begin to cover losses sustained by the shippers in claims that are not paid, or deterioration for which no claims are made, and the injurious effect on the price received for the produce actually sound. The economic losses to consumers, carriers, shippers, producers, especially consumers and producers, who finally shoulder the greater part of the burden, are enormous. This great wastage of the nation's food-supply is an important factor in the high cost of living and is very generally one of the main reasons for losses instead of profits to the growers or producers. The most important fact in this connection is that most of these losses are unnecessary and preventable. As the decay and consequent losses occur in transit, it is of the utmost importance that growers, shippers, and carriers have a clear and accurate knowledge of the fundamental factors governing condition of fruits and vegetables in transportation.

Few commodities are more subject to decay and deterioration in transit than are fruit and vegetable crops. In considering the transportation of these products and their behavior in transit, it is absolutely essential that the fact be kept in mind that fruit and vegetables are living organisms with a definite span of life beginning in the orchard or field and ending normally in actual death-decay. It must be remembered, therefore, that, in preparing these products for shipment, in transportation, and through all stages to the ultimate consumer, one is dealing with real organisms, the life-span of which will be lengthened or shortened by methods of handling and conditions in transportation. A correct interpretation of the reasons for the losses from decay and deteriorations occurs in transit is, therefore, necessary if growers, shippers, and carriers have a clear and accurate knowledge of types of troubles that destroy the market value of fruits and vegetables. The prevention of these losses must be based on a clear understanding as regards the relation of the development of these troubles to methods of growing, packing, shipping, and to temperature conditions in transit. The types of troubles that may destroy or lessen the value of those products are of two kinds, decay and skin-blemishes. In ordinary transportation the former is by far the most important, while in storage skin-blemishes may be very important factors. Decay may result either from attacks by fungous or bacterial organisms, or through physiological breakdown which may be termed natural death decay. The organisms causing decay in transportation may be conveniently be divided into two groups, those which are parasitic, or which may cause decay of sound uninjured fruits; and those which are saprophytic or which have not the power to attack the sound unbroken skin of fruits or vegetables. Saprophytic organisms are responsible for by far the largest proportion of losses due to fungous decay in transportation and can be controlled only through careful and correct handling methods in the harvesting and preparation of the fruit for shipment.

Physiological breakdown or death-decay hinges largely on proper handling methods and temperatures...
In transportation. It is plain, therefore, that the fundamental factors influencing, to the greatest extent, the behavior of fruits and vegetables in transportation can be divided under the following heads: (1) Cultural; (2) Maturity at time of picking; (3) Care exercised in all handling operations; (4) Promptness of cooling; Precooling; (5) Temperatures in transportation.

Cultural history of the crop.

In so far as cultural practices determine the crop's freedom from disease when harvested and its inherent keeping quality, are cultural operations responsible for condition of these crops in transportation. Of especial importance are the methods of orchard or field sanitation. Field or orchard diseases attacking growing fruits or vegetables very often cause serious decay in transit. Peaches from orchards or sections affected with brown-rot (Sclerotinia) or Monilia usually show serious development of brown-rot after shipment. In certain humid sections of the Pacific coast, for example, the prevalence of brown-rot makes long-distance shipping of cherries and fresh prunes a hazardous venture. Certain vegetable crops, such as lettuce, celery, and tomatoes, when transported long distances, sometimes develop serious decay in transit through diseases that attack the growing crops in the fields. Such decay can usually be controlled and delayed by disease control methods applied in the fields or orchards when the produce enters the transportation chain. Some of the more common diseases affecting crops in field or orchards, can be controlled only through proper orchard- or field-sanitation practices. While the rapidity of the development of such decay in transportation can be controlled, to some extent by rapid, prompt cooling, the handling and maintenance of very low temperatures, the only real preventive lies in the control of these diseases in fields or orchards.

Maturity at time of harvesting.

The picking-maturity of peaches, muskmelons, and other quick-ripening fruits is governed largely by the distance from market and general experience as regards the carrying quality of such fruits at different stages of maturity under ordinary refrigeration. When they are to be shipped for considerable distances, the usual practice is to pick and pack them while still so green, hard, and immature as to be unfit for immediate consumption. Sometimes they are harvested in such a green stage that they do not properly ripen in transit, and while not entirely worthless from a marketing standpoint, their poor eating quality necessarily results in very low prices. Fruits from certain sections have undeniably gained a reputation for poor quality because of the custom of consumers never having tasted any properly matured fruit. There is no questioning the fact that if the quick-ripening fruits entering into long-distance transportation could be harvested at much nearer full maturity, that is, hard, ripe, and transported to the consumer in sound condition, both producer and consumer would benefit greatly, the former in increased returns, the latter in securing a more wholesome and palatable fruit.

The reason for the present condition is largely found in the notion that such fruits must be picked while still very green and hard to carry in sound condition to the market. To some extent this idea is well founded. Greater care, however, in all handling operations, with prompt cooling will enable growers and shippers successfully to handle the quick-ripening fruits at more advanced stages of maturity. When precooling facilities are available, it has been demonstrated that it is not only possible but practicable to harvest such fruits as peaches and pineapples at advanced stages of maturity as will give the consumer a product possessing its maximum fine quality and wholesomeness. When such facilities are not available, much can be accomplished toward the same end through proper and careful handling, prompt loading, and slowing of the load in the car in such a way as to facilitate circulation and consequent quick cooling or refrigeration. The practicability of successfully transporting more nearly tree- or plant-ripened fruits possessing their maximum fine quality of the variety when delivered to the consumer, will depend both on the grower and the carrier. The grower must exercise, first of all, the greatest care in handling and get his fruit under refrigeration quickly. The carriers must have the facilities in which the product can not only be cooled faster but transported at lower temperatures than is ordinarily obtained in the average equipment. What has been said above, relative to the desirability of harvesting certain fruits at much advanced stages of maturity, does not, of course, apply to such fruits as pears, lemons, and fruits or vegetables which should be picked green in order that they may possess their maximum fine quality when finally ripened or cured.

Cultural history of the citrous fruit crop.

In the harvesting and preparing of the citrous fruit crop for shipment determines, to the greatest degree, its shipping or keeping quality. Extensive investigations conducted on a commercial scale by the Bureau of Plant Industry, United States Department of Agriculture, for a number of years, covering a wide range of fruits and vegetables, have clearly and conclusively demonstrated that decay occurring in transit after arrival at the market is due very largely to rough methods of handling. The fungous organisms causing decay gain entrance through mechanical abrasions of the skin made in picking, hauling, packing, or other handling operations. Every break or tear in the skin offers lodgment for fungous spores, which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moisture atmosphere favor rapid development and growth of these fungous organisms. If handling and storage conditions are usually fairly high during the harvesting season, as is frequently the humidity. During periods of muggy or rainy weather, the conditions are ideal for the germination and development of fungous spores, and almost every injury is certain to result in decay. The fundamental consideration, therefore, in all handling operations is the preservation of the skin in a sound and unbroken condition.

The handling operations involved in the harvesting and preparation of the citrous fruit crop for shipment may serve as a very good example. In the harvesting of citrus fruits the mechanical abrasions may result from cuts made by the choppers used in severing the fruits from the tree, from contact with thorns on the trees, from dropping the fruits into the picking-sack or field-box, rough handling in loading, and jarring in hauling over rough roads or on springless wagons. Any injury or breakage of the skin makes the fruit susceptible to decay. Even slight injury or breakage of the surface cells of the skin offers lodgment for fungous spores which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moisture atmosphere favor rapid development and growth of these fungous organisms. If handling and storage conditions are frequently high during the harvesting season, as is frequently the humidity. During periods of muggy or rainy weather, the conditions are ideal for the germination and development of fungous spores, and almost every injury is certain to result in decay. The fundamental consideration, therefore, in all handling operations is the preservation of the skin in a sound and unbroken condition. In a short article it is obviously impossible to go into details as to how injuries are made in handling from field to car. The handling operations involved in the harvesting and preparation of the citrous fruit crop for shipment may serve as a very good example. In the harvesting of citrus fruits the mechanical abrasions may result from cuts made by the choppers used in severing the fruits from the tree, from contact with thorns on the trees, from dropping the fruits into the picking-sack or field-box, rough handling in loading, and jarring in hauling over rough roads or on springless wagons. Any injury or breakage of the skin makes the fruit susceptible to decay. Even slight injury or breakage of the surface cells of the skin offers lodgment for fungous spores which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moisture atmosphere favor rapid development and growth of these fungous organisms. If handling and storage conditions are frequently high during the harvesting season, as is frequently the humidity. During periods of muggy or rainy weather, the conditions are ideal for the germination and development of fungous spores, and almost every injury is certain to result in decay. The fundamental consideration, therefore, in all handling operations is the preservation of the skin in a sound and unbroken condition. In a short article it is obviously impossible to go into details as to how injuries are made in handling from field to car. The handling operations involved in the harvesting and preparation of the citrous fruit crop for shipment may serve as a very good example. In the harvesting of citrus fruits the mechanical abrasions may result from cuts made by the choppers used in severing the fruits from the tree, from contact with thorns on the trees, from dropping the fruits into the picking-sack or field-box, rough handling in loading, and jarring in hauling over rough roads or on springless wagons. Any injury or breakage of the skin makes the fruit susceptible to decay. Even slight injury or breakage of the surface cells of the skin offers lodgment for fungous spores which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moisture atmosphere favor rapid development and growth of these fungous organisms. If handling and storage conditions are frequently high during the harvesting season, as is frequently the humidity. During periods of muggy or rainy weather, the conditions are ideal for the germination and development of fungous spores, and almost every injury is certain to result in decay. The fundamental consideration, therefore, in all handling operations is the preservation of the skin in a sound and unbroken condition.
even more careful handling to avoid bruising and to preserve the skin of the fruit in an unbroken condition during all the operations of picking, hauling, and packing. Peaches are very commonly injured through the pickers exerting too great pressure with the thumb or other fingers when removing the fruit from the tree, thereby handling in loading, and bruising in the various operations of grading and packing. Sizers or graders have been used to a considerable extent in the handling of peaches, most of the graders now in use afford too many opportunities for injury to be universally recommended in the handling of such crops. In red raspberries, for example, the most serious decay results from too great pressure on the berry when removing it from the core. The use of three fingers instead of two minimizes the pressure and danger of injury. The inclusion of over-ripe berries in cups or crates intended for long-distance shipment is also a very prolific source of decay. The marketing or distributing zone of such fruits and berries can be extended by several thousand miles by the exercise of a little more care in picking and grading. In grapes the most serious injuries result from the loosening of the berry from the pedicel, and it requires the most careful handling, both in picking and packing, to avoid this type of injury which is chiefly responsible for the frequent excessive decay occurring in transportation.

Careful handling involves the exercise of thoughtfulness in the manipulation of the fruit from tree to car in order to preserve the skin of the fruit in an unbroken sound condition. It necessitates the most careful supervision of labor. It means simple and the minimum amount of machinery for washing, drying, sizing or grading, and constant attention to keep it clean and in perfect order. The whole handling problem is an economic one related to systems of both hiring and supervising labor. In citrous states cooperative associations have found it necessary to take over the field handling as well as the packing-house handling to insure uniformity of careful work. Where each grower does his own picking, the bad handling of one nullifies, to a large extent, the good work of the other, especially if the fruit from the different growers is pooled and shipped in the same car. The advantage of this method of cooperative handling depends largely on having the right kind of manager and foreman, men who not only know what careful handling is and means, but who can secure such work from every man in the organization having anything to do with the physical handling of the fruit. The system of paying labor is largely responsible for carelessness in handling and decay in transit. Too much emphasis cannot be laid on quality as the tendency is at present decidedly in the direction of attaching too much importance to quantity. Quantity at the expense of quality is poor economy in the handling of any perishable fruit crop.

There is considerable question and argument as regards the best picking-receptacles, particularly as to whether picking-sacks or -bags are preferable to pails or baskets or other similar containers. For citrus fruits, and other hard thick-skinned deciduous fruits, canvas picking-bags are usually preferable. Peaches and other thin-skinned deciduous fruits are injured by the rubbing of one fruit against another, and must be picked in receptacles with rigid sides. In such receptacles the fruit will not be subjected to more or less rubbing against one another as they would be in a picking-bag where every fruit necessarily moves somewhat with the movement of the picker.

Quickness and promptness of cooling.

Next to care exercised in the physical handling of the fruit, temperature is the most important factor in determining the life-span of the fruit. The question of temperature in the handling of fruits for transportation is related primarily to the promptness and rapidity with which the produce is cooled and maintained at low temperatures in transit. Most of the fruits and vegetables are harvested during periods of high temperatures. The physiological and chemical changes that constitute ripening proceed very rapidly at high temperatures and but very slowly at temperatures slightly above freezing. High temperatures shorten the life-span of the fruit, both through rapid ripening and the rapid development and growth of producing organisms. Low temperatures retard the ripening processes as well as the germination and growth of fungi causing decay. It is, therefore, of the greatest importance that the produce be cooled as promptly and as quickly as possible after removal from the tree or field. Delay of a few hours of the more quick-ripening fruits after harvesting in the field or packing-house during the heat of the day may mean the shortening of the normal life-span of such fruits by days. Prompt cooling is essential, whether this is accomplished by precooling before shipment or slower cooling in a refrigerator car. Advantage also may be taken of cool night temperatures by allowing the fruit to remain uncapped out in the open over night and packed later in the cool of the morning. More cooling can usually be accomplished this way over night than in a whole day in a refrigerator car, especially if the fruit is wrapped and tightly packed.

Precooling.

The prompt quick cooling of produce prior to shipment has been termed “precooling.” It is usually accomplished by mechanical means in warehouse plants before loading in cars, or in car-precooling plants after loading. In the latter case the precooling is accomplished by forcing large volumes of cold air through the load in the cars. Most of the smaller warehouse plants have been built and successfully operated using ice and salt for refrigeration. As to which system is the best is still more or less of an open question and depends largely on local conditions. Warehouse plants have the advantage of the rapid cooling of the produce can be commenced immediately after packing without any delay. The cooling is usually more uniform and very often the plants are used as warehouses to hold fruits and vegetables in good condition for considerable periods when, on account of market conditions, or for any other reason, it is desirable to do so. Mechanically cooled warehouse-precooling
plants are expensive to build and operate, and where the harvesting-season is short, the benefits from precooling must be very marked to justify the expense. The salt and ice plants were designed to meet this objection and have proved very practicable where ice can be obtained at a reasonable rate and where the daily output does not exceed a few cars. The principal objections to car-precooling plants are the delay between loading and precooling and the more or less unequal cooling of the different packages in the car. The delay incidental to finishing the loading of a car, and the switching to a precooling plant is sometimes considerable and, in some instances, the total delay may approximate, to some extent, the slow cooling under regular refrigeration. In a number of instances, where car-precooling plants are in operation, in order to minimize delays, there is too much of a tendency to cut down the actual period of precooling, which results in partial precooling only. Some of the reasons why precooling has not been more generally used may be found in the rather heavy initial investment necessary to build a plant, and the delay in shipment necessitated by holding over for precooling. Especially is this true with deciduous fruits where, in many sections, the shipping-port and where each shipper is desirous of getting his fruit or produce to the market as quickly as possible.

Precooling has been utilized more in connection with the handling and shipment of citrus fruits from California and elsewhere. It has apparently been found to be profitable in the citrus industry largely because of the long orange shipping-season, and for the reason that it is utilized also to reduce the cost of transportation. Precooled fruit from the growers’ warehouses is shipped without any icing, especially in the upper tiers, in transportation. The delay incidental to finishing the loading of the fruit in the various positions in the car. Very often the upper tiers are 15° to 20° higher in temperature than the bottom tiers and have ripened to such an extent as to make it necessary or desirable to sell them separately from the remainder of the fruit. This can be done by leaving straight uninterrupted aisles between rows from one end to the other. Cleats between each layer from bottom to top will also facilitate quicker cooling. Racks so constructed as to provide a space of 4 inches between rack and floor for free circulation of cold air from each bunker toward the middle of the car, beneath the load will greatly facilitate quick cooling of every package in the load. In loading fruit into preiced cars, it is very commonly the practice to leave both doors open during the entire period of loading. Much of the refrigeration is lost in this way which could easily be conserved if more care was exercised to open the doors only when absolutely necessary.

In so far as methods of loading and stowing are concerned, the responsibility for the safety of the load and, to some extent, its quick cooling rests on the shipper. The other factors, however, in actual transportation that have to do primarily with quick cooling and the maintenance of low temperatures in transit and freedom from breakage, to overcome any delays, must share responsibility. When properly prehandled produce has been stowed and loaded correctly, both as regards liability to shifting in ordinary freight handling and as to facilitating air circulation and quick cooling, a shipper has largely fulfilled his responsibility so far as products in transportation is concerned. Following this, the responsibility for the safe transportation of properly loaded product rests almost entirely on Temperatures in transit.

The necessity for the maintenance of low temperatures in transit has already been emphasized. The question is often asked: How low ought the temperatures in a refrigerator car to be for best results? The only answer to this problem is: As low as possible, consistent with safety from freezing. The same principle applies as in storage. The lower the temperature above actual freezing, the more effectively are ripening and the development and growth of decay-producing organisms checked. While fruit may continue to grow very slowly at temperatures of 40° F. or below, few germinate at this temperature. If, however, germination has already taken place, the best that can be expected of refrigeration is to check their development and development of decay-producing organisms.

The good effects of quick and prompt cooling have been nullified to a considerable extent by the rapid deterioration and simply transfers the troubles in transit. from the first receiver at the market to the retailer or consumer. Precooling must be thorough and as uniform as possible. The refrigerator car used for the shipment of precooled produce should be sufficiently insulated to maintain reasonably low and uniform temperatures in transit.
the transportation company, both as relates to freedom from breakage and efficient refrigeration. The carrier half of the bunker in the earlier and cut. In switching is mainly responsible for the condition of a properly stowed load as regards shifting, breakage, and the like. The efficiency of the refrigerator car is primarily responsible for the quickness of cooling and the maintenance of uniformly low temperatures in transit as well as liability to freezing damage in cold weather. The efficiency of a refrigerator car depends not only on the quantity, quality, and condition of insulation but on the size of the car, the kind of ice-bunker, and facilities for efficiently free circulation and quick refrigeration of all packages in the car.

Salt, as a means of securing lower temperatures in refrigerator cars, is in use extensively in the transportation of meats and similar products requiring temperatures below freezing. It has been used only very sparingly with fruits. Recent tests with somewhat modified equipment indicate that salt can be used to good advantage in securing quick cooling and in maintaining proper low temperatures in transit.

The methods of icing and charging for refrigeration in transit vary considerably in different sections of the country. From Pacific coast points to the East, the carriers, under certain blanket rates, assume all responsibility for refrigeration in transit from point of shipment to destination. In the deciduous fruit sections all cars, unless precooled, go out under standard refrigeration, that is, pre-icing before loading and full re-icing enroute at all regular re-icing stations to destination. The refrigeration rate is uniform on all cars to any one point. Under the standard refrigeration rate for citrus fruits, the cars are usually not iced until after loading unless otherwise requested by the shipper who pays a somewhat higher rate for pre-iced cars. With citrus fruits from California, various other rates are in effect permitting one pre-icing and a re-icing before final shipment, or precooling, and one icing with no re-icing in transit. When the growers do their own precooling and initial icing in transit, a charge is made only for the use of the car and freight on the ice hauled in the bunkers. In the shipment of fruits from Florida there is not only the standard refrigeration rate which calls for full re-icing at the regular icing stations. The shipper, however, also another rate for half-icing, which means the refilling of the bunkers at the various icing stations to one-half of their capacity, the racks on the floors of the bunkers being raised so as to hold the ice in the upper half. In the eastern states, the so-called blanket refrigeration rate at various points is not used to any considerable extent in the shipment of fruits and vegetables. The refrigeration charge to the shipper is usually based on the amount of ice consumed in transit as shown by the carriers' records at icing stations. The shipper pays for the ice actually used and the icing is done according to the instructions furnished by him on the bill of lading. If the shipper orders full refrigeration in transit, the cars are re-iced at the regular icing stations. He may, however, have the option of giving other instructions if he so desires, namely, either the number of hours enroute or the icing stations at which he wishes the cars to be re-iced. Under the standard refrigeration rates, applying in points on the Pacific coast territory, the responsibility for refrigeration in transit rests entirely with the carriers. In eastern territory the responsibility is divided between the shipper and the carrier.

Freezing in transit. The transportation of fruits and vegetables in sound condition in transportation is related not only to efficiency of refrigeration but protection against freezing. During protracted periods of cold weather, such as sometimes occur in the northern and eastern states in the winter, the protection of fruits and vegetables in transit is a real problem. While a number of factors enter into the question of freezing protection in transit, the principal one is insulation. Aside from condition and quantity of insulation, shippers and carriers have both attempted to minimize the danger from freezing by heavy tight loading and lining the inside with heavy paper, sometimes using several thicknesses, by putting in floor-racks and by placing stoves in the bunkers or in the middle of the car.

Both tight and heavy loading are desirable when there is danger from freezing. The tight load tends to hold the heat more effectively and the heavier the load the more heat there is to draw on. Lining with heavy building-paper, or other paper of similar character, gives added protection. Certain roads have found floor-racks of special value in minimizing the danger from freezing. Results both experimentally and commercially fully justify their use to minimize frost damage as well as an aid to more effective refrigeration. The use of stoves or heaters is hardly to be commended, as frequently the injuries from overheating certain parts of the car result in deterioration as regards quality, condition, and appearance that exceed what the freezing damage would have been. In the transportation of potatoes during the colder months from northern producing districts such as Montana, freight cars are uniformly re-iced from pre-icing stations. Ordinary freight cars with specially constructed bins so as to provide an air-space between floor and sides of car and the load are used very largely also. A stove is placed in the middle of the car and a messenger accompanies three, four, or more cars to keep the fires going properly. The heat from heaters either outside or inside the cars is depended on more than the insulation to maintain temperatures above freezing.

H. J. Ramsey.

TRAPA (abbreviated from calcitrapa, which is the same as caltrops, an instrument of war used to impede the progress of mounted warriors; it had four spine-like projections, like the fruit of the water caltrops); Trapaceae or Hydrocharitaceae; by some retained in Onagraceae. Floating plants adapted to the aquarium. Flowers small, axillary, solitary, short-peduncled; calyx 4-parted, the segments persistent, sometimes spinescent; petals and stamens 4; ovary 2-loculed; ovules I-seeded.-Three species, native to the warmer parts of the eastern hemisphere. TRAPA natans is one of the daintiest aquatics in cultivation. It is perfectly hardy and very desirable for aquaria, pools, ponds, or sub-culture. Its beautifully mottled or variegated foliage is very attractive. The flowers are white, small, and inconspicuous. The fruits are very large in comparison with the flowers and leaves, but they are hidden beneath the foliage until they ripen, when they drop off. They are good to eat raw, like chestnuts, and are sweeter and more palatable before the shell becomes hard. The nut is not likely to become of commercial importance in America. The seeds drop from the plant and remain in the pond all winter. Seeds must be kept in water or moist to retain their vitality. (William Tricker.)

Trapa natans, Linn. Water Chestnut. Water Caltrops. Jesuit's Nut. Petiole of floating lvs. 2-4 in. long, nearly glabrous; blade rhombic-orbicular, dentate in upper half, slightly villous along the nerves beneath: fr. 4-spined, but the 2 lateral ones shorter. Eu., Orient. Gen. 24, p. 557. G.C. II. 10:213. B.R. 259.—It has two kinds of lvs. The submerged ones are root-like, long, slender, and feathery. The floating lvs. form a loose rosette. The 4-spined angles are swollen and spongy near the apex. The fr. is an inch or two across and has 4 spinescent angles. It is roasted and eaten in some parts of Eu. like the common chestnut. It is sparingly
TRAPA

naturalized in this country. Var. verbanensis, Lessati (T. verbanensis, De Not.), of Lake Maggiore in Italy, has deltoid lvs. and compressed 3-angled fr. with 2 short horns.

bispinosa, Roxbg. SINGHARA-NUT. Petiole of floating lvs. 4-6 in. long, woolly; blade 2 x 8 in., slightly crenate or serrate, more or less hairy on both sides, with 2 of the spines sometimes absent. India, Ceylon.—Said to yield very large and sweet nuts which are sold under the name of Singhara-nut; much used by natives.

T. bicoria, Less. Lin. f., the Ling of China, is by some referred to T. natans: the fr. has 2 strong opposite long decurved horns like those of a bull's head.

WILLIAM MILLER.

TRAUTVETTERIA (E. R. von Trautvetter, a Russian botanist). Ranunculaceae. Tall erect perennial herbs grown somewhat for their broad leaves and small white flowers borne in clusters.

Leaves broad, palmately lobed: fls. white, small, corymbosum-paniculate; sepals 3-5, caducous; petals none; carpels many, forming 1-seeded achenes.—Two species. N. Amer. and E. Asia. Very hardy, thriving in ordinary or rich soil. Easily propagated by division of roots either in late fall or early spring. There is not likely to be much difficulty associated with this operation. Offered by dealers in native plants.


grandid, Nutt. (T. palmata var. occidentalis, Gray). Actea grandis, Dietr.). Much like the above species: lvs. membranaceous, more deeply lobed, often to the base, thin, sparsely hairy beneath along the ribs; reticulations less distinct: styles longer and somewhat curled. Wash., Idaho, Brit. Col.

The genus Trautvetteria is variously interpreted. Many authors regard it as monotypic, the Japanese form (T. pinnatifida, Roth & Zucc.) being included in one cosmopolitan species (T. carolinensis). E. L. Greene, on the other hand, described 6 new American species at one time in 1912: T. coerulea, from Ga.; T. Americana, from Ore.; T. platypetala, Mo.; T. rostrata, Calif.; T. saniculifolia, Idaho; and T. media from New Mex. K. J. DAVIS.

TRAVELER'S TREE: Rastenola.

TREE OF HEAVEN: Ailanthus.

TREES: Arboriculture.


TREFOIL: Clover, Trifolium; sometimes applied to Lotus, Medicago (tick trefoil), and other Leguminosae.

TREMA (Greek, trema, hole, alluding to the pitted stome). Ulmaceå.

A group of about 30 species of evergreen trees or shrubs in the tropical and subtropical regions of the Old and New Worlds: lvs. alternate, short-petioled, serrate, 3- or 5-nerved or pinnervened, stipulate: fls. small, in nearly sessile clusters, monocious or dioecious, apetalous, 5- or rarely 4-merous; sepals of staminates fls. valvate below, imbricate above; stamens 4-5; ovary 1-celled, superior style with 2 linear arilli from beneath, 3-nerved at the base, crescent-serrate, pubescent on both sides, more densely beneath, 3-nerved at the base, 2-4 in. long: fls. in small axillary clusters: fr. globose, black, ½ in. long, crowned by the remnants of the styles. S. Afr. Wood, Natar Fl. 4:380.—It is said in Calif. that in deep soil it makes a much-branched bushy tree with foliage similar to mulberries, and remarkable for the bright orange color of the old lvs. before dropping down.

orientalis, Blume (Celtis orientalis, Linn.). Small tree; branches pubescent: lvs. rigid, ovate-oblong to ovate-lanceolate, acuminate, cordate at the base, crescent-serrate, searhird above, clothed with silky, appressed pubescence beneath, 3-6 in. long: fr. ovoid, ½ in. long, black. S. Asia. Wight, Icon. 1971.—A plant offered under this name seen by the writer proved to be a true Celtis, not a TremÀ.

ALFRED REHDER.

TREMÁNDRÀ (Greek, hole of earth; the anthers burst open through a hole). Tremandraceae. More or less stellate-tomentose shrubs, sometimes grown in the greenhouse. Lvs. opposite, ovate, dentate: fls. in 5's; petals not inclosing the stamens, which are rather large for the family and borne in panicle umbels; sepals 5-12, valvate, somewhat thick; stamens 8-12, valvate, somewhat thick; stamens 8-12; ovary 8-12-loculed: fr. large; orange.—About 9 species. Should be grown in a warm moist house, as the plants naturally grow in damp jungles.

palmtÀ, Vis. (Gastonia palmata, Roxbg.). A small tree frequently 20 ft. in cult., with the ends of the branches sparingly prickly and the young parts tomentose: lvs. crowded at the ends of the branches, 1½ ft. across, palmately 5-9 lobed to below the middle; petals 1-1½ in. long: panicle 12-bracteate, peduncled, erect; umbels 6 in. through, long-sleeked; fls. 1 in. across, yellowish white, showy. Himalayas. B.M. 7008.

T. SundalCa. Annam. G.C. III. 53:296.—T. sundalià, Regel, is apparently a form of T. palmata; T. sundalCa, Miq., is a distinct species from Java and Sumatra, with leaf becoming recurved. See Gillettina.

TREVÉSIA (after the family Treves di Bonfigli of Padua, patrons of botany). Araliaceae. Showy and rather striking small trees or shrubs from Trop. Asia and the islands in that region: lvs. either palmately cut or simple, or digitately or pinnate compound; fls. rather large for the family and borne in panicled umbels; petals 8-12, valvate, somewhat thick; stamens 8-12; ovary 8-12-loculed: fr. large; orange.—About 9 species. Should be grown in a warm moist house, as the plants naturally grow in damp jungles.

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TREVIRÁNA: A section of Achimenes.

TREVIÓRIA (named for Sir Trevor Lawrence). Orchidaceae: Epiphytic orchid grown in the greenhouse. Pseudobulbs elongated-pyramidal, not compressed, 1-1½ in. lvs. large, rather leathery, folded, contracted to the petiole: scapes arising from the base of the pseudobulbs, simple, bearing a lax few-fl. raceme: fls. large, fleshy, pedicelled; sepal rather thick, spreading, lateral ones oblique, very large; petals fleshy, twisted, conspicuously narrower than the sepals; labellum fleshy, concave, erect, not movably jointed with the base of the column, lateral lobes erect, axe-shaped, lady surrounding the column, middle lobe hastate; column rather long, terete, clavate or abruptly truncate at apex; rostellum 2-toothed, membranaceous; pollinia 2: caps. fusiform.—About 3 species. Trop. Amer.

CHORIAS, Lehni. Lady cespitosa: pseudobulbs long-pyramidal: fl. oblong-lanceolate, acuminate, long-
petiolated: spike pendulous, few-fl., commonly 3 fls. fleshy, greenish; dorsal sepal, oblong-lanceolate, acuminate, revolute, lateral ovate, obliquely acuminate; petals ligulate, oblong-lanceolate, plicate; spike pendulous, few-fl., rachis stout: fls. up to 2½ in. across, green; sepal broad-ovate, subacute, concave, fleshy; petals much narrower than the sepal, oblong-lanceolate, spreading-recurred, plicate, lip fleshy, lateral lobes car-shaped, erect, midlobe 5-grooved, stipitate, swollen, 2-cuspidate. Colombia. B.M. 7805 (as T. Chloris).

TRÆWIA (from C. J. Trew, a German physician, 1695–1769). Also spelled Tréwia. Euphorbiaceae. Small tropical softwood trees rarely cult. in greenhouses, being little known to gardeners and apparently not in the American trade: branching from the base: lvs. opposite, entire, 3–5-nerved; fls. dioecious, in lateral racemes or the pistillate singly, apetalous; stamens simple, 5 or more; styles free above the base. About 5 species: mostly in Trop. Asia. Related to Mallotus. T. nudiflora, Linn., with broadly ovate, acute or acuminate, cordate to subcuneate lvs., has been in cult. in Eu. from S. Asia. It is prop. by cuttings in sand.

Trianea: Lianolium.

TRIBRÔMA: Theobroma, p. 3331.

TRICÁLÝSIA (Greek, triple calyx; true of some species). Including Kraussia. Rubiaceae. Erect or climbing shrubs, used as ornamentals in extreme South. Branches opposite, terete or obtusely quadrangular. Lvs. opposite, short-petioled; stipules short, broad, apiculate and intra-petiolate: fls. rather small, subsessile, calyx pyramidal, the tube cohering one-third its length, anthers 10, hairy; capsules small, leathery, 5–6 lines diam. Trop. Amer. and intro. into S. Flia. T. undulatifolia, Hort., is offered in the foreign trade.

TRICHINÜM (Greek, hairy, alluding either to the plant in general or to the fl.-heads). Amaranthaceae. Herbs, subshrubs or rarely shrubs, glabrous or pubescent, adapted to greenhouse cult.: lvs. alternate, narrow, rarely obovate or spatulate, entire: fls. in dense spikes or globose or obovate heads, white, straw-colored or rose, hermaphrodite; perianth narrow or elongate, 5-parted, segms. equal, linear, rigid, usually plumose; stamens 5; ovary sessile or stipitate, glabrous or lanuginous, ovule 1: fr. an indehiscent uricle.—About 60 species, natives of South America.

exaltátum, Benth. (Pilóta exaltáta, Nees). A tender perennial, 2–3 ft. high, erect, usually branching above: lvs. 2½ in. long, oblong-lanceolate, rather thick, contracted into a long petiole; upper lvs. smaller: spikes erect, long-peduncled, at first ovoid-campanulate, becoming longer: perianth 5-lobed, tomentose, with dull red tips. B.R. 25:28 (as T. alopecuurifolium).—Intro. in this country as a greenhouse subject.

TRICHÔLÒS (Greek, for three, and Chloëis, a genus of grasses, referring to the 3 awns which differentiate the two genera). Gramineae. Perennial grasses that resemble Chloris but differ in having 3-awned lemmas. Species 5, Mex. and S. A. Amer.

mendoncina, Kurz. (T. Blanchardiana, Hack.). Spikes several, erect, slender, approximate at top of the culms, feathery with the delicate awns. Argentine.—An ornamental grass, readily grown from seed.

A. S. HITCHCOCK.

TRICOCÂLÔN (Greek, hair and stem; said to allude to the bristles that tip each tubercle on the st.). Aeclepiadaceae. Perennial herbs, suitable probably for the greenhouse. Sts. low, thick, fleshy, many-angled, angles tuberculate; tubercles aculeate: fls. in dense spikes, ovary 5-cleft, lobes broadly ovate; corolla disk-shaped, deeply 5-cleft, lobes broadly ovate; disk double, short-stipitate, outer deeply 5-cleft, inner 5 lobulate.—About 15 species. Trop. and S. Afr. T. pictum, N. E. Br. St. subglobose or cylindrical, oblong, very obtuse, 2–3 by about 2 in., irregularly tessellate-tuberulous, glabrous; fls. flescised, erect, fasicled 2–4-fl.; sepal broad-ovate; corolla not less than ¾ in. diam., white marked with purple spots and numerous short lines, lobes broad deltoid-ovate, acute. S. Afr. B.M. 8579. T. Pilatusii, N. E. Br. Plant 5–9 in. high, branching at base: sts. ¾–2¾ in. diam., cylindrical, with many tuberculate angles, glaucous-green, glabrous, tubercles ending in stiff bristles; fls. in small clusters, between the angles, toward the top of the sts.; sepal ovate, very acuminate; corolla bright creamy yellow, glabrous and smooth outside, densely papillate on the inner face of lobes. S. Afr. Var. major, N. E. Br. Plant and fls. larger than the type. S. Afr.

F. TRACY HUBBARD.

TRICOCRÊNÜM (Greek, hair and spur; alluding to the long slender spur). Orchidaceae. A small group allied to Rodriguezia (Burlingtonia); the plants grow in dense matted tufts.

Pseudobulbs very small, each bearing a broad fleshy
ICHOCENTRUM

H.: infl. a few-fl. raceme on which usually only 1 fl. opens at a time; sepals and petals free, spreading; labellum larger, spurred, with 2 lateral lobes and a 2-parted middle lobe; column short; pollinia 2, on a wedge-shaped stipe.—About 20 species. Epiphytes of dwarf stature, growing best on blocks; free-flowering; they suffer from too much water at the root; give them a warmhouse temperature. Prop. by division.

**Albo-purpureum**, Reichb. f. Lvs. oblong-lanceolate, 3 in. long, tufted: fls. on short peduncles, 2 in. across; sepals and petals obovate-lanceolate, inside maroon-brown, with greenish tips, outside greenish; labellum subquadrate, white, with a large purple spot on each of the lateral lobes. Brazil. B.M. 5688. A.F. 6:609. J.H. III. 51:382.


TRICHOSPORUM (Greek, hair and tongue, referring to the fine hairs on the labellum). Orchidaceae. Epiphytic herbs, occasionally grown in the warmhouse. Sts. leafy, elongated, not pseudobulbous: lvs. distichous, apex into 4 short lobes. Panama.

**Epiphytic herbs, occasionally grown in the warmhouse.**

**TRICHOSPORUM (Greek, hair and tongue, referring to the fine hairs on the labellum).** Orchidaceae. Epiphytic herbs, occasionally grown in the warmhouse. Sts. leafy, elongated, not pseudobulbous: lvs. distichous, apex into 4 short lobes. Panama.

**HEINRICH HASSELBRING.**

**TRICHOGLOSSIS** (Greek, hair and tongue, referring to the fine hairs on the labellum). Orchidaceae. Epiphytic herbs, occasionally grown in the warmhouse. Sts. leafy, elongated, not pseudobulbous: lvs. distichously arranged along the st., narrow: peduncles lateral, very short, 1- to few-fl.; fls. small or medium; sepals spreading, lateral very broad at the base, dorsal oblong; petals like the dorsal sepal; lip adnate with the column-foot, forming a long horizontal spur-like chin, spreading above, lateral lobes erect, short, midlobe rather broad, spreading; column short, wingless; pollinia 2, globose.—About 30 species, Malaya and the Philippines. T. Solenophora, Kunze. Sts. elongated: lvs. fleshy, somewhat lanceolate, up to 5 in. long, about 1 in. wide: racemes 1-fl.; sepals obovate-oblong, 4-5 lines long, bright green, each with 5 transverse brown-purple bands; petals much smaller, similar in color, but with only 3 bands; lip 1½ in. long, white, soon becoming yellowish with 2 blood-red spots on the disc, filiform-crenulate. T. Dawsonidna, Swartz. Lvs. 12-18 in. long, oblong-lanceolate; fls. 2 in. diam., yellow-green barred with brown; sepals oblong-lanceolate; petals shorter; lip subessiculate, side lobes oblong, midlobe ovate, acute, with a short falcate wing on each side of the tip. Burma.

**FRANCIS TRACY HUBBARD.**

**TRICHOLÉPIS** (Greek, hair and scale, the involucral scales are narrow with long hair-like tips). Compositae. Annual or perennial herbs, which are branched and unarumed: lvs. alternate, entire, toothed or the lower pinnatifid; heads terminal, solitary, homogamous; involucre ovoid or broader; bracts many-rowed, very narrow, unusually with long recurved hair-points: fls. all hemaphrodite, similar and fertile, yellow, red, or purple; tube slender; limb 5-cleft: achenes glabrous, oblong or obovoid, ribbed.—About 7 species, India.

**Furcata, DC.** Glabrous or puberulous herb, 1½-6 ft. high, branched from the base; lvs. 2-6 x ½-2½ in., elliptic-lanceolate, acute or acuminate, denticulate, short-petioled; head rather large, yellow; involucral bracts needle-like. Himalaya. Grown for ornament.

**TRICHOMANES** (Greek, soft hair). Hymenophyllaceae. A group of filmy ferns distinguished by its tubular cup-like indusium and filiform elongate receptacle. (Fig. 3837.) Very delicate in texture and capable of being grown successfully only under shaded glass. Over 100 species are known. Various species may be found in the collections of fanciers, but the following appear to be the only ones regularly in the American trade. For culture, see Ferns.

**Radicans, Swartz.** Lvs. 2-8 in. long, 1½ in. wide, bipyramidal, pinna ovate, obtuse; indusia terminal, on short lobes. Tropical America, extending into the southern states as far as Ky.

**Prieurii, Kunze (T. anceps, Hook.).** Lvs. 12-18 in. long, 6-12 in. wide, tri-quadrinpinnatifid; pinnae ovate-lanceolate; sori 2-12 to a pinnule, small, in sinuses; indusia with a much dilated lip. Trop. Amer.

**L. M. UNDERWOOD.**

**TRICHONÉMA: Romanes.**

**TRICHOPHILIA** (Greek, hair and cap; the anther is concealed under a cap surmounted by three tufts of hair). Orchidaceae. Handsome orchids, usually grown in pots, although epiphytal. Pseudobulbs crowded on the short rhizome, flattened and often elongate, 1-lvd., surrounded with dry scales at the base; lvs. large, solitary, erect, fleshy, keeled; fls. abundantly produced on short, nodding or decumbent scapes; sepals and petals narrow, spreading, often twisted; labellum large, forming the most conspicuous part of the fl., united with the column below, lateral lobes convolute, middle lobe spreading; anther bent over; pollinia on a triangular caudicle; cincinnus fimbrately winged.—About 20 species, ranging from Mex. to S. Amer. The fls. keep fresh a long time, both on the plant and when cut. They need an intermediate or greenhouse temperature. If grown too warm, they suffer. Prop. by division.
TRICHOPILIA


nobilis, Reichb. f. (Pilama nobilis, Reichb. f. T. candida, Lindl.). Pseudobulbs large: lvs. broadly oblong-acute: fls. white; sepals and petals linear-oblong, acute, 2 in. long; labellum twisted, greenish white, with a yellow spot in the throat. Vernacula. I. H. 19:94 (as T. fragrans var. nobilis). F.M. 1872:21 (as T. fragrans)—This has larger stouter pseudobulbs and shorter broader lvs. than T. fragrans. The labellum is larger and the petals shorter compared with the size of the fl. Var. alta, Hort., has fls. pure white.

tortilis, Lindl. Pseudobulbs oblong, compressed, somewhat curved, 2-4 in. long: lvs. solitary, oblong, acute, 6 in. long: fls. solitary, on decumbent stalks shorter than the lvs.; sepals and petals linear-lanceolate, 2½ in. long; spirally twisted, brownish green, sometimes with a yellow blotch at base of lip. Colombia. HEINRICH HASSELBRING.

suavis, Lindl. Fig. 3838. Pseudobulbs thin, compressed, 2 in. long: lvs. broadly oblong, 8 in. long; scape pendent, about 3-fl.: fls. on long, curved stalks, large; sepals and petals lanceolate-acute, wavy, 2 in. long; labellum large, twisted, brownish green; labellum forming a tube around the column, upper portion expanded, 4-lobed, white with crimson spots, becoming entirely crimson within. Fls. profusely in summer and sometimes again in winter. Mex. B.M. 5739. B.R. 1883. H.C. 3:101. B. 3:122. C.O. 5. Var. alta, Hort., is advertised.

TRICHOSANTHES (Greek, hair and flower, alluding to the fringed edge of the petals). Cucurbitaceae. Snake Cucumber. Climbing herbs, annual or perennial, sometimes shrubby at base, roots sometimes tuberous, grown both in the greenhouse and outdoors as tender annuals.

Leaves entire or 3-5-lobed, base cordate; tendrils simple or 2-3-crenate: fls. rather large or small, white, monocious; male fls. racemose, calyx-tube oblong or cylindrical, dilated above, 5-lobed, corolla rotate, 5- parted; stamens 3, ovary rudimentary; female fls. calyx and corolla as in male, stamens rudimentary or none; ovary oblong or globose: fr. usually large, fleshy, globose, oblong, ovoid-fusiform, or conical.—About 50 species, Trop. Asia, N. Austral, and Polynesia. Monographed in DC. Monogr. Phan. 3:351. The fr. is often ornamental and highly colored; in T. Anguina it has been noted over 6 ft. in length. The plants flower in July from seed sown in March. They may be treated as tender annuals.

A. Frutes or small or none on the racemes of male fls.

b. Fr. ovod.

cucumeroides, Maxim. Root fleshy, tuberous; st. slender, 12-15 ft.: lvs. ovate in outline, 4-6 in. long, more or less palmately 3-5-lobed, margin crenulate; peduncle bearing the male fls. 1-4 in. long and 3-15 fls.
TRICHOSANTHES

petals about ½ in. long, oblong, acute, longly fringed: fr. oblong, shortly rostrate, nearly 3 in. long, vermilion-colored. Japan.—Offered by importers of Japanese plants.

Anguina, Linn. (T. colombiana, Jacq.). SERPENT or SNAKE Gourd. Fig. 3839. St. slender, tall-growing: lvs. nearly circular in outline, 5-7 in. across, 3-7-lobed; lobes round; margin undulate or wavy: peduncle bearing the male fls. 4-10 in. long, 8-15-fld.: body of petals oblong, less than ½ in. long, fringed ½ in. long: fr. slender, contorted, often exceeding 3 ft. in length... B. R. 1859: p. 655.

AA. Bracts large on the male raceme.

b. Calyx-segments entire.

cc. Lvs. lobed.

Kirlibwii, Maxim. (B. vitifolius, Naud.). Perennial root tuber-like: st. annual, high-climbing, 20-30 ft.: lvs. nearly circular in outline, 3-8 in. across, deeply 5-7-lobed, the lobes oblong, acute, coarsely serrate: racemes bearing the male fls. 4-8 in. long, 3-8, rarely only 1-fld.: petals triangular-wedge-shaped, deeply cut and the segments, much cut and longly fimbriate, ovate, somewhat acute; base shortly attenuate, yellowish orange, about 4 in. long, 2½ in. in length. Mongolia.

cc. Lvs. not lobed.

cordata, Roxb. (T. palmata, Wall.). Root tuberous: st. robust, high-climbing: lvs. wide, ovate-cordate, acute or shortly acuminate, 5-8 in. long, rarely somewhat angled or obscurely lobed; margin slightly dentate: peduncle bearing male fls. 5-8 in. long, 4-8-fld.: calyx-segments finely acute: fr. globose, red, orange-streaked, not acute at the apex. India.

bb. Calyx-segments toothed.

bracteata, Voigt (T. palmata, Roxb.). St. stout, climbing to 30 ft.: lvs. broadly ovate, scabrous above, usually deeply 3-7-lobed; lobes acute; margin dentate: peduncle of male fls. 4-8 in. long, 5-10-fld.: fr. globose, red with orange stripes about 2 in. long. India.

F. W. BARCLAY. F. TRACY HUBBARD.†

TRICHOSMA (Greek, three and ridge, referring to the 3-lobeled labelium). Orchidaceae. A genus of 1 species resembling Cypea. Sepals and petals similar, erect spreading, the lateral pair forming a distinct mentum with the projecting foot of the column; labelium 3-lobeled, the lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges: sts. slender, 2-lvd.: inflo. racemose. T. albo-marginata of the trade is unidentified.

sulivis, Lindl. (Éria coronaria, Reichb. f.). Lvs. lanceolate, undulate, 3-nerved: fls. few in a terminal raceme, white, yellowish or purplish, fragrant; sepals ovate-lanceolate; petals oblong; labelium ovate-oblong, streaked with purple; disk yellow, middle lobe with several crenate ridges. Himalaya. B. R. 28: 21.

HEINRICH HASSELBRING.

TRICHOSPORUM (Greek, hair and seed; seeds with 1 or more long hairs at the ends). Syn., Echynanththus, Geissorhiza. Subshrubs or shrubs, often climbing over trees, glabrous or rather villous, grown in the greenhouse. Lvs. opposite, fleshy or leathery: fls. showy, scarlet, greenish or yellow and green mixed, fuscaded in the axils or at the ends of the branches; rarely solitary; calyx truncate, 5-cleft or 5-parted; corolla-tube elongated, ventricose or broadened above; limb somewhat 2-lipped, usually strongly oblique; perfect stamens 4; disc annular, usually thick, cup-shaped; ovary superior, oblong or linear: caps. long-linear, 2-valved—About 55 species, India, Malaya, and E. Trop. Asia.

These beautiful free-flowering plants are propagated by cutting the branches that have been made during the season of growth into lengths of about 2 inches, having two leaves attached and another joint to insert in the sand. They root in about a month in a close frame when the temperature top and bottom is maintained around 70°. Being epiphytal under natural conditions, these plants like a loose open material to grow in, and equal parts of osmunda fiber and sphagnum moss to which plenty of broken charcoal has been added are the best potting material. Shallow pans are best to grow them in, and provision should be made for the water to pass freely through them. The plants should not be allowed to flower the first season, the aim being to secure a good foundation for a future plant, and this is done by pinching the shoots three or four times during the season, growing them in a night temperature of 65°. If properly tended they may be kept cooler and given enough water to prevent shriveling. The plants should not be stopped the second season, but allowed to run to flower; but after they have finished flowering they may be pruned back to within 6 inches of the base of the plant. Trichosporums should be grown hung from the roof of the house, near the glass, and when the sun gets strong they should have a light shade. When well rooted in the pan they are growing they will be subject to insect pests. (George F. Stewart.)

A. Calyx deeply 5-parted, the lobes acute.

grandiflorum, D. Don (Echynanththus grandiflorus Sprong.). St. creeping, mostly herbaceous, 4-5 ft.: lvs. lanceolate, acuminate, 4-5 in. long, repand-serrate, fleshy: fls. aggregated; calyx fleshy and short; corolla arches-tubular, 2-3 in. long, downy, orange-scarlet. E. India. B. M. 3843. P. M. 5: 241.—Will succeed in an intermediate house.

AA. Calyx tubular, entire or shortly 5-toothed.


Lobbianaum, Kunze (Echynanthus Lobbiana, Hook.). The commonest species in cult. in this country: differs from T. pulchrurn in narrower and nearly entire lvs., corolla downy and projecting only twice or less than the length of the purple downy.
TRICHOSPORUM  

caely. Java. B.M. 4260, 4261.—A very attractive plant when well grown.  


Wall. lvs. lanceolate: calyx tubular, short-toothed, gla-  

brous; corolla about 2 in. long, orange-red, pubescent. E. Indies. B. Dicheanum, Kunze (Erycbanthus javanicus, Hook.). Allied to T. pulchrum; differs in having a pubescent calyx and corolla, 1-fld.; fls. small and whitish, in corymbs, in clusters, axillary, solitary; calyx 1½ in. long, lobes narrowly lanceolate, acuminate; corolla cylindrical, funnel-shaped, scarlet with dark purple nerves and spots. SUMMER. T. marmoratum, Kunze (Erycbanthus marmoratus, F. Moore).  

Lem.), may be expected to appear in choice warmhouse collections.  

When well grown,  

TRICHOSTÉMA (Greek, hair and stamen, referring to the filaments). Lobélia. Blue Cups. Hardy or half-hardy herbs, adapted to the wild-garden or rockery.  

Leaves entire; floral lvs. similar: floral whorls axillary, densely or laxly many-fld.; calyx campanulate, 10-nerved, 5-toothed; corolla-tube slender, usually exserted, without a ring inside; limb subequally 5-cleft, lobes oblong or broadly declinate; stamens 4, didymo-  

mous; ovary deovly 4-lobed; nectaries obovoid, reticu-  

lately roseo. —About 10 species, N. Amer.  

dichóstéma, Linn. BASTARD PENNYROYAL. Low, viscid annual: lvs. oblong or lanceolate-oblong, obtuse, short-petioled; corolla blue or pink, sometimes white. Sandy fields, Mass. to Rv., Fla., and Texas.  

Janâtum, Benth. A perennial shrubby plant with rosemary-like lvs. and cymes of fls. in a naked terminal thyrse, 1-nerved, sessile, margins revolute; calyx and corolla covered with dense violet or purple wool; corolla ¼in. long. S. Calif.—A very handsome shrub, known as “ramero.”  

Pérpusi, Brandeg. Perennial, somewhat woody, much branched, 1-½ ft. high; lvs. short-petioled, ovate, ½-¾ in. long, dark green; floral whors axil- 

The petals are divided into 3 pointed lobes. Syn., Tricytis. Elascocarpos. Trees grown in the greenhouse, hardy in the extreme South where they are used as ornamentals.  

Leaves alternate or opposite, serrate: peduncles axillary, solitary, 1-fld.; fls. rather large; calyx cam-  

panulate, truncate, obliquely 5-toothed, deciduous; petals 5, 3-dentate or -lobed; stamens numerous; ovary 3-5-lobed, ovoids many in a cell: caps. leathery, usually angled, loculicidally 3-5-valved.—Two species, Chile.  

The accepted name is now Crinodendron.  


C. Patágua, Molina (C. Hoekeriannum, Gay. Tricytis dependens, Hook., not Ruiz & Pav. T. hexap­  


F. TRACY HUBBARD.  

TRICÝRTIS (Greek, three connexities, referring to the nectar-bearing stamens at the base of the three outer perianth-segments). Liliaceae. TOAD-LILIES. Half-hardy perennials, pretty garden plants; also used for pot culture.  

Rhzinus short-creeping; st. erect, simple below the infl., leafy; infl. terminal, or laxly dichotomous in the upper axis: fls. few, rather large, somewhat longpedicelled; perianth usually beau- 

tifully spotted inside, campanulate, segments distinct from the base, lanceolate, acute; stamens 6; ovary ob-  

long, 3-cornered, 3-lobed: caps. narrowly oblong. T. bicónsulá, L.  


a. Base of lvs. not clasping the st.  

b. Plant not stolon- 

férus.  

F. TRACY HUBBARD.  

TRICYRTIS (Greek, three connexities, referring to the nectar-bearing segments of the three outer perianth-segments). Liliaceae. TOAD-LILIES. Half-hardy perennials, pretty garden plants; also used for pot culture.  

Rhzinus short-creeping; st. erect, simple below the infl., leafy; infl. terminal, or laxly dichotomous in the upper axis: fls. few, rather large, somewhat long-pedicelled; perianth usually beautifully spotted inside, campanulate, segments distinct from the base, lanceolate, acute; stamens 6; ovary oblong, 3-cornered, 3-lobed; caps. narrowly oblong. T. bicónsulá, L.  


a. Base of lvs. not clasping the st.  

b. Plant not stolon- 

férus.  

F. TRACY HUBBARD.  

3377  

TRICYRTIS  

3841. Tricytis hirta. (×5)  

formosa,  

Baker. Sts. flexuous, about 1 ft. high: lvs. few, sessile, oblong-campanulate, acute, base cuneate, lower 4–5 in. long, ¾–1 in. broad, both surfaces green: fls. few, in a lax corymbs. yellow-purple, scarcely spotted, about ¾in. long: style as long as the stigmas. Formosa.
BB. Plant stoloniferous.

stolonifera, Matsum. Herbaceous, 2 ft. high, with a stoloniferous base: st. reddish purple below, greenish above, at first hairy, later glabrous; fls. elliptic-lanceolate, acuminate, narrowed to a sheathing base, 8-15 in., glabrous above, with dark blotches and sunken nerves; fls. purple, indistinctly blotched; perianth yellow at base, segms. elliptic, acute, 1 in. long, 2-laterally saccate at base. Fornosa. B.M. 8560.

AA. Base of lvs. clasping the st.

b. St. pilose, with spreading hairs.

hirta, Hook. (T. japonica, Miq.). Fig. 3841. St. 1-3 ft. high, everywhere clad with soft whitish spreading hairs; fls. 6-15, racemose or suberacemose, whitish, the outer segms. covered with rather large purple spots. Widespread in the woods of Japan. B.M. 5555. Gn. 30. p. 431; 49:290. V. 12:2294. Var. nigra, Hort. (T. nigra, Hort.), has black instead of purple spots. Gn. 49:290. A form with variegated lvs. was once offered in this country.

BB. St. not prominently hairy, puberulent or very slightly pilose.

c. Fls. yellow, unspotted.

flava, Maxim. St. dwarf: lvs. oblanceolate: fls. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

cc. Fls. spotted, not yellow.

d. Spots rather large.

pilosa, Wall. St. 2-4 ft. high, very slightly pilose: lvs. oblong: fls. numerous, loosely corymbose, whitish, with large purple spots; style half as long as the stigmas. Himalayas, 5,000-6,000 ft. B.M. 4955 (perianth-segms. narrowly oblong). F.S. 12:1219.

dd. Spots minute.

e. Style as long as the stigmas.

latifolia, Maxim. St. glabrous, flexuous, 2-3 ft. high: lvs. broadly oblong or the uppermost ovate: fls. few in a terminal corymb, whitish, with minute purple spots; style as long as the stigmas. Japan.

ee. Style half as long as the stigmas.

macropoda, Miquel. St. 2-3 ft. high, puberulous above: lvs. oblanceolate: fls. in a loose corymb, whitish purple, with minute purple spots; style half as long as the stigmas. Blooms in June and July, according to J. B. Keller. Japan, China. B.M. 6644 (perianth-segms. broadly ovate, decidedly yellow, spotted red and veined red near tips). In F. S. 18:1820 is figured a plant with sessile lvs. striated with white, and no fls., which he refers to T. macropoda. This was sent out by Van Houette as T. hirta, but it is a glabrous plant and probably lost to cult. Var. striata, Hort., is offered in the trade as a form with variegated green-and-white lvs.

T. grandiflora, Hort., should be compared with T. hirta, var. nigra. It is a name scarcely known to botany. It is said to have fringed flowers (basal and staminal). (In Oct. and Nov. there is no fragrant fl.). Dutch growers say that T. grandiflora has white fls. motted with black.

WILHELM MILLER.

TREDAX (an old Greek name used by Dioscorides, meaning summer eating, alluding to a plant that was a summer vegetable). Compositae. Hardy perennial herbs, possessing little beauty. Plants branched, hirsute or glabrous: lvs. opposite, incised-dentate or pinnately cut, segms. few and narrow; heads medium-sized, long-peduncled, heterogamous: ray-fls., yellow, male disk-fls. greenish, fertile; involucres ovoid, campanulate or rather hemispherical; bracts few-rowed, slightly unequal: achenes turbinate. About 27 species, Trop. Amer.; one species also occurs in India and Mauritius. Two species have been cult. occasionally. T. coronopifolia, Hemsl. About 1 ft. high; lvs. variously pinnatifid or trifid, lobes linear: fls. yellow, rays 5-lobed. Mex. T. triobata, Hemsl. (Gallinago tri­obata, Cav.). About 1 ft. high: lvs. 3-lobed or pinnately incised: fls. yellow; rays 5-toothed. Mex.


TRIENTALIS (Latin for the third of a foot; referring to the height of the plant). Primulaceae. STARFLOWER. CHICKWEED-WINTERGREEN. Very glabrous small perennials sometimes grown in wild borders. Rhizomes slender, creeping: st. solitary, slender, erect: lvs. usually the same number as the petals, somewhat whorled, obovate-elliptical or lanceolate, very entire; peduncles 1-3-fl., filiform, without bracts: fls. white; calyx 5-9-parted, segms. linear-lanceolate, persistent; corolla rotate, 5-9-parted; tube very short, segms. elliptic-lanceolate, very entire; stamens 5-9; ovary free, globose; caps. globose, 5-valved, many-seeded. Two species, one in Eu., the other in N. Amer.

AA. Lvs. acuminate at both ends.

americanus, Pursh. St. naked below, 3-8 in. high, 5-10-fl. at the summit: lvs. lanceolate: divisions of the white corolla finely acuminate. Damp woods, La. to Va.

ee. Lvs. obtuse (acute in var. latifolia).

europaeus, Linn. St. either naked or with a few scattered lvs. below the cluster of obovate or lanceolate oblong, obtuse or abruptly somewhat pointed lvs.: divisions of the white or pink corolla abruptly acuminate or mucronate. Alaska, Eu., and Asia. Var. arctica, Ledeb. Dwarf: lvs. in long decreasing divisions, white. Var. latifolia, Torr. St. naked below the cluster of 4-7 oblong-obovate, or oval, mostly acute lvs.: corolla white to rose-red. Woods, W. Calif. to Vancouver's Isl. By Pax & Knuth in Engler's Das Pflanzenreich, hft. 22, this plant is kept separate as T. lati­folia, Hook., making 3 species in the genus.

F. W. BARCLAY.

TRIFOLIUM (name refers to the three leaflets). Leguminosae. CLOVER. Low annual and perennial herbs, useful for cover-crops, soil-enrichment, and also in lawn-seed mixtures.

Leaves digitately 3-, rarely 5-7-foliate; stipules adnate to the base of the petiole; fls. usually purplish, red or white, rarely yellow, in spikes, heads, or umbels, or rarely solitary; calyx-teeth or lobes about equal or the lower longer, the 2 upper sometimes more or less connate; petals usually withering rather than falling off, more or less adnate to the base of the stamen-tube; stamens 9 and 1; ovary small, ripening into a few-seeded, mostly indehiscent pod. Between 200 and 300 species, most abundant in the N. Temp. zone.

The clovers are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops and green-manures. See Clover, page 505, Vol. II. For the role of clovers as nitrogen-fixers, see Legumes, page 1834, Vol. IV. The species described
are offered mostly as forage plants. Many clovers are perennial, although they are of relatively short life, so that frequent resowing is necessary if plants are to be kept in robust condition. Some of the species are annual, and these tend to become weeds. All are propagated readily by means of seeds; but as the seeds are small and oily, they may not germinate well in dry hot soil. Some annual white-flowered species are offered in some parts, particularly in the East, where they have been introduced from Europe: T. agrarium, Linn., yellow or hop clover, with oblong-obovate sessile leaflets; T. procumbens, Linn., low hop-clover, more spreading, leaflets obovate and the terminal one stalked; T. dubium, Schth., with leaflets truncate or emarginate at apex and the terminal one stalked. A silky-pubescent white-flowered annual species from Europe, T. arvense Linn., is the rabbit-foot clover of fields and waste places. T. odoratum of seedsmen is evidently Melilotus. Allied genera are Lespedeza, Medicago, and Melilotus.

a. Fls. in a long spike.

incarnatum, Linn. Crimson or Scarlet Clover. Fig. 1633, Vol. II. Annual, erect, 1-3 ft. high, soft-hairy: lvs. long-stalked, the lfts. broadly obovate and denticulate and sessile or nearly so by a cuneate base, the stipules large and thin and veiny and somewhat toothed: heads becoming 2-3 in. long, very dense; lfts. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. Now much used as a cover-crop in orchards. See Cover-Crops. It is very showy when in bloom. If seeds are sown at midsummer or later, the plants may be expected to survive the winter and bloom early in spring.

rubens, Linn. Perennial, 20 in. or less tall, in clumps, the st. erect: lvs. short-stalked, the lfts. oblong-lanceolate and strongly denticulate, the stipules long-linear-lvd. marsh plants of little value to the cultivator, although 1 species is listed abroad for planting in bogs or wet places. Perennial, erect: lvs. rush-like, more or less diffuse or trailing glabrous plant: lfts. obovate and serrulate, and green-manuring.

filiforme, Linn. Yellow Suckling Clover. Annual, of diffuse growth: lvs. obtuse or obcordate, somewhat denticulate, the terminal one stalked, the stipules broadly ovate, lancilanceolate and somewhat denticulate, the lfts. oblong-lanceolate and subacute to retuse, ciliate and entire, the stipules small and loose: fis. white, fragrant. Eu. and thought to be native in the northern part of the U.S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some places prised for pasture. There are forms with red and purplish foliage. This is considered by most authorities to be the shamrock of Ireland. A form of it is offered as T. minus, "the genuine Irish shamrock." See Shamrock. Var. atropurpureum, Hort., is a dwarf form: lvs. bronze, edged with bright green. Var. pentaphyllum, Hort., is a creeping rock-plant: lvs. have a bronze luster. Var. purpureum, Hort., has fine bronzy purple foliage. The species assumes many forms.

b. Corolla yellow.

c. Individual fls. pedicelled.

hybridum, Linn. Alsike or Swedish Clover. Ascending or nearly erect, 1-3 ft. high, branching, glabrous: lvs. long-stalked, the lfts. obovate and serrulate, stipules ovate-lanceolate and thin; heads small and loose, nearly globular, long-stalked: fis. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very hairy. Perennial.

c. Fls. in globular or ovate heads.

Corolla white or ochroleucous (yellowish white).

alexandrinum, Linn. Egyptian Clover. Berseem. Annual, with appressed hairs, the st. tall, erect or ascending and branching: lvs. numerous, the lfts. oblong or lanceolate and somewhat dentilicate, the stipules lanceolate-subulate and partly free from the petiole: head stalked or sessile, ovate, becoming oblong-conic in fr.: fls. ochroleucous. Egypt. Syria.

pannonicum, Jacq. Hungarian Clover. Perennial, very hairy, the st. usually simple, 2 ft.: lfts. lance-oblong and subacute to retuse, ciliate and entire, the stipules narrow and longer than the short petioles: heads ovate-oblong, stalked: fls. pale yellowish white or creamy yellow. Eu., Asia.—Handsome plant for the border; also recommended for forage.

repens, Linn. White Clover. Fig. 3842. Low creeping glabrous perennial: lvs. long-stalked, the lfts. obtuse and obscurely toothed, the stipules small and scale-like: heads long-peduncled from the ground, small and loose: fls. white, fragrant. Eu. and thought to be native in the northern part of the U.S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some places prised for pasture. There are

3843. Day and night positions of red clover leaf; unfolding young leaf at the right.

stipules ovate-lanceolate and thin; heads small and loose, nearly globular, long-stalked: fis. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very hairy. Perennial.

c. Individual fls. sessile.

d. Plant perennial.

pratense, Linn. (T. pratense perennis, Hort.). Common Red Clover. Pea-Grass. Fig. 3843. Ascending and somewhat hairy, 1-½ ft.: lvs. long-stalked, the lfts. oval or obovate and sometimes notched at the end and the blade marked with a large spot, the stipules broad but with a bristle point: heads globular, ovate, sessile: fls. red-purple. Eu., but everywhere intro., and much grown for pasture hay and green-manuring.


dd. Plant annual.

resupinatum, Linn. (T. suaveolens, Willd.). Annual, diffuse or trailing glabrous plant: lfs. obovate and serrulate and as long as the petiole, the stipules lanceolate-acuminate: heads globose, with rudimentary involucres; fls. purple. Greece, Egypt to Persia.—Grown for ornament.

I. H. B.

TRIGLOCHIN (Greek, referring to the 3-pointed fruit of some of the species). Alismaceae; or by Buchenau in Engler’s Das Pflanzenreich, hft. 16 (IV. 14), 1903, placed in the Scheuchzeridce. Thirteen species of linear-lvd. marsh plants of little value to the cultivator, although 1 species is listed for planting in bogs or wet places. Perennial, erect: lfs. rush-like, more or less fleshy, sheathing at base: fls. small, spicate-raceme, on a long jointless naked scape, greenish; perianth of 3-6 parts; stamens 3-6; ovaries 3-6, united. T. maritima, Linn., the species mentioned, is widely distributed in the northern hemisphere along seashores and also in interiors: scape to 2½ ft. tall: lvs. thick: fr. ovoid or prismatic, pedicelled, in a long open racemose spike. The plant has a grass-like appearance and inconspicuous bloom.
TRIGONELLA (Latin, a little triangle; probably referring to the shape of the fls.). Leguminosae. Annual or perennial herbs, usually strong-smelling; Ivs. pinnately 3-foliate; lfts. with the veins often running out into teeth; stipules adnate to the petiole: fls. yellow, blue, or white, solitary, capitulate, somewhat umbellate or shortly and densely racemose, sessile or pedunculated at the axils; calyx tubular; petals free from the stamens, standard obovate or oblong; wings oblong, keel shorter than the wings, obuse; stamens 9 and 1; ovary sessile or short-stipitate, many-ovuled; pod sometimes thick and long-angled, sometimes linear, compressed or terete.—About 58 species, 1 from Australia, the others from Eu., Asia, and extra-Trop. Af.

Fænæm-Græcum, Linn. Fenugreek, which see. White-flèd. annual, 1-2 ft. high, blooming in June and Aug. Distinguished from other species in its section by the erect unbranched st. and obovate lfts., which are obscurely dentate; stipules lanceolate-falcate, entire: calyx pilose: pods falcate, twice as long as the beak. Eu., Orient.

F. TRACY HUBBARD.†

TRIGONIUM (Greek, three and small angle, alluding to the triangular form of several parts of the plant). Orchidaceæ. Epiphytic herbs, grown in the warmhouse.

Stems very short, soon thickened into fleshy 1-2-lvd. pseudobulbs: lvs. leathery, not folded, linear or oblong; scape from below the pseudobulb or from a simple rhizome, many-sheathed, 1-fld.: fls. rather large, short-pedicelled, between spathe-like bracts; sepals about equal, connivent or coherent into a 2-angled tube at base; petals much smaller than sepals; lip erect, lateral lobes clasping the column, midlobe spreading, fleshy or callous at base; column without wings or lateral lobes clasping the column, midlobe spreading at base; petals much smaller than sepals; lip erect, oblong: scape from below the pseudobulb or from a pseudobulb, oval, compressed, 2-lvd., compressed: fls. - heads about 1 in. long. Aug., Sept.


spatulatum, Lind. & Reichh. f. Pseudobulb ovate, 2-edged: l. broadly ligulate, 8 in. long: fl. terminal; dorsal sepal ovate from a ligulate base, acute, lateral sepals oblong-lanceolate, acute, all yellowish purple; petals lanceolate, with a fleshy disk below the apex; lip narrow, angulately 3-lobed, midlobe transversely semi-ovate, rather acute. Colombia.

subspèns, Rolfe. Rhizome subreptent, stout: pseudobulbs rather distant, oblong, somewhat compressed, obscurely 3-ribbed, about 1 in. long, 1-lfd.: l. ligulate, rather obtuse, 6-7 by about 1 in., rather leathery: scape 6-7 in., his with numerous lanceolate sheaths; dorsal sepal rhomboid-oblong-lanceolate, about 1 in. long, lateral suboblique, broad-elliptic, all greenish yellow; petals whitish with 3 brown lines, narrowly illiptic-oblong; lip greenish yellow, with brown radiating veins on the side lobes, 3-lobed, short, midlobe oblong. Habitat unknown.

The following species are sometimes found in coll.: T. acuminatum, H. & B. (Trigona). Pseudobulb ovate, acute, sulcate: l. linear; fl. dull straw-yellow, reflexed: petioles very short, all yellowish green; lfts. recurved at apex; petals ovate-lanceolate. British Guiana.—T. Eryngium, Batei. Very similar to the above, ovate, compressed, 2-lvd.; lfts. oval, often 1½ in. long, linear-spatulate, acute, 6-7 in.; bl. compressed, densely pilose at the base; petals yellow with brown veins; sepals ovate-lanceolate, apex acuminate, about 1 in. long, violet; lip with a fleshy yellow front lobe and narrow purplish side ones.—T. odoratissima, Cass. (Liatrîs odoratissima, Michx.). VANILLA PLANT. Also called Carolina vanilla, dog's-tongue, etc. Rather stout, glabrous, perennial herb 2-3 ft. high, corymbose branched above: lvs. entire or sometimes dentate, oblong, 4-10 x 1-1½ in., oblong, ovate or oval, sometimes spatulate: fls. corymbose-paniculate: fls.-heads about 1 in. long. Aug., Sept. B.B. 3:319.—The other species (T. paniculata, Cass.) has a similar range and is distinguished by its viscid-pubescent st. and thyrsoide-paniculate fls.

TRILLIUM (Latin, trîplum, triple: leaves and floral parts in threes). Lilàceæ. Wake-Robin. BIRTHROOT. WHITE WOOD LILY. GROUND LILY. Interesting and handsome perennial herbs, hardy and very useful for spring-flowering in the wild border or rockery or even in the garden border.

Rhizome short, thick, ascending or horizontal; stts. simple, erect, sheathed at base: lvs. 3, whorled at the top of the stalk: flowers 3, 6-7 in., the petals usually larger, spreading, 3-nerved; fls. 1, between the lvs., sessile or pedicellate, erect, cernuous or reflexed, violet, lurid, white or greenish; perianth persistent, segments distinct, spreading, 3 external thinner herbaceous, green or rarely colored, 3 inner petals like usually larger, spreading, sometimes recurved; stamens 6; ovary with a broad base, sessile, ovoid or subglobose, 3-celled: berry globose or ovoid, usually 3-ribbed, indehiscent.

—About 30 species, N. Amer. and extra-Trop. Asia from the Himalayas to Japan.

Trilliums are amongst the characteristic flowers of American woods. The best-known species is T. grandi-florum, which ranges from Canada to the mountains of North Carolina and extends westward beyond the Great Lakes. All trilliums delight in moist rich soil. They thrive in woods mold. The root is a deep-seated mostly perpendicular rhizome (Fig. 3844). It is customary to transplant trilliums from the woods when in bloom. This is because the plants can be found readily at that time and because the desire to grow them is strongest when the plants are in flower. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous season. After flowering, the plant stores energy for the succeeding year. By midsummer this work is accomplished and the tops die; then the plants are at rest and they are in proper condition to be moved. However, good results are sometimes secured by moving them in spring. These remarks will apply to most early spring-blooming small herbs. Give trilliums a rich deep rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums force well. See Forcing. Plants may be propagated by seeds sown as soon as ripe. Blooming plants may be expected in two or three years. Trilliums are among the choicest of all
early spring plants, and they should be more common in gardens. They can be made to thrive well in borders about city yards. They may also be colonized in grass where the lawn-mower is not used. Best results are usually attained, however, when they are planted alone in masses.

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3845. Trillium sessile var. californicum. (X about 1/4)

3846. Trillium grandiflorum. (X X3)

2. nivale, Ridd. A dwarf species, 5 in. or less high, early: lvs. narrow and obtuse, 1-2 in. long: fls. white, on a short erect or inclined pedicel, the petaloids about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B.M. 6449.

3. undulatum, Wild. (T. erythrocrophum, Michx. T. pictum, Pursh.) Of medium to large size, 1 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. rather large, white, on a short but slender erect or inclined pedicel, the petals ob lanceolate and wavy, about 1 in. long and usually purplish at the base. Woods, Nova Scotia to Mo. and Ga. B.M. 3002. L. B.C. 13:1232.

4. sessile, Linn. Strong-growing, 1 ft. or less high: lvs. broadly ovate or rhomboidal, acute, more or less spotted: fls. sessile in the whorl of lvs., small, purple or greenish, the petals narrow and acute. Woods, Pa. to Minn., Ark., and Fla. B.M. 40. L.B.C. 9:875. F.S. 22:2311.—Variable. Var. giganteum, H. & A. (var. angustipetalum, Torr.). Similar to var. californicum, but the lvs. somewhat petiolate and the petals narrower. Calif. and Ore. Apparently not in the trade. The forms of T. sessile appear to be the only trilliums native to Calif. except T. ovatum. Var. californicum, Wats. (var. giganteum, Torr.). Fig. 3845. Much stouter, the lvs. often 6 in. long and spotted, and the petals sometimes 4 in. long: fls. purple, rose-color, or white, the petals rhomboidal-ovate or narrower. Calif. and Ore. G.F. 3:321 (adapted in Fig. 3845). Var. Nuttallii, Wats. (T. viridescens, Nutt.). Lvs. pubescent beneath, as also the upper part of the st.: petals linear-lanceolate, purplish green with brown base. Ark. Var. rubrum, Hort. A form of var. californicum, with lfs. deep red-purple. Var. Wrhayi, Wats. (T. discolor, Wray). Petals spatulate-obtuse, 1 in. long, greenish. Ga. B.M. 3097.

5. lanceolatum, Boykin (T. recurvatum var. lanceolatum, Wats.). Plant often more than 1 ft. tall: lvs. lanceolate, sessile: fls. dull or brown-purple, an inch or
TRILLIUM

more long, narrow-lanceolate or linear, the sepals ascending or somewhat reflexed, the filaments usually exceeding 3° in. in length. Ga. and Ala.—Little known in cult.

6. recurvatum. Beck. Strong-growing, usually 1 ft. or more high: lvs. ovate or ovate-oblong, tapering to both ends, on short but slender petioles: fls. brown-purple or dull purple, about 1 in. or more long, the petals narrow and erect, the sepals narrow and reflexed. Woods. Ga. to Minn., Mass. and Me. B.M. 3250. Not known to be in the trade.

7. petiolatum, Pursh. St. scarcely arising above the ground: lvs. ovate-elliptic to reniform, with stalks as long as the blade or even longer (blade 3-5 in. long): fls. purple, the petals 1-2 in. long and narrow-ob lanceolate, the sepals erect. Idaho, Ore. and Wash.—Little known in cult.

8. grandiflorum, Salisb. Figs. 1588 (Vol. III), 3846. Stout, 1 ft. or more high: lvs. broad-ovate or rhombic-ovate, narrowly to broadly roundish-rhomboidal, abruptly acuminate, 3-8 in. long: fls. dark purple, recurved or deflexed; sepals lanceolate to ovate-lanceolate, acute; petals about the same length. ovate or broadly ovate, acute or obtuse. N. C., Tenn., and Ga., in the mountains.—Allied to T. erectum.

12. pusillum, Michx. Small, usually not 1 ft. high: lvs. lanceolate or oblong, oblong-flattened, less than 1 in. long, on a short erect pedicel, petals lanceolate and exceeding obtuse petals. Pine lands, N. C., S. C.

13. cernuum, Linn. Plant 1 ft. or more high: lvs. very broadly rhombic-ovate, nearly or quite sessile: fls. white, the petals 1 in. or less long, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 954. Mn. 10:49.

14. stylonum, Nutt. (T. seeroutum, Ell., and T. Crises, Ell.). Slender, 12-14 in. high: lvs. ovate-lanceolate, narrow at each end, short-stalked: fls. rose-color, the petals oblong, obtuse or acute, curved, undulate, sometimes 2 in. long. N. C. to Fls.

T. Cernuum, Wall. A species of Temp. Himalaya, little known and described by Hooker as follows: "Lvs. shortly petiolate, ovate or ovate-cordate, acute: sepals subequal, narrowly linear."—T. obsoletum, Pursh. Founded on a Canadian plant, which has been referred to T. erectum. Maximowicz keeps it distinct, however, extending its range to Kamchatka and Japan. It is the T. erectum var. japonicum, Gray. According to Wall., "is distinguished by a somewhat produced connective (between the anther-cells) and very short stigmas."

9. ovatum, Pursh. Much like T. grandiflorum, but the petals narrow-lanceolate or narrow-ovate, the sepals 1-2 in. long, narrow, or less rhombic. Calif. to B.'r. Col.—The Pacific coast representative of T. grandiflorum.


9. ovatum, Pursh. Much like T. grandiflorum, but the petals narrow-lanceolate or narrow-ovate, the sepals 1-2 in. long, narrow, or less rhombic. Calif. to B.'r. Col.—The Pacific coast representative of T. grandiflorum.

TRIPETALÉIA

(Tripetalum, name shortened by Linnæus from Triostospernum, which is from Greek for three bony seeds). Caprifoliaceae. Feverwort. Horse Gentian. Coarse hardy perennial herbs, glabrous or glandular-pilose: st. rather simple, terete: lvs. opposite, sessile, rather fiddle-shaped or obovate, entire: fls. usually solitary, axillary, solitary or clustered, dirty white, yellow, or purple; calyx-tube ovate, limb 5-lobed, persistent; corolla tubular-campanulate, base of tube gibbous, limb oblique, lobes unequal; stamens 5; disk small, swollen; anthers 5-celled: berry fleshy, ellipsoid, 3-5-celled. About 8 species. N. Am., Himalayas, and China.

perfoliátum, Linn. St. 2-4 ft. high, stout: lvs. ovate, shortly acuminate, narrowed below into connate-perfoliate or simply connate base: corolla dull brown-purple. Rich soil. New England and Canada to Ill. and Ala. B.B. 3:234.—Sometimes offered by collectors. It is a weedy plant of very easy cult. P. W. BARCLAY.

TRIPÉTEA

(Greek, three and petals). Ericaceæ. Two species of Japanese shrubs with deciduous alternate, short-petioled entire lvs. and white or pinkish fls. in terminal racemes or panicles: sepals and petals 3; stamens 5, shorter than the petals, the anthers opening with a longitudinal slit; ovary 3-celled, superior, short-stalked; style slender, curved: caps. septicidal, many-seeded. Closely allied to Elliotia, but easily distinguished by its 3-merous fls. T. paniculata has proved well hardy at the Arnold Arboretum, and probably also by cuttings. T. paniculata, Sieb. & Zucc. Shrub, to 6 ft.: lvs. short-petioled, rhombic or rhombic-ovate, acute, cuneate at the base, glabrous except a few hairs on the midrib beneath, 1-2½ in. long: fls. in panicles 2-4 in. long, white, tinged pink, 1½ in. long, style exserted; bracts subulate. Aug.-Sept.

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Japan. T. bracteata, Maxim., has smaller obovate obtuse lvs. and pink fls. in racemes, with elliptic or obovate bracts. Japan.

ALFRED REHDER.

TRIPHASIA (from the Greek for tripælia). Ratibidae, tribe Cistaceae. Small ornamental shrubs or trees distantly related to the orange, sometimes used as hedge-plants.

Plants with spreading branches; spines double, axillary; lvs. alternate, sessile, trifoliolate; fls. cupulate, 3-merous, white, stamens 6, free; fr. an ovate berry filled with a sweet, sticky pulp and containing usually a solitary seed. —Only 1 species is known.

trifolia, P. Wilson (Lamomia trifolia, Burm. T. americana, Lour. T. trifoliata, D.C.). LIME-BERRY. Fig. 3818. A shrub or small tree, sometimes attaining a height of 15 ft.: lvs. trifoliolate, dark green; lfts. ovate, retuse, entire-margined, lateral ones smaller than the central one; spines in pairs, straight, very sharp, shorter than the lvs.: lfts. white, fragrant, axillary, solitary; petals thick; stamens free, filaments subulate, shorter than the corolla; style thick, longer than the stamens; fr. ovate, small, dull red, \( \frac{1}{2} \) in. diam., having a thick skin, 1-celled, generally with only a single large seed, imbedded in the mucilaginous spicy pulp. Burmann, Fl. Ind., tab. 35. Jacq. Icon. pl. rar. v. 3, pl. 463. L.B.C. 1:18. Riss. & Poit. Hist. nat. ou. 2 ed., pl. 108. —Of unknown nativity but widely cult. and naturalized in tropical and subtropical regions, being grown as an ornamental plant. Prop. by seed. The frs., which are filled with a highly aromatic juicy pulp, are sometimes used in tropical countries for making marmalade. The shrub is attractive, flowering and fruiting freely and is used for lawn planting and hedges, but it is injured by severe frosts. This species is able to grow in soil too salty to support the common citrus frs. and is being tested as a stock for use on such soil.

WALTER T. SWINGLE.

TRIPHORA (Greek, bearing three flowers). Orchidaceae. Terrestrial plants with leafy sts. and fleshy tubers. Fls. axillary, solitary or several; sepals free, equaling the petals; lip erect, not crested, spurless, 3-lobed; column elongated, clavate; pollinia granular-powdery, tailless. —Species about 10, American. By some authors retained in Pogonia.

trianthophora, Rydb. (T. pendlula, Nutt. Pogonia pendula, Lindl.). Sts. sometimes tufted, 2-12 in. tall; lvs. nearly orbicular to ovate, 2-8 in. long, clasping: fls. single, or 2-7, drooping, pale purple; sepals and petals obtuse, elliptic; lip about as long as petals, narrowed into a short claw. E. N. Amer. B.R. 908.

GEORGE V. NASH.

TRIPLARIS (Latin, from tripælia, the parts of the fructification are in 3's). Syn., Velasquézia. Polygonaceae. Trees grown out-of-doors in the extreme S., in the warmhouse in the N. Lvs. alternate, short-petioled, column elongated, clavate; pollinia granular-powdery, tailless. —Species about 10, American. B.R. 908.

TRIPLETREE (Latin, from tripælia, the parts of the fructification are in 3's). Syn., Velasquézia. Polygonaceae. Trees grown out-of-doors in the extreme S., in the warmhouse in the N. Lvs. alternate, short-petioled, column elongated, clavate; pollinia granular-powdery, tailless. —Species about 10, American. B.R. 908.

TRIPLETTREE (Latin, from tripælia, the parts of the fructification are in 3's). Syn., Velasquézia. Polygonaceae. Trees grown out-of-doors in the extreme S., in the warmhouse in the N. Lvs. alternate, short-petioled, column elongated, clavate; pollinia granular-powdery, tailless. —Species about 10, American. B.R. 908.

TRIPSIACUM (Greek, to rub or thrash, probably alluding to the ease with which the fertile spike can be broken up). Gramineae. Perennial grasses with stout culms and monocious infl., in spikes terminating the culm and branches: fls. monocious, in the same spike, the stamineate above; spikes terminal and axillary; stamineate spikelets 2-fld., in pairs at each joint; pistillate single, 1-fl., imbedded in each joint of the rachis, so that the smooth cartilaginous axis and the outer glume form a nearly cylindrical mass; at maturity the pistillate spikes separate into the joints. —Species about 6, of the warmer parts of N. Amer., one extending north to Cent. U.S. and in many places furnishing considerable native fodder.

dactylolides, Linn. (T. violaceum and T. Dactylis of the trade). GAMA-GRASS. SESAME-GRASS. Culms in bunches, 4-7 ft.; spike 2-3 at summit and often single from the upper axes. Moist soil, Conn., Ill., Kans., and southward. Dept. Agric., Div. Agrost., 20:13. —A wild fodder-grass, sometimes cult. for forage and also in gardens as a curiosity. Raised from seed, or more certainly from cuttings of the rootstocks.

For an illustrated account of Tripsacum-Euchlaena and Tripsacum-Zea crosses, see article by Collins and Kempton, Journal of Heredity, March, 1916.

A. S. HITCHCOCK.

TRIPTERYGIUM (Greek, three and wing, in reference to the 3-winged fr.). Celastraceae. Three shrubs from E. Asia with deciduous alternate rather large lvs. and small white fls. in terminal panicles; fls. polygamous; calyx 5-lobed; petals 5; stamens 5, inserted at the margin of a cupular disk; ovary superior, 3-angled, incompletely 3-celled, with short style; fr. a 3-winged, 1-seeded nutlet. The following species has proved hardy at the Arnold Arboretum and is a handsome shrub conspicuous chiefly on account of its large bright green foliage contrasting well with the reddish brown sts. terminated in July and Aug. by conspicuous panicles of small whitish, fragrant fls. It apparently grows well in my soil. Prop. is by seeds and probably by cuttings.

T. Regelii, Sprague & Takeda (T. Wulfordii, Regel, not Hook. f.). Glabrous shrub, to 2 ft., with angled warty reddish brown branches: lvs. petioloed, broadly elliptic, acuminate, broadly cuneate at the base, serrat, 3-6 in. long.: fls. greenish white, \( \frac{1}{2} \) in. across, in terminal panicles leafy at the base, and to 8 in. long; fr. little over \( \frac{1}{2} \) in. long, with 3 broad wings. July, Aug. Manchuria, Korea, Japan. Gt. 18:612. Not yet in the American trade.

ALFRED REHDER.
TRISETUM (Latin, three and brevisset: the florets are 3-awned). *Gramineae.* Tufted hardy perennials of no real horticultural interest. Inf. terminal spike-like or loose panicles: spikelets 2 (rarely 3–5)–fl.; rhachilla prolonged beyond the upper palea; glumes unequal, keeled; lemma membranaceous, keeled, 2-toothed at apex, bearing a slender dorsal sana; palea narrow, 2-toothed. About 90 species, widely distributed throughout the temperate regions of the world. *T. flavescenta,* Beauv. (Arvensis flavescenta, Lam.). Calyx 1½–2⅔ in. high, erect, simple, glabrous: sheaths shorter than the internodes; ligule ½ in. long; blades 1½–5 in. long, 1–3 lines wide: panicle open; branches somewhat flexuous: spikelets 3–4–fl.; glumes smooth or scabrous; awn long, bent, and twisted. Exu., Asia, and intro. into Amer. B.B. (ed. 2) 1:217. Not in common cult., but occasionally used in agriculture.  
F. Tracy Hubbard.

TRISTAGMA (Greek, three drops, alluding to the 3 nectar-glands of the ovary). Including *Stephanolirion,* *Lilirha.* Herbs with subglobose tunicate corms, used for fall-blooming. Lvs. radical, few, narrowly linear: scape simple, leafless: fls. in a terminal umbel, not loose: spikelets 3–4–fl.; glumes smooth or scabrous; awn long, bent, and twisted. Eu., Asia, and intro. into Amer. B.R. 1861, a French botanist). Lvs. 6–9 in. long, about 2 lines wide: scape slender, about 1 ft. long: fls. 1 in. long, 2–5 in. umbel, the segms. linear and greenish; crown none. —Now treated by Baker as *Brodiaea.* Baker. Likely to be offered by Dutch bulb-growers.  
T. narceaeoides, Bent. & Hook., does not appear to be in the American trade. It is 1 ft. or more high, with short narrow-linear lvs., and white fls. bearing a bright orange narrow-lance-like crown of 3–5 broad unequal more or less connate scales.  
F. Tracy Hubbard.†


TRISTRAMA, R. Br. (Lophostemon arborascens, Schott). BRISBANE BOX. Fig. 3549. An unbranched tree attaining 150 ft.; young shoots and calyx hoary-pubescent; lvs. 3–6 in. long, ovate-lanceolate, glabrous, usually crowded at the ends of the branches and apparently verticillate; fls. mostly on the branches well below the lvs.; petals about 1½ in. long, white and spotted, fringed. Queensland. B.R. 1839 (as *T. macrophylla*). —A handsome evergreen shade tree, valuable for avenues in hot dry regions, as it withstands great drought; it also produces timber valued for strength and durability. Much grown in New S. Wales as a boulevard tree. Hardy in Cent. Calif., withstanding an exceptional temperature of 26° F. at Berkeley.

Joseph Buett Davy.

TRISTELLATEIA (Latin, three and star: each flower has 3 winged frs., which have the appearance of stars). *Malpighiaceae.* Scandent shrubs, probably adapted only to the warmhouse. Lvs. opposite or verticillate in 4's, entire, petioles usually 2-glandular at the top, base with 2 very short atipules; racemes terminal or lateral, sometimes paniculate; fls. yellow; calyx 5-parted; petals clawed, keeled outside, sagittate-ovate; stamens 10, all perfect; ovary 3-lobed: samara 3, mature at the latter part of October. About 20 species, Madagascar, Indian Archipelago, and Austral. *T. australis,* A. Rich. Strong climbing shrub with pendent shoots; lvs. ovate or ovate-oblong, 2–x1–2½ in., glabrous; racemes 2–6 in. long; fls. opposite, short-peduncled, yellow; petals 5, obtuse or ovate-oblong, 5–6 lines long; filaments finally deep red. Malaya and Australasia. B.M. 3334.

TRITELIA: *Brodiea.* The following species, listed under *Tritelea,* is to be combined with the treatment of *Brodiea* in Vol. I, p. 576.  

"is probably a form of this species rather than the *T. violacea,* Kunth, a Chilean species."  
L. H. B.

TRITHRINAX (apparently triple Thrinax, alluding to leaf-division). *Palmaceae,* tribe *Carypeae.* South American fan palms, some of which are known to be cultivated in the open in the United States. The genus is distinguished from allied genera chiefly by the following characters: fls. hemaphrodite; petals inbicate; filaments connate into a tube; carpels distinct; styles long, distinct, terminal in fr.—Five species. *T. brasiliensis* is a little-known palm. It seems to have been confused in the trade with *Thrinax Choco,* which is referred to this work as *Acanthorhiza Choco.* The fls. of the former are bifid; of the latter apparently not. André says the first species described below is unique by reason of its sheaths at the base of the lvs. These, he says, "are composed of fibers which are at first parallel and longitudinal, then obliquely intersected and finally plaited at right angles like the mats of pandanus in which the coffee of the Antilles and Bourbon is exported. At the summit these narrow strips unite and form a series of very long, robust, recurved spines which are evidently designed to protect the fls. and frs. against climbing animals." Not in common cult. in Amer., although 3 of the 5 known species are planted.

brasiliensis, Mart. Trunk slender, 6–12 ft. high, 2–3 in. thick: lvs. palmate-flabelliform, glabrous and often

bracteolata, Mart. Plant as above, 6–12 ft. high: lvs. palmate-flabelliform, glabrous and often

brasiliensis, Mart. Plant as above, 6–12 ft. high: lvs. palmate-flabelliform, glabrous and often

campêstris, Drude & Gris. Fig. 3850. Differs from T. brasiliensis in the segms. being shallowly bifid and

white-tomentose above but nearly glabrous beneath, and with stouter spadix branches: plant more rigid. Argentina.— Said to be a striking palm.

acanthócoma, Drude. Dwarf, stout, with many strong reflexed spines, the caudex with netted sheaths: lvs. large, fan-like, cut nearly to base into about 40 narrow bifid segms.: spadix branched. Brazil. Gt. 27:301.

TRITICUM (old Latin name for wheat). Gramineae. The genus as now limited comprises 2 sections, Eglitops, with 12 species of S. Eu. and Asia, one of which is thought by some to be the original of the cult. wheats; and Triticum proper, which includes wheats and speltcs. As far north as N. Y. and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best-known kinds are T. vulgare (Linn. (T. sativum, Lam. T. vulgare, Vill.). (For account of a wild species of Syria, the probable ancestor of wheat, see Aaronsohn, Bull. Soc. Bot. France, 56:227). T. Richardsonii, Trin. Under the name Cryptopyrum Richardsonii, Schrad., this species has sometimes been catalogued by seedsmen as an ornamental plant. It is a perennial with a slender nodding spike of awned spikelets. The species property belongs in Agropyron (A. Richardsonii, Schrad.) and resembles the wild A. caninum, Linn., with which some authors unite it. It is native from Que. across the continent. A. S. Hitchcock.

TRITOMA: Kniphofia.

TRITONIA (name explained as follows by Ker-Gawler, its author: "Name derived from Triton, in the signification of a vane or weathercock; in allusion to the variable direction in the stamens of the different species"). Including Montbretia. Iridacae. BLAINVILLE. Sth. Afr. Showy-flowered corn-bearing herbs used both as greenhouse and summer-blooming subjects.

Corms or bulbs small, covered with fibrose sheaths or tunics: sts. simple or slightly branched: lvs. few, narrow-linear or broader and sword-shaped, usually falcate: spathes disposed along the rachis or the few branches, short, membranaceous, often 3-toothed: fls. 1 to 2 in a spathe, sessile; perianth-tube slender, limb concave or broadly campanulate, lobes obovate or oblong, nearly equal; ovary 3-celled: caps. membranaceous, ovoid or oblong.—About 50 species, S. Afr. Allied to Crocosmia, Acidanthemum, Sparaxis, and Cladiolus. Few of them are in general cult., although many of the species have been intro. at one time or another. Those of the Montbretia class are showy hardy summer-flowering bulbs, to be handled like gladioli; or they may be left in the ground permanently if given protection of mulch in cold climates. As far north as N. Y. and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best-known kinds are T. crocosmiflora and T. Potzii. Most of the Latin names in catalogues belong to these, as sulphurea, tigridea, pyramidalis, grandiflora, elegans, floribunda. To gardeners, tritonias are usually known as montbretias. Garden tritonias grow 1 ft. or more tall, producing several to many showy fls. of a yellow, orange, or red color, and bearing several stiffer linear or sword-shaped lvs.

a. Three lower perianth-segms. bearing hatchet-shaped processes.

bracteata, Worsley. True lvs. about 3, appearing after flowering, about 1 ft. high and 3 in. broad; the early lvs. are really bracts: scape about 1 ft. high, flexuous, much branched; fls. 50-60, tawny red, scentless, opening singly or in 2's, subtended by the large foliaceous bract, irregular in shape, about 1 in. across; outer segms. about 3 in. broad, inner segms. about 3 in. broad and recurved. S. Afr.

aa. Three lower perianth-segms. without hatchet-shaped processes.

b. Fls. hooded.

Clusiána, Worsley. Allied to T. secuira, from which it differs in having lvs. twice as long and wide, no obtuse or other indentation on the outer perianth-values: plant about 1 ft. high; fls. orange (?), hooded, all facing one way. S. Afr.—This species with hooded fls. seems to form a link between Tritonia and Antholyza.

bb. Fls. not hooded.

c. Perianth-segms. obovate.

crocáta, Ker-Gawler. Slender, simple or branched from near the base, bearing few fls. in loose 1-sided racemes: fls. about 2 in. across, tawny yellow or orange-red, the stamens one-third the length of the perianth-limb. Cape Colony. B.M. 184 (as Ixia crocata). Gt. 54: 82. Var. miniatá, Baker (T. miniatá, Ker-Gawler), has light red fls. B.M. 609. There are color varieties, as purpurínea, Hort., cocca-

3850. Tritonax campêstris.

3851. Tritonia Pottsii. (x4)
TRITONIA

**TRITONIA** (Greek, wheel and to allude) is a genus of flowering plants in the family Iridaceae, comprising about 100 species, widely dispersed over the world.

Some of the following plants occur in the trade under *Montbretia* (or *Tritonia*).

- **Crocosmia** (Montbretia) is a genus of flowering plants in the family Iridaceae, comprising about 30 species, native to South Africa and Madagascar. The name *Crocosmia* derived from the Greek words κρυος (kryos) meaning frost and σμια (smia) meaning dew, referring to the frost-resistant nature of the plant. Crocosmia are deciduous perennial plants with sword-shaped leaves and bright orange-red flowers in summer. They are commonly grown as garden plants and are known for their vibrant colors and easy care.

- **Tritonia** crocosmiflora** is a species of flowering plant in the genus *Tritonia*. It is native to South Africa and is typically grown as an ornamental plant due to its attractive flowers and ease of care. The species is known for its showy orange-red flowers with blood-red throats, which bloom in summer. Tritonia plants are popular in gardens and are often chosen for their ability to grow in a variety of conditions. **Tritonia crocosmiflora** .

- **Crocosmia aurantium** is a species of flowering plant in the genus *Crocosmia*. It is native to South Africa and is typically grown as an ornamental plant for its vibrant orange-red flowers with blood-red throats, which bloom in summer. Crocosmia aurantium is a popular choice for gardens and is known for its showy and long-lasting flowers, which make it a favorite among gardeners. **Crocosmia aurantium**.
TROLLIUS

TROLLIUS [old German, trol, something round; trolblume, in allusion to the shape of the flowers). Ranunculaceae. Globe-flower. A group of neat hardy herbaceous perennials of a dozen or more species, mostly found in moist or marshy places of the North Temperate zone; useful in garden borders. Roots fibrous, thickened; Ivs. palmately divided or lobed; fls. large, solitary, white, yellow, golden yellow, or purplish, those in cult. usually yellow or orange-yellow; petals 5 to many, small, ungulate, with a nectariferous pit at the base of the blade; sepals 5–15, large, usually constituting the showy part of the fl.; stamens many; carpels 5 to many, sessile, many-ovuled; follicles in a head.—Very like Ranunculus in general appearance, but distinguished at once by bearing follicles rather than achenes. For monograph, see Huth, in Helos ix. (Berlin), 1892; and for the Eastern Asian species, Finet & Gagnepain, Contrib. Fl. As. Or. 1: 136–139; also in Bull. Soc. Bot. France 51:393–396 (1904).

Trolliuses are grown for the beauty of their globular flowers and show of dark green leaves. They are suited to wet sunken gardens, wild borders, and edges of water-gardens, although in a good garden soil not lacking in moisture they do well. They may be increased either by seeds or by dividing the old plants; but the young plants grow slowly at first, and will not flower before the second season from seed. The usual globe-flower of the horticulturist is T. europaeus, with incurring sepals so that the flower has a ball-like appearance; in most of the species the sepals spread nearly or quite horizontally. They bloom in spring and early summer.

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a. Number of sepals exceeding 10 (15–20).
b. Sepals incurved, forming a globe-shaped fl.

1. europaeus, Linn. (T. globosus, Lam.). Flg. 3853. Sts. erect, 15 in. or more high, often branching; lower Ivs. petioled, others sessile; Lvs. only 5-parted, lobed, cleft, and toothed, those of the root- Ivs. on short petioles: fls. of a lemon-yellow color, solitary or in 2’s, 1–2 in. across, globe-like in form; sepals 10–15, ovate; petals spatulate, often longer than the stamens; fr. much as in T. laxus. Wet upland meadows of N. Eu. May–July. G. N. 40:102; 71, p. 310. G. 19:609. G. W. 15, p. 129. J. H. Ill. 51:594; 54:555.—Different forms are offered or sometimes listed. Var. Loddigesii, Hort., has deep yellow fls.

Var. napelliformis, Huth (T. napelliformis, Roep.). St. many-fld. and Ivs. deeply divided.

bb. Sepals spreading, making an open fl.

b. Petals longer than the stamens.

2. asiaticus, Linn. Plant much like T. europaeus, often taller, the smaller bronze-green lvs. more finely lobed and cleft; fls. a rich orange-color with sepals spreading. May. Siberia. B. M. 235.—The blossoms of this are well suited for cut-fl. purposes. The plants thrive best and produce richest colors if partially exposed to the sun. T. giganteus, found in garden lists, is a very tall form of this species.

cc. Petals shorter than the stamens or not exceeding them.

3. dechangaricus, Regel. Much like T. europaeus, but fls. open or spreading, golden yellow within and reddish outside; sepals about 15, rounded and mucronate; style subulate and straight. Turkestan.—Mentioned in foreign lists.

4. alticus, C. A. Mey. (T. caucasicus var. alticus Fin. & Gagn.). Plant 1–2 ft., with foliage much like that of T. europaeus: fls. large (2 in. across), yellow or pale orange, with 15–20 broad and obtuse sepals (perhaps sometimes as few as 10); petals 5–15, narrowly linear and obtuse. Altai region, Siberia. Gt. 6:66.—Little known in the trade.

aa. Number of sepals 5–10, spreading.

b. Petals one-third or one-half longer than the stamens.

5. Ledebouri, Reichb. f. Plant about 2 ft., with Ivs. divided to the base and the divisions lobed and toothed; fls. yellow, with 5 spreading veined ovate sepals; petals 10–12, narrowly linear, not prominent but surpassing the stamens. Siberia.—Listed, but apparently little known horticulturally.

6. chinesis, Bunge (T. sinensis, Hort.). Long regarded as a form of T. asiaticus, but now separated; stout striate glabrous herb: radical Ivs. obsolete; lower st-Ivs. reniform and the upper orbicular-reniform, sometimes 7 in. across, palmately 5-parted, the segms. broad-oblanceolate: sepals 12 or 13, the outer ones broad-ovate and obtuse, the inner ones rather longer and narrower; petals 20, linear, over 1 in. long, exceeding the glabrous stamens. N. China. B. M. 8095.—

3853. Trollius europaeus (X 10).

In English gardens this species is said to thrive well and to seed freely when grown in the bog-garden or beside water.

7. japonicus, Miq. St. low (4–8 in. high), shape-like and 1-fld., the Ivs. being radical and involucrate: fl yellow, with 5 or 6 sepals which are 1 in. or less long. Japan.—Sometimes combined with J. chinensis; apparently closely allied to T. laxus. Franchet & Savatier, in Flora of Japan, maintain the species as distinct.

8. patulus, Salisb. Low, 1 ft. or less high; radical Ivs. palmately dissected, the segms. incised-dentate: fl golden yellow; sepals usually 5, sometimes 6 or 7, ovate and spreading; petals and stamens nearly equal, the former 1–3; style erect and about equaling the ovary. Caucasus to Persia.—Finet & Gagnepain define this species very broadly, to include others. They make var.
TROLLIUS

TROLLIUS (from Greek word for trophé; the leaves are shield-shaped and the flowers helmet-shaped). Tropæolum.

Narrow form of gardens (but not of botanists). Climbing or rarely diffuse soft-growing herbs, grown in the garden for their showy flowers. Roots fleshy, sometimes tuberous; lvs. alternate, peltate or pinnately angled, lobed or dissected; stipules none or rarely minute, bright-like or dissected; peduncles axillary, 1-flowered; fls. irregular, usually orange or yellow, rarely purple or blue, but the garden forms now show a great range of color; sepals 5, connate at their base, posterior produced into a long slender spur;

petals 5 or fewer by abortion, usually narrowed into distinct claws, two upper smaller or dissimilar and inserted in the mouth of the spur; stamens 8, free, unequal, with declined usually curving filaments; ovary 3-lobed, ripening into 3 indehiscent carpels (these constitute the “seed” of commerce).—About 45 species, S. Amer., chiefly from the cooler parts of Peru and Chile. Monographed in 1902 by Buchenau in Engler’s Pflanzenreich Hft. 10 (IV. 131).

The common species, T. minus and T. majus, are also grown for their young pods and seeds, which are made into pickles. The perry-tasting leaves are sometimes used like cress, in salads. Probably most species are perennial. Tropæolum thrive in any warm sunny fairly moist place. The tops are tender to frost. For early effects, seeds may be started indoors in pots or boxes. The common climbing species are T. majus and T. peltatum, both of which are very useful for window-boxes, balconies, for covering banks and walls, and for growing amongst shrubbery. The common dwarf species, T. minus, is earlier and usually more floriferous, and is very useful for the front row in the border. On rich soils, nasturtiums produce very heavy foliage that overtops the bloom. T. peregrinum, the canary-bird flower, is grown either indoors or in the open. Probably most species are perennial. Many of them are tuberous and withstand some frost at the root; but the half-hardy species are little known in this country.

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A. Species annual or perennial but not tuber-bearing.
B. Petals 5, entire or rarely emarginate or crenate at the apex.
C. Inferior petals not ciliate at the base.
D. Plants perennial, low, prostrate, glabrous.

I. polyphyllum, Cav. Perennial, half-hardy: st. succulent, prostrate or climbing: lvs. peltate, orbicular, cut beyond the center into 7-9 narrow divisions; fls. much like T. majus in shape, but smaller; spur slender but rather short, the calyx tri-lobed. petals obvolute-cuneate, unguiculate, yellow, wavy or emarginate, the 2 upper ones streaked with red. Chile. B.M. 4042. P.M. 10:175. F.S. 20:2066. G.C. II. 20:241. Gn. 46, p. 156. G.M. 88:367. St. naturally prostrate.—T. Leichtlinii, Hort. Garden hybrid between T. polyphyllum and T. leptophyllum (see suppl. list), raised by Max Leichtlin, of Baden-Baden. More closely approaching the former, but with larger lvs., more

TROLLIUS

genuina, Fin. & Gagn. to include T. laxus, Salisb., T. pumilus, Don, and T. pumilus var. yunnanensis, Franch; also var. Lédebouri, Fin. & Gagn. (T. Lédebouri, Reichb. f.), differing from the type in having the sepals longer than the stamens.

9. caucasicus, Stev. (T. pbulus var. caucasicus, Huth). Radical lvs. palatomately dissected, the segms. incised-dentate; sepals 5-8, elliptic, spreading; petals 10, usually equaling the stamens; style about equaling the ovary. Caucasus, Armenia, etc.—Perhaps a form of T. pbulus, as considered by Huth. Under the name T. caucasicus, the plant offered abroad is described as a hardy perennial, with large orange fls. in July and June; 2-3 ft. In horticultural literature the fls. are usually described as globular, which raises a question as to the identity of the cult. plant.

10. pumilus, Don. St. 1 ft. or less high, from a horizontal rootstock, the base bearing old lvs., with few lvs. on the st. and those above the middle: lvs. small, 1-2 in. diam., orbicular, thickish, 5-parted, the segms. broadly obvolute and 3-lobed; lfs. 1 in. across, solitary, yellow or sepals 5 or 6, rounded, atched at the end; petals 10-12, about equaling the stamens, cuneate-oblong; foliaces many. Alpine Himalaya.

Var. yunnanensis, Franch. St. to 2 ft. high and sometimes 3-flowered: lvs. narrowly dentate, the teeth short and rigidly mucronate; cauline lvs. 1 or 2; sepals 6-9, broadly ovate or suborbicular; petals long-clawed, shorter than the stamens. W. China.—Described as horticulturally not unlike Caltha palustris, but superior, with dark green lvs. and bright golden yellow salverform fls. in May.

11. laxus, Salisb. (T. americanus, Mullh.) Sts. slender, weak, ½-2 ft. long, somewhat ascending: radical and lower st-lvs. long- or short-petioled; all the lvs. 5-7-parted; lfs. cuneate and much cleft and toothed: fls. usually solitary, 1-2 in. across; sepals 6-7, entire or toothed at the end, more spreading than the other species; petals many, much shorter than the stamens: follicles ¼ in. long, straight beak one-fourth as long; head of fruit ½ in. across. Bogs and damp places, Mich., to New England and Del. and westward. May-July, or Aug. B.M. 1889 and L.B.C. 96 (both as T. americanus).

Var. alibiflorus, Gray (T. alibiflorus, Rydbg.). Much like the type but usually lower, more slender: lfs. usually 5: fls. pale or white; petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

12. acialis, Lindl. Plant only 3-4 in. high: lvs. as in the above, or only 5-parted: fls. lemon-yellow, spreading, on sts. hardly reaching from the ground; sepals 9, nearly lanceolate, acute, sometimes toothed; petals spatulate, shorter than the stamens. N. India. B.R. 20:32.

T. aurantiacus, Hort., described as lemon-yellow: probably a form of T. europaeus.—T. Excelsior, Hort., and T. Atheras, Hort., with deep orange fls., are probably T. europaeus forms.

K. C. DAVIS.

L. H. B.†

TROPÆOLUM

(TROPÆOLUM (from Greek word for trophy; the leaves are shield-shaped and the flowers helmet-shaped). Tropæolum. A narrow form of gardens (but not of botanists). Climbing or rarely diffuse soft-growing herbs, grown in the garden for their showy flowers.

Roots fleshy, sometimes tuberous; lvs. alternate, peltate or pinnately angled, lobed or dissected; stipules none or rarely minute, bright-like or dissected; peduncles axillary, 1-flowered; fls. irregular, usually orange or yellow, rarely purple or blue, but the garden forms now show a great range of color; sepals 5, connate at their base, posterior produced into a long slender spur;
nearly orbicular, undulate and with points on the margin; fls. large, long-squarred, orange-red, the upper petals large, rotundate, broad and entire, the 3 lower ones small and clawed and coarsely toothed and also fringed on the claws. Colombia, B.M. 11:271. G.M. 9:16. Var. minutum, Hubb. (T. Lobbianum var. minutum, Hort.), is said by some to be a hybrid with bright vermilion fls. Var. Regina, Hubb. (T. Lobbianum var. Regina, Hort.), is a form with bright salmon-red or salmon-orange fls. There is a horticultural strain of more compact growth, known as T. Lobbianum compactum; this strain occurs in numerous colors. Horticultural color-forms listed under the name T. Lobbianum are atropurpureum, dark purple; aureum, clear golden yellow; fulgens, dark scarlet; Chatszidum, yellow, washed with red.

dd. Plant glabrous.

e. Lvs. orbicular-reniform; nerves terminating in mucros; petals mucronate.

4. minus, Linn. Fig. 3855. Dwarf annual, not climbing, smaller in all its parts than T. majus: lvs. orbicular-reniform, apiculate at the ends of the veins: petals narrow and apiculate at the apex, the lower intensely maculate. Peru. B.M. 96.—Very likely blended with T. majus by hybridization, in garden forms. T. pinnatum, Andr., is either a monstrosity of this species or more probably a hybrid between T. minus and T. peregrinum, having the lvs. somewhat poliuate,
brous: lvs. peltate near the margin, cordate-orbicular, divided to about the middle into 5 lobes, which are mostly apiculate: fls. canary-yellow, odd and very irregular; spur green, hooked: 2 upper petals erect and large, obovate-clawed, much fringed; 3 lower petals small and narrow. Ciliate. Supposed to be native of Peru and Ecuador. B.M. 1351. B.R. 718. G.W. 10, p. 497.—An excellent quick-growing vine, although the fls. can scarcely be called showy.

AA. Species tuber-bearing.

b. Tuber large, obconical or pear-shaped.

7. tuberum, Ruiz & Pav. Root producing a pyriform tuber 2-3 in. long: st. climbing, glabrous: lvs. peltate near the base, cordate-orbicular, 5-lobed nearly or quite to the middle: fls. rather small, the calyx and long spur red, the petals yellow, small and nearly erect and little exceeding the calyx. Cerru and Bolivia. B.M. 3714. F.S. 5:452. P.M. 5:49. R.H. 1853-341 (tubers). J.H. III. 30: 355. H.U. 1, p. 4.—Plant stands some frost. In Peru, the tubers are eaten, and the plant is sometimes cult. in Eu. for the tubers. It appears in the American catalogue of European dealers. The tubers are usually boiled, or said to be eaten in a partially dried condition.

BB. Tuber longer, moniliform in many members: lvs. in 5 parts, usually divided to the base: petals scarlet.

8. pentaphyllum, Lam. Slender climber, the glabrous colored sts. arising from a tuberous root: lvs. divided to the base into 5 oblong or obovate segms. or lfts.: fls. small (about 1 1/2 in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B.M. 3190. B.H. 22:73.—A half-hardy species, showy because of the great number of bright small fls.

BBB. Tuber small, spathoid or somewhat flattened, rarely elongated: lvs. smaller or small, divided to the base.

c. Throat of the spur venetosose-turbinate, aperture narrow; spur cone-like, its tip cylindrical-subulate; petals lemon-yellow.

9. tricolor, Sweet, emended by Lindl. (Sweet spelled the specific name tricolor), but, as Lindley pointed out, this is orthographically incorrect) (T. coeruleum, Miers). Fig. 3857. Perennial from a fleshy or tuberous root: lvs. peltate, orbicular, divided into 6 oblong villous lfts.: fls. about 1 in. long, somewhat cornusopia-shaped, the calyx being the conspicuous part; main part of the calyx vermiculatum, the short lobes purplish, the small petals yellow. Chile. B.M. 3189. B.R. 1935. F.S. 4:369. P.M. 2:123. Gt. 62, p. 273. G.W. 6, p. 277.—Very choice half-hardy climbing, prostrate plant and probably the best known in this country of the tuberous-rooted kinds. Usually grown indoors. Its growth is very delicate. Var. grandiflorum, Hort. (T. Jardtii, Paxt. T. Jardtii, Buchen.), differs only in having larger lvs. F.S. 5:29.

CC. Throat of spur open; spur short or very short, conical; throat of corolla narrow, almost closed when old; petals white.


ccc. Throat of spur conical, aperture broad; throat of corolla broad, open; petals yellow.


TRÁXIMON (Greek, edible, which does not apply).

Compositae. Mostly perennial nearly stenless herbs, belonging to the Cichoriacere, with clusters of sessile radical lvs. and simple scapes bearing a head of yellow or purple fls. in summer, on a naked or bracted stalk: involucre campanulate, the bracts in several rows: rays blunt and 5-toothed at the apex.—Species 30, in N. Amer., except possibly 2 species which are S. American. The plants are little known to horticulturists. The name Tróximon is now given up for Agoseris (Greek, goat eulacrora).

Agóseris cuspidáta, Dietr. (Tróximon cuspidátum, Pursh. Nethoçádis cuspidáta, Greene). Root thick: lvs. entire, linear-lanceolate, thickish, 4-10 in. long, the margins conspicuously white-woolly and crisped: scape about 1 ft. high: fls. yellow, about 1-1 1/2 in. wide: achene not beaked. Prairie of Ill. and Wis. to N. D.—Cult. easy in any good border. Not unattractive. It has rather large dandelion-like heads of fls. in late summer. May be offered by collectors. N. TAYLOR.


TSÜGA (its Japanese name). Pinàcece. HEMLOCK. Ornamental trees, grown chiefly for their graceful habit and handsome evergreen foliage. Resinous trees with slender horizontal branches: lvs. usually 2-ranked, short-petioled, linear, flat or angular, falling away in drying: staminate aments axillary, subglobose: ovulate ament terminal, the scales about as long as the bracts, each with 2 ovules at the base; cones small, ovate, or oblong with thin flexible persistent scales, much longer than the bracts; seeds winged.—Nine or 10 species in N. Amer., E. Asia, and the Himalayas. The genus is closely allied to Abies and Picea and differs little in the structure of the fls.; the cones are very similar to those of the larch, but the lvs., which are much like those of Abies in their outward appearance, though smaller, are very different in their internal structure from all allied genera, having a soli-
The hemlock spruces are evergreen trees of pyramidal habit, with spreading irregularly whorled much rami­
fied branches clothed with small linear usually two­ranked leaves and small cones which are usually freely produced. The cones are only about 1 inch long except in some species, which has cones two or three times as large. *T. canadensis* is quite hardy North and the Japanese species and *T. caroliniana* have proved hardy as far north as Ontario. *T. Mertensiana* is almost as hardy. *T. heterophylla* is tender. There are probably no more beautiful hardy conifers than the hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff formal appearance of many of the conifers, but are graceful and stately at the same time. *T. heterophylla* is the most vigorous species and is more graceful than the Canadian hemlock, but tenderer. *T. Mertensiana* is noticeable for its light bluish green foliage and the more narrow pyramidal habit. *T. Sieboldii* is a very handsome species with dark green glossy foliage, but of slow growth and in cultivation usually remains shrubby. *T. canadensis* bears pruning well and is well suited for tall hedges (see Gn. 2:289. Gn. M. 2:15; 4:19). The other species will probably bear pruning equally well. The hemlocks are not very particular as to the soil, provided it contains a sufficient amount of constant moisture. *Tsugas* are not difficult to transplant. Propagation is by seeds sown in spring and by grafting on *T. canadensis*. The varieties and the Japanese species are also raised from cuttings. See also *Arboriculture, Abies, and Picea* for cultivation.

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- Globularia, 4.
- Gracilis, 5.
- Helophylla, 5.
- Hookeri, 6.
- Jeffreyi, 5.
- Mertensiana, 5, 6.
- Microphylla, 4.
- Nana, 2, 4.
- Parvifolia, 4.
- Patonianna, 6.
- Pendula, 4.
- Reicali, 6.
- Sargentiana, 4.
- Seraphini, 6.
- Sieboldii, 1, 2.

**KEY TO THE SPECIES.**

1. Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½–1½ in. long.

- albo-spica, 4.
- Argentea, 6.
- Argenteo-variegata, 5.
- Canadensis, 4.
- Caroliniana, 5.
- Compacta, 4.
- Diversifolia, 2.

- erecta, 4.
- globosa, 4.
- globularia, 4.
- gracilis, 5.
- helophylla, 5.
- hookeri, 6.
- jeffreyi, 5.
- mertensiana, 5, 6.
- microphylla, 4.
- nana, 2, 4.
- parvifolia, 4.
- patonianna, 6.
- pendula, 4.
- reicali, 6.
- sargentiana, 4.
- seraphini, 6.
- sieboldii, 1, 2.

- Margin of lvs. entire; apex of lvs. usually emarginate, sometimes obtuse.
- Margin of lvs. finely denticulate, at least toward the apex; apex of lvs. obtuse or acutish.
- Cones peduncled; scales almost orbicular, glabrous.
- Cones sessile; scales oval, slightly puberulous outside.

**1. Sieboldii, Carr. (T. Araragi, Koehne). Fig. 3858.**

Tree, attaining 100 ft., with spreading slender branches: branchlets pale yellowish brown, somewhat glossy, gla­brous, with reddish fl. cushions: lvs. linear, usually broadest at the apex, emarginate, grooved and glossy dark green above, with 2 whitish lines beneath, ½–3/4 in. long; cone ovate, 1–1½ in. long, the peduncle exceeding the bud-scales; bracts bifid. Japan. G.F. 10:492 (adapted in Fig. 3858). F.E. 32:1501. S.I.F. 2:4.

**2. diversifolia, Mast. (Abies diversifolia, Maxim. T. Sieboldii nana, Carr.). Fig. 3859.**

Tree, very similar to the preceding, but smaller and chiefly distinguished by the reddish brown pubescent branches: lvs. linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base: cone smaller, ½–3/4 in. long; peduncle not exceeding the bud-scales; bracts truncate, crenulate, not or slightly bifid. Japan. G.F. 6:495; 10:493 (adapted in Fig. 3859). S.I.F. 2:4.

**3. caroliniana, Engelm. Carolina Hemlock. Tree, attaining 70 ft., of more compact habit and with darker green foliage than the following: young branchlets light reddish brown, finely pubescent or almost gla­brous: lvs. linear, obtuse or acutish. There are probably more beautiful hardy conifers than the hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff formal appearance of many of the conifers, but are graceful and stately at the same time. *T. heterophylla* is the most vigorous species and is more graceful than the Canadian hemlock, but tenderer. *T. Mertensiana* is notice­able for its light bluish green foliage and the more narrow pyramidal habit. *T. Sieboldii* is a very handsome species with dark green glossy foliage, but of slow growth and in cultivation usually remains shrubby. *T. canadensis* bears pruning well and is well suited for tall hedges (see Gn. 2:289. Gn. M. 2:15; 4:19). The other species will probably bear pruning equally well. The hemlocks are not very particular as to the soil, provided it contains a sufficient amount of constant moisture. *Tsugas* are not difficult to transplant. Propagation is by seeds sown in spring and by grafting on *T. canadensis*. The varieties and the Japanese species are also raised from cuttings. See also *Arboriculture, Abies, and Picea* for cultivation.

**3859. Tsuga diversifolia. (×15)**

most commonly used in the E. for framing and clap­
boarding of buildings. It is not used for finishing
lumber. A number of garden forms have been raised;
the following are the most important: Var. álbo-spica,
Nichols. Tips of the young branchlets creamy white.
Var. compácta, Sénéc. (var. compácta rósea, Beisen.)
Dwarf conical pyramid with numerous short branchlets
clothed with small lvs. Var. globós, Beisen. (var.
globúlis erécta, Kunkler). Dense, globose, much-
branchled form with numerous upright branches nod-
ding at the ends. Var. grácilis, Gord. (var. microphylla,
Hort.). Slow-growing form with slender sparingly ramified branches, spreading
and more or less drooping at the ends: lvs. very small, about 2¾ in. long.
Var. náná, Carr. Dwarf and depressed
form with spreading branches and short
branchlets. Var. parviflóra, Veitch.
Lvs. very small, % in. long or shorter: branchlets stout,
closely set and numerous. Var. péndula, Parsons (var.
Sérpenús péndula, Hort., var. Sargentúna, Kent.).
Flat-topped form with spreading branches and drooping
branchlets. Var. pendula, H. (var. pendula, Schneid.)
Sargentii pendula, Sarg., not Carr.
Flat-topped form with numerous upright branches nod­
ing at the base. Recently intro. and probably as hardy as
T. yunnanensis). Has proved hardy at the Arnold Arboretum
and thrives well.—T. dumosa, Sarg. (T. braziiensis, Carr.). Tree,
3–20 ft.: lvs. gradually tapering from the base, aculate, acutish,
with broad silvery white lines beneath, %–1¾ in. long: cone 1 in.
3860). A spray of hem­
lock spruce. — Tsuga
canadensis. (XII)
toothed and with narrow white lines beneath: cones sessile, about
1½ in. long, lustreous. Cent. and W. China. G.C. III. 39:236 (cones,
3860). A spray of hem­
lock spruce. — Tsuga
canadensis. (XII)
toothed and with narrow white lines beneath: cones sessile, about
1½ in. long, lustreous. Cent. and W. China. G.C. III. 39:236 (cones,
3860). A spray of hem­
lock spruce. — Tsuga
canadensis. (XII)
some distance, %–1¾ in. long: cone 1 in.
3860). A spray of hem­
lock spruce. — Tsuga
canadensis. (XII)
The form of the chalice or perianth-cup, the substance of the flower, the shape of the segments, and the color, are marked features in the tulips of the different classes and seasons. The usually cultivated tulips have very broad flower-segments, obtuse or abruptly narrowed and short-pointed, as in Fig. 3862. In the wild, however, are many forms with long-narrowed segments, as shown in Fig. 3863 (adapted from Gardener's Chronicle), and these may be seen sometimes in the gardens of amateurs; they are very interesting and often showy. It appears that in earlier times the sharp-pointed flower-parts were desired. Other tulip forms are represented in Figs. 3864 and 3865, as well as in the succeeding pictures accompanying this article.

The colors of tulips cover a wide range except that there are no real blues. There are clear whites, yellows and orange, crimsons and reds, violets and purples, and many vari-colored types. The tulips known as "breeders" are self-colored kinds; that is, the flowers are of solid colors, usually in dull and neutral shades of red and yellow with tints of bronze, buff, and brown. The reason for the name is this: When tulips are grown from seeds, the flowers at first are usually self-colored; the same bulbs when grown for a few years tend "to break" into mixed colors, particularly into feathered markings; the self-colored stage is a breeding-stage for other kinds. When the bulbs are multiplied asexually (as explained farther on), they reproduce the stage in which they then are; if propagated in the "breeder" stage, they give self-colored flowers; if in the "broken" stage, they give partly colored flowers. These stages are longer or shorter in different lots of seedlings, and are not definite epochs. The "broken" tulips are of many kinds. Those with white ground or under-color and blue or purple markings are "hybloeënem" or "hybloeems," and those with yellow ground-color and red to brown over-color are "bizarres." The terms "hybloeem" and "bizarre" are also sometimes applied to selfs, or breeders, when the colors are prevailingly blue or purple in the one case or prevalingly yellow in the other. Selected strains of breeder tulips, with very large bloom, long stems, and "art colors" are now popular. The so-called "rectified" tulips are broken breeders with solid colors in stripes, plumes, and patches; they are hybloeem and bizarres. It is said that the "breaking" is facilitated by certain soils.

There are many classes of tulips. We might distinguish three roughly: (1) The early single tulips of the Duc Van Thoï kind, of small stature, excellent for first bloom and for early bedding, being out of the way for other bedding plants; they lack the size of bloom and the "substance" of later kinds. There are also later-flowering single tulips of the early class. (2) Later-flowering or "tulipa" tulips, comprising the main-season kinds that have been preserved by cultivators in the old countries since the collapse of the tulipomania of Holland. (3) The Darwins are stately plants, mostly selfs or "breeders," closing the tulip season, with very rich and deep colors in crimsons, reds and purples; there are
some whites but no yellows. This Darwin race is relatively recent, having been given its present name (in compliment to Charles Darwin) little more than twenty-five years ago. Broken rectified Darwins in several color combinations are known as Rembrandt tulips.

There are many other classes or subclasses, and races of intermediate season, that need not be mentioned here.

Vari-colored garden tulips are classified by F. D. Horner (England) into six main sections or classes, and the self-colored or "breeder" strains into three classes, as follows: (1) Flamed Bizarres. These have a yellow ground flamed with red, very dark, almost black, and chestnut-brown. (2) Feathered Bizarres. These have similar colors, but the yellow grounds are marked or penciled on the margin, whereas the flamed flowers have a heavy 'beam' of color in the center of the petals. (3) Flamed Bybloemens. These have a white ground marked with lilac, purple, and very deep black-purple color. (4) Feathered Bybloemens. Similar in color, but with feathered instead of flamed petals. (5) Flamed Roses. These are flamed with rose and scarlet colors on the pure white ground. (6) Feathered Roses. These have a white ground, and are flamed with rose and scarlet colors. There are three more classes of what are termed 'breeder' Bizarres. Yellow selfs. Bybloemens. Lilac and light to deepest purple selfs. Roses. Rose and scarlet selfs. They are termed 'breeder' because in the course of a few years these self-colored flowers become flamed or feathered, and pass out of the breeder state."

The common garden tulips, in their many forms, are probably all developments of the Gesneriana group, comprising T. Gesneriana, T. suaveolens, and the like. Many of the forms sometimes catalogued as "botanical tulips" are also very ornamental and are always interesting in a collection. A number of species may be had in the trade. They should be better known.

Tulip history (Stubenrauch).

The tulip has an unusual and interesting history, on which we may pause briefly. The origin of the garden tulip seems to be lost beyond recovery. It is often said that it is derived from Tulipa Gesneriana, but this does not explain it. It merely means that in 1753 Linnaeus grouped all the garden tulips he knew under the name of Tulipa Gesneriana. But the tulip of that day had been cultivated for two centuries by Europeans, and previously for an indefinite period by the Turks, from whom, of course, we have no exact records. (Fig. 3866.) One might study wild tulips in their native places and compare them with descriptions without being certain of the original form which the Turks brought from the wild, simply because of the lack of records at the beginning. It is necessary to have some scientific name for the garden tulips. The one most one dare say is that the garden tulip are chiefly referable to T. Gesneriana and T. suaveolens, with the distinct understanding that these names do not represent an original wild stock. Tulipa suaveolens requires explanation. This name, which dates from 1757, stands for a kind of tulip discovered wild in southern Europe long before that date. There is no proof that it was native; the probability is that it had escaped from gardens and run wild. In 1799, it was distinguished from the other tulips then known by the fragrance of the flowers; the earliness of bloom, slightly greater size and pubescent scape. From the early records it appears that there were fragrant early-blooming flowers among the first tulips received from Turkey. This is one of the main reasons for thinking that T. suaveolens is not native to southern Europe. At all events, it is clear that T. suaveolens has played an important part in the evolution of the garden tulip, the Due van Thal class being credited to this source. The distinctions between T. suaveolens and T. Gesneriana given in the sequel are those of Baker, but they do not hold at the present day. It is impossible to refer any given variety with satisfaction to either type. Some writers have said that the leaves of T. suaveolens are shorter and broader than those of T. Gesneriana. This character also fails. All grades of pubescence are present. Some pubescent plants have long leaves and odorless flowers. Others have short glabrous leaves and fragrant flowers.

For practical purposes it may be said that most of the common garden tulips, at least the late-flowering ones, are T. Gesneriana, while many of the early-flowering kinds, e.g., the Due van Thal class, are supposed to be derived from T. suaveolens. It is impossible to press much nearer the truth, as the prototypes of the old garden favorites cannot be known completely and precisely.

The first tulip seeds planted by Europeans were sent, or brought to Vienna in 1564 by Busbequius, the
TULIPA

The narrow-petaled varieties are practically unknown. After the introduction of seed to Vienna the tulip became rapidly disseminated over Europe, both by home-grown seed and by new importations from Turkey. In 1556 Gesner first saw the flower at Augsburg, and it is mainly on his descriptions and pictures that the species T. gesneriana was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated tulips on a rather large scale. A picture from him is shown in Fig. 3866. He did not introduce the tulip into Holland, but the appearance of his specimens in 1591 did much to stimulate the interest in the flower in that country. The best of Clusius' plants were taken from him, as the admirers of the tulip were unwilling to pay the high prices he demanded. After this, the propagation of the tulip proceeded rapidly in Holland and the flower soon became a great favorite. The production of new varieties became a craze throughout the Netherlands, culminating in the celebrated "tulipomania" which began in 1634. The excitement continued for four years, the price of bulbs often being above that of the precious metals. Thirteen thousand florins were paid for a single bulb of Semper Augustus; but the dealings were often in the nature of pure speculation, no bulbs changing hands. Governmental interference was necessary in order to end the ruinous speculation. After the craze subsided, the production of varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected by the rich for the many new plants from America. For a time the tulip was considered more or less of a poor man's flower, although it has at no time been without many staunch admirers among the upper classes.

With the Turks the narrow acuminate flower-segments were in favor, while western taste preferred the rounded forms (Fig. 3868). The Turks seem to have been satisfied with a preponderance of the reds and yellows, for in the first sowings of Turkish seeds the larger part of the resulting blooms were of those colors. It thus came about that flowers so colored were considered common and undesirable in the European gardens and all effort was directed to the production of the rarer white-grounded forms with finely and distinctly marked stripes, those with a sharp bright red being the favorites. Indisputable evidence of this is seen in the old Holland "still-life" paintings of that time, where one finds none but the rarer forms represented (Solms-Laubach). All the early tulips of direct Turkish origin had acute more or less narrow and reflexed segments. In the Dutch fields the center of the bulb-growing industry of the world down to the present time, for the narrow-petaled varieties are practically unknown among our common garden forms, so much so that the extreme typical one has been referred to a separate species (T. acuminata, Fig. 3872). In the Dutch fields they are now known as "thieves," and are destroyed as soon as they make their appearance. The quest for unusual colors appears to have been one feature of the tulip furore. Dumas' "Black Tulip" is interesting in this connection.

Parrot tulips were known toward the end of the seventeenth century. They were often considered...
the original form from which this strain might have been developed. Many of the garden varieties of today exhibit more or less laciniation, so that it is probable that "Parrot" strains might be developed from them by simple selection.

Double tulips seem to have made their appearance at an early date. In "Hortus Eystettensis" (1613), there are four forms figured, one of which, at least, seems to have been almost wholly made up of bracts, as it is shown entirely green and is described as being "wholly herbaceous and green." The other three there figured are: one red, one yellow, and the other white with maroon borders. Solms-Laubach places the advent of double tulips at a much later date, 1665, and gives as the first authentic record the account of "'Tulipa lutea centifolia, le monstre jaune double." Flowers with as many as 200 petals are mentioned. A double form of "T. serotina" was known in 1701, and at the beginning of the nineteenth century a double form of T. gallica was described.

Cultivation of the tulip.

"The tulip is one of the easiest plants to grow, but, like other plants, it profits by extra care. In any ordinary soil it gives excellent satisfaction, if good bulbs are secured in the first place.

For outdoor cultivation for spring bloom the bulbs should be set in September to December in the latitude of New York. They should be planted before hard freezing weather comes. The soil should be a sandy loam, well worked to a depth of at least 12 inches for best results, and enriched with leaf-mold and well-rotted cow-manure. Fresh manure of any kind should never be used near bulbs of any sort. On heavier soils tulips can be successfully raised if extra care is given to insure perfect drainage. Drainage is important under all conditions. The bulbs will never prove satisfactory in low wet situations, and if there is danger from standing water it is best to raise the beds several inches above the surrounding ground. The production of large perfect flowers depends on a large supply of fibrous roots. Size of bulbs is not so important: a large bulb cannot offset a deficiency of roots.

Plant the bulbs 4 to 6 inches deep (to the bottom of the bulbs) and 4 to 9 inches apart, depending on the class or size of the plants, the closer distances being for the early single kinds and the wider distances for the later and larger kinds. Care should be exercised to place all the bulbs at the same depth, as otherwise they will not all bloom at the same time. When the ground begins to freeze, cover the beds with leaves, dry forest litter, or other light material. After danger of heavy frosts is past in spring the beds should be uncovered, and if the work of preparation and planting has been well done the tulips will require little or no further care. In England many of the beds of choice and delicate varieties of tulips are protected when in flower from heavy rains and hot sun by means of light cloth screens, and are thus kept in good condition for some time.

Tulips may remain in the ground several years if the tops are not cut off and if the maturing leaves are not smothered by other plants. In practice, however, the best results are usually not secured in this country after the bulbs have been in the ground two or three years. The Darwin class seems to lack in constitution, and the plants should be renewed every two years or so.

In old-fashioned gardens, tulips often remain year after year; but when the beds are needed for other flowers in succession, the bulbs are lifted as soon as the flowers are past and reset elsewhere until the plants mature and the tops die down naturally. Then the bulbs are taken up, sorted and dried, and stored in a cool dark place until planting-time; or they may be planted at once in the permanent quarters if the area is ready to receive them. Even in borders and among shrubbery, it is well to take up the bulbs every two or three years and sort out the small ones, replanting the remainder; or, if they are weak, to discard all of them for new ones. For the best bedding work, it is advisable to use strong freshly imported stock each year.

To make design-beds, choose bulbs of very uniform size. Dig out the bed, removing all the earth a little deeper than the bulbs are to be planted, then make a thin layer of soft earth on which the bulbs may rest; this should be stroked level and be at a uniform depth. Then place the bulbs in the design and fill in around them carefully by hand; then place the earth back in the bed.

For pot culture (winter and spring bloom), a mixture of fine garden loam, two parts to one of well-rotted manure (cow-manure composted for two years is best), mixed with enough clean sand to make the mass easily friable, is most suitable. If no loam is obtainable and a heavier garden soil must be used, one part of the latter will be sufficient, in which case the addition of an equal proportion of leaf-mold will be advantageous. From three to five bulbs, according to size, to a 6-inch pot are effective. Deep pans are often used with good effect; a 6-inch pan may hold five or six early singles, and an 8-inch pan as many as ten (Figs. 3867, 3868). Fill the pots lightly and press the bulbs into the soil, thus bringing the base in close contact with the soil-particles. Cover the bulbs to the tip and press the soil firmly all around. Water once freely and cover the pots entirely with soil, leaves, or litter, so that they will be out of reach of frost, or place them in a dark cold (not freezing) cellar or room until the bulbs have become well rooted, which under ordinary conditions will re-
The tulip can be grown to perfection in the Pacific Northwest, but the cost of production, on account of the high wage-rate, may be a controlling problem. As the situation looks now, the American can produce fully as good a bulb, and one that will mature earlier than the Holland-grown; but whether these can be sold in the eastern market in competition with the Dutch is a question yet to be determined. It is probable that the bulbs can be grown as far south as San Francisco. South of San Francisco, the single early tulips bloom very close to the ground; on the other hand, the Darwins seem to do very well in the Santa Cruz and Ventura regions. At the government bulb-farm at Bellingham, Washington, good tulip bulbs with normal increase have been produced under adverse conditions.

Put a little charcoal crown.

Propagation is effected in various ways. Tulips may be increased by offsets, but these are not constant as new bulbs produced within the outer tunics by means of cutting the old bulbs. Fig. 3869 shows a section of a bulb with new inner bulb and outer offset in place. The new bulb is completely inclosed in a sac which afterward becomes the outer dry membranous tunic. The pubescence, if any, may be found on the inside of this sac, even in the earliest stages of growth.

The new bulb is attached to the base of the flower-stem, immediately above the root-crown from which the former proceeds directly upward. Each new bulb-tunic (including the outer sac) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 3869 shows the separated leafy bulb-scales, and indicates the homology of tunics and leaves. Sports among the offsets are at present mainly depended on for the production of new varieties. These have been found susceptible to the breaking off process, though perhaps slower to respond than the seedlings. Seed production is now practiced only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is likely to come into favor.

Tulips are “Holland bulbs,” that is to say, the bulbs are grown mostly in Holland and are extensively shipped to this country. Considerable interest has been aroused in the growing of commercial bulbs in this country, particularly in the Puget Sound region. The tulip can be grown to perfection in the Pacific Northwest, but the cost of production, on account of the high wage-rate, may be a controlling problem. As the situation looks now, the American can produce fully as good a bulb, and one that will mature earlier than the Holland-grown; but whether these can be sold in the eastern market in competition with the Dutch is a question yet to be determined. It is probable that the bulbs can be grown as far south as San Francisco. South of San Francisco, the single early tulips bloom very close to the ground; on the other hand, the Darwins seem to do very well in the Santa Cruz and Ventura regions. At the government bulb-farm at Bellingham, Washington, good tulip bulbs with normal increase have been produced under adverse conditions.

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Tulips are “Holland bulbs,” that is to say, the bulbs are grown mostly in Holland and are extensively shipped to this country. Considerable interest has been aroused in the growing of commercial bulbs in this country, particularly in the Puget Sound region. The tulip can be grown to perfection in the Pacific Northwest, but the cost of production, on account of the high wage-rate, may be a controlling problem. As the situation looks now, the American can produce fully as good a bulb, and one that will mature earlier than the Holland-grown; but whether these can be sold in the eastern market in competition with the Dutch is a question yet to be determined. It is probable that the bulbs can be grown as far south as San Francisco. South of San Francisco, the single early tulips bloom very close to the ground; on the other hand, the Darwins seem to do very well in the Santa Cruz and Ventura regions. At the government bulb-farm at Bellingham, Washington, good tulip bulbs with normal increase have been produced under adverse conditions.

Put a little charcoal crown.
includes species that are nearly all of small stature and possess comparatively small fls. It is a charming plant, growing about 9 in. high. The fls. have yellow segms. edged with white. When fully open in sunny weather a group produces a brilliant effect, and it is one of those small bulbous plants that are most appropriate for the rock-garden planted between other low-growing plants. The bulbs may be left undisturbed in the ground; a group planted amongst Alchemilla mollis in the rock-garden at Kew flowered quite as freely the second year as the first."—W. I. in G.C. III. 52:206 (with fig.). Baker describes it st. 1-fl., and not more than 3 or 4 in. long; lvs. 2-3 glaucous, lanceolate; perianth above 1 in. long, funnel-shaped, bright yellow inside, the outer segms. ob lanceolate and green-tinged on outside. E. Turkestan.

Subgenus II. Tulipa proper, without distinct style.

A1. Outer bulb-tunic quite or nearly glabrous

b. Perianth yellow, flushed with green outside. ........................ 2. fragrans

BB. Perianth crimson tinged with yellow outside. ........................ 3. Hageri

BBB. Perianth vermilion. ....................... 4. præstans

2. fragrans, Munby. Height 6-12 in.; proper lvs. 3, crowded at middle of st., linear or lorate; fls. yellow, greenish outside; perianth funnelform-campanulate, 1½ in. long, in a cluster; segms. oblong-lanceolate, acute; filaments bearded at base; ovary slightly narrowed at collar; stigmas small. Algeria. Gn. 45:456.—Allied to T. syriaca, differing in position of the lvs. and segms. uniformly wide.

3. Hageri, Heldr. Height 6-8 in.; lvs. 4-5, lorate acute, not undulate; fls. chiefly red, about 2 in. across; perianth broad-campanulate, 1½ in., inodorous; segms. acute, red, with a large green or purple-black basal blotch margined with yellow; stamens purple-black; filaments linear, bearded at base; ovary narrowed at collar; stigmas small. Hills of Parnes range in Attica. B.M. 6242. F. 1877:169. Var. nitens, Hort. Wallace. Said to be much finer than the type; fls. 3 in. across, bright orange-red, the outer segms. flushed with gray and bronze, black at base. Asia Minor. Gn. 63, p. 372.

4. præstans, Hoog (T. suaveolens var. sulphurea, Regel). Bulb about 1 in. diam., rounded, with leathery skin which is almost glabrous inside: scape to 18 in., white-hairy, 1- to several-fl.: fls. light scarlet-vermilion, the segms. all uniform in shape, pointed: lvs. hairy, rather wavy. B.M. 7320. B.C. III. 33:325. Gn. W. 24:317.—Once confused with T. suaveolens, but now considered to be clearly distinct, and that species is identified with the Duc van Tol form.

A2. Outer bulb-tunic always hairy at base inside and usually furnished with a few scattering hairs above but sometimes without them.

b. St. and lvs. pubescent. ....................... 5. suaveolens

BB. St. and lvs. glabrous. ...................... 6. straunigula

c. Leafy only at base of st. ........................ 7. australis

d. Lvs. lanceolato-f. yellow. .................. 8. primulina

dd. Lvs. lorate-lanceolate. ..................... 9. viridiflora

CC. Leafy to middle of st. or above.

d. Perianth uniformly dark scarlet with a bright yellow basal blotch. 10. fulgens

dd. Perianth uniformly with a blackish-twin basal blotch, bordered with bright yellow. ....................... 11. macrospela

DDD. Perianth variable, but rarely with a dark-twin basal blotch. 12. Gesneriana

13. nitida

5. suaveolens, Roth. Duc van Tho. Tulips. Height 3-6 in.; lvs. 3-4, mostly at base of st., lowest lorate-lanceolate and broad; perianth campanulate, 1½-2½ in. long, edges ciliate, bright red or variegated; segms. all acute; filaments glabrous; anthers yellow; ovary prismatic; stigmas very large. S. Russia and S. Eu., but possibly only a naturalized form of old intro. Turkish garden varieties. F.S. 12:1223. B.M. 839. Var. paulinae, Hort. St. with 2 fls., bright scarlet, rather pointed in form, with black mark at base of each segm.

6. straunigula, Rehoul. Said by Baker to be very near T. suaveolens, but much taller and the segms. furnished at base with a large black blotch; typically red-fl., but with yellow varieties. Italy. B.R. 1900 (as T. acrocarpa). Var. masculata, Hort., has soft yellowish fls. blackish at base.

7. australis, Link. Height 12-18 in.; st. slender; lvs. 2-3, crowded at lower portion of scape, channelled; bud nodding; perianth 1½ in. across, funnel-form-campanulate, yellow, outside ridged; segms. obovate-oblong, acute at apex, slightly puberulent; anthers yellow; filaments flattened, bearded at base; ovary narrowed at collar. Savoy, France, Spain, Portugal, and Algeria. Gn. 45:456.

8. primulina, Baker. Bulb ovoid, 1 in. diam., the outer coats brown and thinly armed-hairy inside: st. glabrous, 1-fl., less than 1 ft. long; lvs. 3-6 near base of st., linear and channelled, glabrous: fl. very fragrant, pale primrose-yellow somewhat red-tinged on outside. Algeria. B.M. 6736. Closely allied to T. australis.

9. viridiflora, Hort. Outer bulb-tunic glabrous except around root-crown, where there is a dense fringe: st. glabrous; lvs. 3-4, glaucous, edges slightly ciliated near base; fl. large, soft green, edged with yellow or white. Gn. 32:514.—Garden form. Bears some resemblance to a Parrot tulip. Var. præcox, Hort., is larger, pale green.

10. fulgens, Hort. Garden form with beautiful scarlet fls.: height 5-15 in.; lvs. 3, lanceolate or ovate, very wavy: perianth-segms. all obovate-ovate, acute; anthers yellow; pollen yellow; filaments white, flattened, glabrous; ovary prismatic; stigmas small, not wavy.

11. macrospela, Baker. A supposed hybrid of unknown origin. T. Gesneriana probably being one of its parents. Height 10-18 in.; lvs. 3-4, long and narrow, lowest long-lanceolate, flat, pendent: peduncle wiry; perianth campanulate, slightly funnelform, emitting a heavy sweetish unpleasant odor, bright crimson to cerise or cherry-red, with a distinct nearly black cuneate basal blotch broadly margined with yellow or yellowish white at top; segms. obtuse or outer sometimes acute, outer reflexed, inner erect; filaments dilated, white at base, black, violet or striated above, glabrous; ovary prismatic; creamy white; stigmas same color, large, slightly undulated.

12. Gesneriana, Linn. COMMON GARDEN OR LATE TULIPS. Figs. 3862, 3884, 3885, and others. Height 6-24 in.: st. erect: lvs. 3-4 or more, lower lorate-lanceolate or obovate-lanceolate, often undulated, glaucous, pubescent variable; peduncle variable; fls. 1-2½ in. long, inodorous, bright red or varicolored, when bright red with only an obscure basal
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emarginate; anthers yellow; filaments black, glabrous; deep scarlet with a broad-cuneate dark violet-blue ovary narrowed at collar; stigmas yellow, twice as long as fl.-stalk, not undulated, outer acute; segments yellowish white; stomata black; ovary with a small cusp in the center; filaments glabrous, flattened; ovary prismatic; stigmas large and usually crisp. Origin uncertain. Intro. from the Turkish gardens in 1554. Long since hybridized and cult. out of all semblance to any wild forms. Supposed original from (Baker) in B.M. 6430 (as T. Schreinta). Darwin tulips (Fig. 3871) are a strain of long-stemmed late self-colored tulips.

Var. Dracótina, Baker.  PARRÓS TULIP. Fig. 3870. Similar in habit; perianth usually yellow and red striped and spilted; segms. deeply cleft and incisately dentate. F.S. 21:2221 (as T. turcica).

Var. spatulata, Hort. (T. spatulata, Bertol.). This differs from the type in its larger fls. of a brilliant red color with a large purplish black blotch at the base of each of the segms. Italy.—Probably the largest of the wild tulips.

Var. Stranovayáïína, Hort. Very large brilliant scarlet fls., with a handsome dark basal blotch. One of the naturalized tulips found without disposition to vary in fields near Florence, Italy. F. 1881: 65.

Var. álbo-oculá, Krelnge. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a distinct white basal blotch; inner segms. obtuse, outer acute; filaments white.

13. níta, Hoog. Bulb ovoid and small, with long neck, the brown coats glabrous inside except a few short hairs at base and top; scape slender and very short (2–5 in. high), glabrous: lvs. 3, linear-lanceolate, falcate and channeled: fl. bell-shaped, 1 1/2 in. long, bright crimson with a large dark basal blotch margined short (2–3 in. high), glabrous: lvs. 3, linear-lanceolate, falcate and channeled: fl. bell-shaped, 1 1/2 in. long, bright crimson with a large dark basal blotch. Intro. to cult. 1890. B.M. 7440. G.M. 39: 390.—Allied to T. Greigii and T. pulchella.

18. cariná, Hort. Krelage. Lvs. 3, not crowded, as long as fl.-stalks, slightly undulate, lightly ciliate on edge near base: perianth open-campanulate, 3 in. long, dark scarlet, tinged with green just above and blending into a bright yellow basal blotch; segms. acute, cuspidate; stomata yellow; ovary prismatic; stigmas white, not undulated. Habitat unknown. Vars. rubra and violacea, Hort., are offered.

19. vitellina, Hort. Lvs. 4, not crowded, as long as fl.-stalk, not undulated, thinly ciliate on edges; peduncle slightly tinged with red near fl.: perianth campanulate, 2 in. long, sulfur-yellow, no basal blotch; inner segms. rounded, outer acute; filaments yellowish white; stomata not undulated.—Said to be "hybrids between T. eugeniae and T. Greigii." It is one of the "Cottage Garden" tulips, a class of old-fashioned tulips which have been preserved from oblivion in the gardens of the poor. Recently they have been restored to popular favor. Well worth attention.

20. vólifó, Linn. Height 9–15 in.: lvs. usually 3, at base of scape, channeled, linear-lorate: peduncle sometimes 2-fl. in cult.: bud nodding; perianth funnelliform-campanulate, 1 1/2–2 in. long, yellow, segms. all acute, inner narrow; ovary bladder-form (narrowed at collar); stigmas smaller than ovary-diam., yellow. Said to be native in England and widely so in Eu.—In cult. as T. florentina and T. florentina var. odorata.

21. Ostrowskiana, Regel. Outer tunics of the bulb blackish, strigoïds-pilos at their apex inside: st. 3-ld., glabrous, 1-fl., 8–10 in. high, including the peduncle: lvs. glaucescent, glabrous, immarginate, the lower narrowly lanceolate, strongly undulate, the upper linear-lanceolate to sublinear, shorter than the st.: peduncle glabrous: sepals more or less spreading, elliptic, pers...
ceptibly narrowed into a short cup, purplish brick-red, base marked with a blackish spot, glabrous; filaments glabrous. Turkestan. Gt. 33:1144. B.M. 6710 (as T. Kupferbourniana).

22. Kolpauskiana, Regel. Tunics of the bulb fuscous, stigmos-pilose toward the apex inside: sts. 3-lvd., 1-fld.: lvs. erect-spreading or spreading, undulate, obscurely cartilaginous margined, margin smooth or scabrous, lower lvs. narrowly lanceolate or linear-lanceolate, upper rather linear (sublinear); peduncle glabrous; perianth erect; sepal spreading, elliptic-lanceolate to lanceolate, all acute or rarely rather obtuse, yellow, outer ones very often becoming reddish or greenish dorsally or entirely purple in a variety, apex and base glabrous; stamens glabrous. Turkestan. B.M. 6635 and G.C. III. 27:309 (both as T. Borsczewski).—Nearly allied to T. Generiana, Linn., which differs in the 3-4-lvd. st., the broader immarginate lvs. and in the campanulate-continvously often obtuse segms. of the perianth.

23. Sprénegri, Baker. Late-flowering: height 10–18 in.; lvs. 4, close together, long, linear-lanceolate, stiff: peduncle wiry, tinged with deep red under fl.; perianth open-campanulate (star-shaped), 2 in. long, bright scarlet with a somewhat dull brown basal blotch, all around with dull orange-yellow, all blending into one another; segms. all oblong-ovate and cuspidate; filaments reddish brown; ovary reddish; stigmas equal to narrow collar. Hab. (?) Intro. by Damman & Co., Naples, 1894. Gn. 50:438. Gt. 44:1611. G.M. 49:665. Said to be the latest tulip.

A4. Outer bulb-tunic with scaring appressed hairs all over inside.

B. St. pubescent (T. maculata finely so and sometimes glabrous; T. Tubergeniana not considered).
C. Perianth usually bright red with a yellow basal blotch.
D. Perianth orange-scarlet, vermilion, or red, with a dark brown, purplish, or bluish black basal blotch.
E. St. glabrous, or essentially so (see No. 77).

24. elegans

Cc. Lower lvs. linear.
Dd. Lvs. very much undulated, entirely so.
Ee. Perianth-segms. all round or oblong at top, not ending in point.
Ff. Inner and outer segms. acute or at least short-pointed.

25. maculata

26. Micheliana

27. ingens [iana

28. Maximowiczii, Regel. Lvs. erect: peduncle glabrous; perianth crimson, with a black basal blotch; segms. obtuse, ending in a short sharp point; anthers light purple; filaments linear, not bearded. B. Bokhara, 1889. Closely allied to T. lino-folia, from which it differs in having outer bulb-tunic hairy at apex (not wooly), erect lvs. and sharp-pointed perianth-segms.

29. E. Bokhara, 1889. Closely allied to T. lino-folia, from which it differs in having outer bulb-tunic hairy at apex (not wooly), erect lvs. and sharp-pointed perianth-segms.

30. Kesselringii, Regel. Lvs. 4–5, crowded at base of st., lorate-lanceolate, or linear-channeled; peduncle sometimes obscurely puberulent; perianth campanulate, 1½–2 in. long, bright yellow, flushed with red and green inside; inner segms. subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diam. Turkestan. B.M. 6754.

31. st., lorate-lanceolate, or linear-channeled; peduncle sometimes obscurely puberulent; perianth campanulate, 1½–2 in. long, bright yellow, flushed with red and green inside; inner segms. subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diam. Turkestan. B.M. 6754.

32. Korolkowii, Regel. Height 6–9 in.: lvs. 2–3, falcate, margin crisped: perianth campanulate, red, with a distinct black basal blotch; inner segms. oblong, outer obovate; filaments lanceolate; stigma small.

33. Kaufmanniana, Regel. Height 12–18 in.: lvs. 3–4, lorate-lanceolate: perianth fine scarlet, campanulate, 2½ in.; segms. obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small.—A well-marked garden race, with the habit of T. generiana, from which it differs by its small stigma, pubescent peduncle, and bright red fl.-segms., with a broad black basal blotch.—Baker.
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34. **Hoogiana**, Fedtsch. Outer bulb-scales covered on inside with reddish hairs: st., including bloom, 6-18 in. in. long, smooth: lvs. 4-6, lanceolate-tapering, smooth, with a narrow membranous white short-ciliate margin, the lowest 8-10 in. long and 1½-3 in. broad: fl. scarlet, with a large black blotch bordered with orange on each segm. within the cup and a corresponding yellow mark on the outside; segms. broad, somewhat abruptly acuminate at apex; filaments linear-lanceolate, blackish violet; anthers black. Cent. Asiatic desert (Bokhara), “a brilliant scarlet, at the base clear yellow.”—T. *Kaufmanniana* is a handsome and valuable species blooming exceptionally early. Sometimes called “water-lily tulip” from the resemblance of the partially opened fls. to those of nymphaea.

35. **saxatilis**, Sieber. Distinct: bulb ovoid, medium size: height 12 in. or more: st. usually maroon, the lowest 1 in. down and bearing 2 fls.: lvs. usually 3, sometimes lowest 12 in. long, lanceolate or linear and glabrous; perianth oblong-cuneiform, 2½-3 in. long, 3 in. across, light yellowish white; segms. narrow not undulated: perianth brilliant red, white streaked with red, with a bluish violet, dark basal blotch; filaments colored like the blotch in perianth. Var. *albiflora*, Hort., white-fls., mentioned. G.W. 12, p. 378.

36. *arména*, Boiss. Lvs. 5, crowded at base of st., falcate, glaucous and glabrous, slightly undulated, long-ciliate on edge all around, longer than fl.-stalk: peduncle glabrous, finely dotted: perianth open-campanulate, slightly sweet-scented, 2 in. long, dark scarlet with black basal blotch margined all around with yellow; inner segms. rounded, outer acute; anthers purple; filaments flattened, black, not bearded.—This name is referred by Baker without hesitation to *T. gesneriana*, but the plants in the trade as *T. arména* differ as indicated above.

37. **Billietiéna**, Jord. & Fourn. Lvs. 3-4, undulate, not ciliate on edge: perianth open-campanulate, 2 in. long, 3½ in. across, inodorous, bright yellow, flushed with scarlet-pink, especially outside, with obscure basal blotch striated with blue-black lines; anthers dark gray or blackish; filaments yellow, with dark striations; ovary narrowed at collar; stigmas light yellow, very large and crisped. Savoy, Italy. B.M. 7253. G.M. 38:311.—One of the late tulips.

38. **Didítrí, Jord. Height** 12-18 in.: lvs. 3-4, undulate, acuminate: perianth campanulate, 2-2½ in. long, 4½ in. across, bright crimson, with purple basal blotch margined with yellow or yellowish white; outer segms. reflexed; stamens same color as basal blotch; ovary narrowed at collar; stigmas larger than collar-diam., white, Savoy, Italy, and Alps. B.M. 6639. G.W. 21:1067. Var. *Mauríiana*, Baker. Lvs. narrower, slightly undulate: perianth brilliant red, with white yellow blotch. Var. planifólia, Baker. St. slender: lvs. narrow, not undulated: perianth deep red, faintly marked with yellowish red or blackish blotch. Var. *alba*, Krelage. Peduncle stiff, motived with perianth light lemon-yellow, or white tinged green outside, basal blotch limited to a few dark striations; filaments same color as fl. Var. *utíescens*, Krelage. Lvs. 3, slightly falcate; perianth light yellowish white streaked with red, with a bluish violet, dark basal blotch; filaments colored like the blotch in perianth. Var. *albiflora*, Hort., white-fls., is mentioned. G.W. 12, p. 378.

39. **acuminata**, Vahl. Fig. 3872. Height 12-18 in.: lvs. 4, lowest lanceolate, all undulated at margins: peduncle shining: perianth very open, light yellow splashed with red lines; segms. sometimes 3½ in. long, less than ½ in. wide, with edges rolled in; stases yellow; filaments flange, glabrous; ovary prismatic; stigmas very large, yellow, not undulated. Turkey(?). “This, the well-known Turkish tulip, is a most distinct type, its origin and the nature of which is not clearly known. It has the bulb, leaf, and glabrous peduncle of *T. gesneriana*, and the flower is similarly variable in color.”—Baker.


41. *Borszczówi*, Regel (later spelled *Borzseövi*). Pronounced *Borzseövi*). Bulb ovate, fuscos, outer tunics pubescent within: plant glaucous, very glabrous: st. 12-15 in. high, white prunose, lower third covered with lacerate scarious sheaths, 1-ft.: lvs. bluish green, ovate-lanceolate, gradually attenuate from the broader base to the apex, decreasing in size, four in number, the lower up to 6 in. long, more or less undulate: petals cuneate-ovate, sparse rounded to the noticeably abrupt cusp, red with an obovate black blotch at base; stamens glabrous. Steppes of Kara-Kue on the Aral Sea. Gt. 33:1175.
42 Dámmannii, Regel. Height 6 in.: lvs. 4, placed whorl-like at middle of st., linear-lanceolate, recurved, obscurely bristly, ciliate on margin, otherwise glabrous; peduncle glabrous; perianth funnelform, spreading; stamens, purplish red or reddish with an oblong-lanceolate black blotch without yellow border; segms. narrowly oblanceolate filiform, glabrous; stigmas broader than ovary-diam. Mt. Lebanon, 1889. Gt. 38:1300.—Allied to T. linifolia and T. Mazamoezoviczii.

A6. Outer bulb-tunic woolly at apex inside.

b. Filaments bearded at base. 43. Lownei

b. Filaments not bearded.

c. Perianth crimson or scarlet, with a distinct basal blotch. 44. linifolia

c. Perianth yellow, without basal blotch. 47. Batalinii

44. Lownei, Baker. Height 2–4 in.; st. glabrous, sometimes 2-headed; lvs. 6 or 7, lanceolate, acuminate, glaucous; peduncle slender, glabrous; bud slightly nodding; perianth funnelform, small, white with a bright yellow basal blotch, tinged outside with light purple or purplish pink, inner segms. wider; stamina yellow; ovary narrowed at collar; stigmas very small. Mountains of Syria and Palestine, 1874.

45. Wilsoniana, Hoog (T. Watsoniana, André). Differers from T. linifolia in bearing a mass of protruding woolly hairs from the bulb rather than short and bristly hairs, in having fewer and somewhat broader lvs., fls. more distinctly reddish and more upright-graced on the outer stages of development, in the ovate inner segms., and in the longer ovary and broader filaments. Mountains of Trans-Caspia, south-west of Aschanbad. G.C. III. 29:327.—Named for G. F. Wilson of Weybridge, England. The fls. are “of a particularly deep and full vermilion-scarlet” outer segms. oblong, with small cusp; inner segms. ovate, more or less reflexed; scape short, 2–4 in. high.

46. montana, Lindl. Bulb large and ovoid, with dense pubescence; height 4–8 in.; lower lvs. oblong-lanceolate, acuminate, undulated, very glaucous; peduncle glabrous; perianth campanulate, 1½–2 in. long, 2 in. across, deep crimson, paler outside; segms. ovate or oblong, flat, acute, the inner often ovate obtuse; filaments purplish; ovary prismatic; stigmas small. Mountains of Persia. B.R. 1106. Var. Julia, Koch. Dwarf, from Caucasus. Not more than 3–4 in. tall; fls. bright red, 1 in. or less long; all 6 segms. obovate and obtuse.

47. Batalinii, Regel. Bulb globose, with thin tunic; height 3 in.; st. glabrous; lvs. 5, crowded into a sort of whorl just below middle of st., linear-lanceolate, glabrous, slightly undulated; perianth campanulate, slightly funnelform, pale yellow; segms. slightly unequal, oblong-ovate or obtuse or short-acute, sometimes deeply incised on the edge near the top; filaments linear, terete, yellow; ovary elliptic-oblong, compressed, trigonous; stigmas coroniform. E. Bokhara, 1889. Gt. 38:1307. B.M. 7991. G.C. III. 19:759; 49:382.—One of the early tulipes.

A7. Outer bulb-tunic everywhere woolly inside.

b. Filaments bearded at base.

c. The filaments flattened. 48. biflora

cc. The filaments cylindrical. 49. Clusiana

48. biflora, Pall. Height 3–6 in.; st. glabrous or slightly pubescent, usually 2– or 3-fl., rarely 4-, 5- or 6-fl.; lvs. often 2, sometimes 3, linear, long; perianth funnel-form, campanulate, 1 in. long, 2 in. across, pale yellow or white inside, tinged green or red or even purplish outside; segms. acute; filaments flattened, ciliate at base; ovary narrowed at collar; stigmas small. Mountains of Cent. Siberia and the Caucasus. B.R. 535. B.M. 6518. Var. turkestánica, Hort. More robust than the type and larger in all its parts; fls. often 4 or 5 on the scape. G.C. III. 47:85.

49. Clusiana, Vent. Described by Baker as “one of the most widely spread and clearly marked of all the tulips, and one that shows the least tendency to outgrow the bulb.” Bulb generally 1-fl.: height 12½ in.; st. slender, glabrous; lvs. 4–5, very narrow and folded double, linear-acuminate, pendent; peduncle slender, tinged with brown directly under fl.; perianth small, when open 2 in. across, funnelform-campanulate, very fragrant, delicate white (sometimes described as lemon-yellow), with a purplish black base and black stamens, outline flushed with red; segms. acute; claw linear or on edge; stamina yellow; filaments cylindrical, densely bearded at base; ovary pyramidal; stigmas small, tinged with red. Portugal, through Medit. region to Greece and Persia. B.M. 1390. Gt. 77, p. 171. Gn.W. 22:329.

50. stellata, Hook. Close ally of T. Clusiana, with similar lvs. and habit, according to Baker, but the segms. more obtuse and the fl. always without the distinct purple eye, the fl. very wide open in sunlight. Himalaya. B.M. 2762.—Bright yellow variations are mentioned.

51. Biebersteiniana, Schlutt. f. Height 6 in.; st. slender, glabrous; lvs. 2–4, crowded together, long, channelled, glabrous, slightly ciliated on edge; bud slightly nodding; perianth funnelform, 2½–3 in. long, bright yellow tinged with scarlet-pink on edges and sometimes green outside; at base a brownish yellow discoloration; inner segms. obtuse, outer acute; anthers yellow; pollen yellow; filaments yellow; ovary prismatic; stigmas yellow, undulated. Asa Minor.

52. Occlus-solis, St. Amans. Tall, 12–18 in.; st. slender, glabrous; lvs. 3–4, lorate-lanceolate, acute, glabrous; perianth funnel-form, campanulate, 2½–3 in. long, 4½ in. across, scentless, erect; segms. bright red, with a large long black yellow-bordered blotch, very acute, the inner ones often less so; anthers yellow; filaments purple; ovary prismatic. South of France, Italy, and Switzerland. B.R. 380 (as T. Gesneriana). Var. Lortétii, Baker. A slight variety, the basal spot oblongate and black. Marseilles. Var. lycica, Baker. St. 6–8 in. long; lvs. crowded; perianth-segms. all acute, inner oblongate-oblong; apex sub deltoid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. Var. alépica, Baker. A form with fls. considerably smaller, with a small, very narrow black basal blotch. Asia Minor, Syria, and Palestine.

53. praecox, Tenore. Height, 12–18 in.; st. slender, glabrous; lvs. 3–5, lorate-lanceolate, acute, undulated at margin; perianth beautiful scarlet, campanulate, 2–3 in. long, 3 in. across, erect, scentless; basal blotch oblong or oblongate and purplish black, margined with yellow; segms. widely imbricated, outer slightly longer, acute, puberulent at apex; inner shorter, obtusely cuspidate; anthers yellow; filaments long, dark purple, glabrous; ovary prismatic; stigma pubescent, reddish. Italy and S France; also Algeria.
CXIV. Tulip varieties of the Tulipa Gesneriana type.
TULIPA

Greece, Syria, Palestine, and Persia. Very closely allied to last, and figured as such in B.R. 294, 1145, 1146; differs, according to Baker, "by its more robust habit of growth, earlier flowering, and ovate more imbricated perianth-segments, with a less clearly marked basal blotch."—One of the oldest known species.

T. siss., Hook, is "often confused with vittellina in gardens, though its flowers are yellow, very robust, taken, at least a fortnight later in blooming. Vittellina is almost white and rarely seen."—T. Ferruginea, Hort. Fl., varies very large, intense glowing crimson with a darker blotch at the base of the segments: lvs. very broad, many-versed: of robust habits and stiff growth. B. C.C. 111, 112.—T. gallica, Linn. Turuncs alvery hirsute within: st. glabrous: lvs. linear-lanceolate, acuminate: fls. yellow; outer segments ciliate to oblanceolae; inner segments, spatulate, rounded. Asia Minor.—T. botanica, Regel: Dwarf: fls. large, goblet-shaped, rich vermilion, with a large black spot at the base of each of the segments. Bokhara.—T. Lichinei, Regel: Bulb-tunics glabrous inside: height 9-16 in.: st. glabrous: lower lvs. lanceolate-linear: 3-4: erect: perianth between campanulate and funnelform: outer segments narrow and acute, the outer bright purple with broad white margin, the inner much shorter and obtuse at apex and yellowish white. Kashmir. Gu. 60: 174.

ARNOlD V. STUBBENRAUcH.

L.H.B.

TUMBOA (native name). Gnetaceae. Appealing strictly the rules of priority; T. Baines, Hook. 1, becomes the name of the strange plant long known as Welwitschia mirabilis; in this work, the description is given under the latter name.

TUNISIAN: Alcives Forli.

TUNICA (Latin, a tunic or coat, from the imbricated involucre). Caryophyllaceae. Annual or perennial hardy herbs, usually elements but stilt with the habit of Gyrostilphi but botanically more nearly allied to Dianthus; sometimes grown in flower-gardens.

Leaves narrow: fls. as in Dianthus, but smaller, gathered in cymose panicles or heads; calyx tubinatile or elongate-tubular, obtuse; stamens 10; petals 5-7; ovary 2-3-celled; berry globose, almost sessile; fruit 2-3 in. long: fls. subsessile, crowded; perianth campanulate, tube long: lvs. subulate, crowded; perianth campanulate, tube 3-4 in. long: fls. yellow, erect; spikes drooping, lax, about 2-3 in. long: perianth campanulate, dark purple, about 3-in. across: ovary globose. Mountains of N. India. B.M. 660. On the same plants in culture it is supposed that this species is known botanically; it is described as having elegant narrow lvs. and erect, 3-spicate in bloom, the upper half clothed with fuzzy white, dark-like spreading flat stigma. Singapore.

F. TRACY HUBBARD.

TURNA (named after William Turner, died 1568). Turnieracea. Glabrous, pubescent or tomentose herbs, shrubs, or subshrubs, suitable for warmhouse cult. Lvs. sparse, entire, serrate or somewhat pinnatifid; stipules small or none. fls. axillary, solitary, rarely racemose or fascicled. calyx tubinatile, funnelform or campanulate, 6-lobed, sessile-campanulate, 5-7-cleft: petals 5-7; ovary nearly sessile, free, oblong: stigma broadly peltate, on a white columnar, exerted style. B.M. 7828. Macrocyclista Baker (Maccrocleista. Kuntze). Ritshome. P. Broad: calyx tubinatile, 6-lobed, reddish: stigma broadly peltate, on a fleshy white columnar, exerted style. B.M. 7829. Var. Fosteriana, Hort. is a wiry-stemmed Annual or perennial hardy herb, usually elements but stilt with the habit of Gyrostilphi but botanically more nearly allied to Dianthus; sometimes grown in flower-gardens.

Leaves narrow: fls. as in Dianthus, but smaller, gathered in cymose panicles or heads; calyx tubinatile or elongate-tubular, obtuse; stamens 10; petals 5-7; ovary 2-3-celled; berry globose, almost sessile: fls. subsessile, crowded; perianth campanulate, tube long: lvs. subulate, crowded; perianth campanulate, tube 3-4 in. long: fls. yellow, erect; spikes drooping, lax, about 2-3 in. long: perianth campanulate, dark purple, about 3-in. across: ovary globose. Mountains of N. India. B.M. 660. On the same plants in culture it is supposed that this species is known botanically; it is described as having elegant narrow lvs. and erect, 3-spicate in bloom, the upper half clothed with fuzzy white, dark-like spreading flat stigma. Singapore.

F. TRACY HUBBARD.

TURNÉRÁ. (native name) Glabrous, pubescent or tomentose herbs, shrubs, or subshrubs, suitable for warmhouse cult. Lvs. sparse, entire, serrate or somewhat pinnatifid; stipules small or none. fls. axillary, solitary, rarely racemose or fascicled. calyx tubinatile, funnelform or campanulate, 6-lobed, sessile-campanulate, 5-7-cleft: petals 5-7; ovary nearly sessile, free, oblong: stigma broadly peltate, on a white columnar, exerted style. B.M. 7828. Macrocyclista Baker (Maccrocleista. Kuntze). Ritshome. P. Broad: calyx tubinatile, 6-lobed, reddish: stigma broadly peltate, on a fleshy white columnar, exerted style. B.M. 7829. Var. Fosteriana, Hort.

T. Macro-
The greatest difficulties are the root-maggot, which is the larva of a small fly, and the flea-beetle. The maggot may be killed by injecting bisulfide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, this treatment is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea-beetle may be kept in check by spraying the plants with bordeaux mixture, or perhaps better by sprinkling them with paris green diluted with land-plaster (one part by bulk of paris green to fifty of plaster).

The turnips and rutabagas have firmer and richer flesh than the turnips. They are usually more prized for consumption in winter, and turnips are usually more popular in the spring and early fall markets. Rutabagas are also more prized for stock-feeding. They yield heavily, are rich and succulent and keep well in any ordinary cellar. Rutabagas started in the middle of June in the northern states will reach their full growth by October. They are usually not harvested until heavy frosts have come. The roots of rutabagas and turnips sometimes persist through the winter, even though they have been solidly frozen, and send up flower-stalks in the spring; but, unlike salad, the roots should not be left in the ground to freeze if they are to be used.

L. H. B.

**TURNIP, INDIAN:** *Arista mus trophyllus.*

**TURPÉA** (named for Turpin, French fl-painter, died 1840 in Paris), *Staphyleaceae.* A genus of about 10 shrubs or trees in Trop. and Subtrop. Asia, the Malay Archipelago, W. Indies, and Mex., with opposite odd-pinnate or simple lvs. and small fls. in large terminal or axillary panicles: calyx 5-parted, persistent; petals 5, broadly spatulate to orbicular; stamens 5; ovary superior, 3-celled, with a large lobed disk at the base; styles 3, distinct or united; fr. 3-celled, fleshy or leathery, with few or many seeds in each cell. Occasionally planted for their handsome foliage in S. Calif. Prop. is by seeds or by cuttings of mature wood under glass with bottom heat.

**TURPÉIA** (named for Giorgio della Torre or Turra, botanist of Padua, Italy). A genus of about 73 species, Trop. and S. Afr., Trop. Asia, and Austral.

**TURRÉA** (named for Cirolia della Torre or Turra, 1667–1698, botanist of Padua, Italy). *Medicine.* Trees or shrubs, sometimes grown in the greenhouse in the North; in the South used as outdoor ornamentals.

Leaves alternate, petiolate, entire or obtusely lobed; peduncles axillary, few-fl., and many-bracted; fls. elongated, white; calyx 4–5-toothed or parted; petals 4–5, elongated, free, twisted; staminal tube 8–10-toothed, anthers 8–10; disk annular; ovary oblong, 5–10-celled; ovules 2, supereous in each cell: caps. 5–many-celled, loculically 5–many-valved.

Fls. solitary or in pairs, axillary.

**heterophylla,** Smith, not Sond. Lvs. more or less obovate-cuneate, 3-lobed above, varying to subentire: fls. ±5–6 in. long. Upper Guiana. B.R. 30.4 (as **T.**
TYPHA (ancient name). Typhox. Cat-tail. Reed Mace. Hardy perennial marsh- or swamp-growing herbs, useful in the water-garden or along brooks or the margins of ponds.

Plants forming colonies, slender or stout, often tall, smooth; rhizome strong and之意ting; st. erect, simple or few and shorter; peduncles erect, terete, strait and not divided; spadix, male and female similar, superposed; fls. monocious, densely clustered in the cylindrical spadix; perianth consisting of slender hairs: fr. minute, subsees.—About 17 species, temperate and tropical regions. Monographed by Graebner in Eger's Pflanzenreich, hft. 2 (IV. 8) in 1900.

A. Female fls. without bracts.
B. Plant robust, more than 3 ft. high: lvs. flat.
c. Pedicels columnar, 1.5-3 mm. long.

latifolia, Linn. Fig. 3875. Plant stout, 4-8 ft. high: lvs. usually broad, linear, ¼-1 in. broad, exceeding the flowering culm: male and female spikes contiguous, rarely remote. N. Amer., Eu., Asia. R.B. 20, p. 199. Y. 2:197. J.H. III. 05:325. Var. eliator, Graebn. (El. eliator, Bör.), has narrow lvs. and shorter contiguous or slightly remote spikes. Eu.

dc. Pedicels short or elongate-cord, 1-1.5 mm. long.

Shuttleworthi, Koch & Sond. Plant stout, 3-4½ ft. high: lvs. linear, 2-6 lines broad, longer than the flowering culm: spikes cylindrical, contiguous, pistillate spikes thick and longer than the staminate. Eu.

bb. Plant slender, rarely over 3 ft. high: lvs. semi-cylindrical or rather flat.

Laxmannii, Lepech. (T. stenophylla, Fisch. & Mey.). Plant slender, 2½-4½ ft. high: lvs. very narrow, rarely even 3 lines broad, semi-cylindrical, grooved inside, convex outside; pistillate spike ovate-oblong or shortly cylindrical, brown, remote from the elongate staminate spike. S. E. Eu. to China.

aa. Female fls. in the axis of bracts.

b. Plant stout, 3-12 ft. high: axis of male spike hairy.

gustafii, Linn. Plant stout, 3-9 ft. high: lvs. narrow, 1-5 or 6 lines broad: spikes about equally long, remote, rarely contiguous; pedicels shortly conoid. N. Amer., Eu. and Asia; also in Trop. Amer.

bb. Plant slender, 1½-3 ft. high: axis of male spike destitute of hairs.

minima, Funk. Plant slender, 1-2½ ft. high: lvs. of the sterile shoots very narrow, linear, less than 1 line broad, of the flowering st. basally inflated sheaths rarely bearing very short involute blades: spikes remote or contiguous, female spike broadly ovate or shortly cylindrical, rusty brown. Eu., Caucasus, and Asia.

F. TRACY HUBBARD.
nate, 6 in. long; spadix with the female fls. below, the male above, the two separated by a sterile portion and the top of the spadix also sterile. China. The type does not seem to be in cult.; the form cult., var. Giraldii, Baroni, has larger and broader lvs., the spathe is purplish outside and is somewhat the color of a ripe olive, the tube and blade are more equal in length than the type; spadix is darker, being purplish black; pollen white. Mountains of N. China. G.C. III. 32:151. Probably adapted to outdoor planting for ornament.

F. TRACY HUBBARD.

TYPHONODORUM (Greek, stormy wind and gift). Aráceae. Robust herb, with a stout caudex 4-10 ft. high: lvs. thick, petioled, triangular-ovate or hastate, acuminaté: spathes with oblong tubes attenuate at both ends, blade 3 times longer than the tube, oblong-lanceolate, caudate-acuminate; spadix crect, strict, cylindrical; male infl. elongated, female short and cylindrical; fls. monocious in an elongated somewhat appendiculate spadix; perianth none; stamens 4-8 in the male fls.; ovary ovoid or subglobose and 1-celled in the female: berry large, compressed, orbicular. One species, Madagascar, Mauritius, and Trop. Afr. T. Lindleyanum, Schott (T. madagascariense, Engler). St. stout, 3-10 ft. high, 4-12 in. thick: lvs. deeply cordate or sagittate, 1½-3½ ft. long, 7 in. to 2 ft. across; petiole terete, 2-4 ft. long; spathe 1½-2 ft. long, tube 3-5 in. long, oblong, green, blade 13-19 in. long, 3-5 in. across, lanceolate, convolute below, yellow: seeds 1½-2 in. across, flattened-orbicular, edible. B.M. 8307.—A striking plant with the habit of Zantedeschia, growing in deep water. See Engler in Das Pflanzenreich, hft. 64 (IV. 23 De), 1915.
UDO, a spring blanched vegetable introduced in 1903 by Lathrop and Fairchild from Japan; it is *Aralia cori­data*, and for botanical description see page 344, Vol. I.

The plant is a sturdy hardy perennial, and the strong young shoots are blanched as they grow; these shoots are used as a cooked vegetable or as a salad. It is a plant of ancient and widespread cultivation in Japan, where there are distinct strains or varieties of it. The cultivation of udo in this country is in its amateur stage for the most part, although it has been grown by the acre in the Sacramento Valley. The following account is chosen from Bulletin No. 84 of the United States Department of Agriculture, 1914, written by David Fairchild.

"There is no doubt that the udo is worthy of adding to our list of spring vegetables, for it is easily grown, its shoots are readily blanched, and it requires little care. A patch of it can be forced every spring for at least six years, and probably much longer. When properly prepared its blanched shoots are delicious; they have their own characteristic flavor, can be prepared for the table in a great variety of ways, and are keenly appreciated by people of discriminating taste. Space for space, udo will yield about the same amount of food for the table as asparagus and will be ready for use at about the same time in the spring. Possibly more labor is required to blanch the shoots of the udo than those of asparagus, but the udo is probably somewhat easier to take care of and yields sooner."

Udo is readily grown from seeds placed in a greenhouse or coldframe, sown ½ inch deep in March or April. When 3 to 4 inches high, the plants are set in the open ground, standing 3½ to 4 feet apart each way; often they will be 6 feet high by autumn. When it is desired to propagate a particular strain, cuttings may be made of the green shoots taken when about ½ inch in diameter and cut 5 inches or more long, the lower end being severed just below a joint.

The stout young shoots are blanched as they emerge from the ground. In mild climates, earth may be mounded over them, but a large drain-tile placed over the mound provides a better method for the home garden.

This method "has at least one disadvantage, however, in that the shoots have a tendency to leaf out and produce a number of unopened leafstalks which take away from the robust growth of the shoots. A method which obviates this defect in using tiles is to put around each hill a deep box or small half cask from which the bottom has been removed and fill it with light sand or such a light material as sifted coal-ashes. Shoots which come up through such a medium are almost free from the elongated leafstalks which are developed when the shoots are produced in the dark air-chambers under the tiles. Care must be taken in any method of mounding up or filling in dirt or ashes over the crowns that the shoots do not break through into the sunlight, for as soon as they do this they become green and take on a rank objectionable flavor. Properly grown udo shoots produced from three-year-old plants should be from 12 to 18 inches long and 1 inch to 1½ inches in diameter at their bases.

"After the removal of the crop of udo shoots in the spring, the crowns of the plants should be completely uncovered and the plants allowed to grow normally throughout the summer, but they should not be permitted to flower unless seed is required, the flower-clusters being pinched or cut back as they form."

For use, the shoots are first boiled in salt-water for ten minutes or so and the water changed to remove the turpentine flavor. An hour's stay in iced-water will remove the resin from the shoots, provided they are cut into thin slices or shavings; the slices may then be used in salads without cooking. It is used also in soups, and on toast.

**UHDEA.** A name proposed by Kunth in 1847 for a Mexican composite, still sometimes listed as *U. bipinnatifida*, Kunth. It is properly *Montanoa bipinnatifida*, Koch, the name Montanoa dating from 1825. See page 2064, Vol. IV.

**ULEX** (ancient Latin name of this or a similar plant). *Leguminosae. FURZE. GORSE. WHIN.* Ornamental woody plants grown for their handsome yellow flowers and evergreen appearance.

Spiny shrubs: Ivs. mostly scale-like, only vigorous shoots near the ground bearing fully developed lvs.: fls. papilionaceous, axillary at the end of the branchlets; calyx 2-lobed, divided nearly to the base; standard ovate, wings and keel obtuse; stamens alternately longer and shorter; pods small, ovoid, few-seeded; seeds strophiolate.—About 20 species in W. and S. Eu. and in N. Afr. Closely allied to Cyrisus and chiefly distinguished by the deeply 2-lobed calyx. The fls. yield a yellow dye. Sometimes cult. as a winter fodder plant in Eu., the green sprigs of one year's growth being eaten.

The furzes are much-branched shrubs with dark green spiny branches, usually almost leafless, and with
showy yellow papilionaceous flowers which are axillary and often crowded at the ends of the branches. They are not hardy North, but under protection they survive the winters in New England. They are valuable as sand-binders for covering dry sandy banks and are also well suited for seaside planting. On account of their dark green branches they have the appearance of evergreen plants and they are very showy when covered with their yellow flowers. They are also sometimes used for low hedges. They prefer sandy or gravelly porous soil and a sunny position; in rich garden soil they grow more rampant, but do not bloom so well. They should be sown where they are to stand, as they do not bear transplanting well, or if this is not feasible, they should be sown singly in small pots and the plants then planted out in their permanent places. Propagation is by seeds sown in spring after the danger from frost has passed; by greenwood cuttings under glass; or by cuttings of nearly mature wood in early summer in a coldframe under glass, forming roots the following spring. Varieties and rarer kinds are sometimes grafted in spring in the greenhouse on U. europaea.

**U. europaea** Linn. FURZE. GORSE. WHIN. Fig. 3876. Much-branched very spiny rigid shrub, 2-4 ft. high; branchlets striped, villous when young; lvs. scale-like or narrow-lanceolate, pubescent: fls. axillary, 1-3, crowded at the end of the branches and forming racemes; corolla bright yellow, about \( \frac{3}{4} \) in. long, fragrant; calyx yellow, hairy; pod oblong, over \( \frac{1}{2} \) in. long, villous, dark brown. April, June and often again in Sept., Oct.; in Calif. almost the whole year. W. and S. Eu; naturalized in waste places in the Middle Atlantic states and also on Vancouver IsI. S.E.B. 3:323. R.F.G. 22:2068. G.W. 17, p. 285.—There is a variety with double fls., var. plenus, Schneid. (var. flore-pleno, Loud.). Gn. 63, p. 441. G.M. 52:393. Another variety is var. strictus, Webb, of upright, pyramidal habit and less spiny, but as it does not bloom freely, it is of little value.

**W. americanus** Forst. Dwarf shrub of dense habit, similar to the preceding species, but smaller in every part, less rigid and with slenderer spines: fls. about \( \frac{1}{2} \) in. long, with the wings straight and shorter than the keel; calyx slightly downy, not hairy: pod \( \frac{1}{2} \) in. long, nearly incised in the calyx. Autumn. W. Eu, England to Spain. S.I.F. 3:322. R.F.G. 22:2068, 3.

**ULLUCUS** (native name). Chenopodiaceae; Volkens in Engler's Pflanzenfamilien places this in Bauelaceae. Fleshy perennial herbs, decumbent and climbing, grown in Peru and Chile for the tubers: rhizomes produced near the base of the plant underground, and much eaten in S. Amer. Sometimes the plant is cultivated in northern countries, but only as a curiosity. It is prop. by the tubers, as are potatoes.

**ULLMÄRIA**: Piliferaudula.

**ULMUS** (ancient Latin name of the elm). Ulmaceae. ELM. Ornamental trees chiefly grown for their handsome foliage and often planted as shade and street trees.

Deciduous, rarely half-evergreen; winter buds conspicuous, with imbricate scales; lvs. short-petioled, usually unequal at the base, with caduceous stipules: fls. perfect or rarely polygamous, apetalous, in axillary clusters or racemes; calyx campanulate, 4-9-lobed, with an equal number of stamens; ovary superior, with a 2-lobed style, usually 1-loculed and with 1 ovule: fr. a slightly compressed dry nutlet, with a broad rarely narrow membranous wing all around (Fig. 3877).—About 18 species of Ulmus are known, distributed through the colder and temperate regions of the northern hemisphere, in N. Amer. south to S. Mex., but none west of the Rocky Mts., and in Asia south to the Himalayas. The wood is heavy, hard, and tough and often difficult to split. It is especially useful in the manufacture of wagon-wheels, agricultural implements, and for boat-building. The inner mucilaginous bark of the branches of U. fulva is used medicinally and that of some Chinese species is made into meal and used for food. The tough inner bark of some species furnishes a kind of bass which is sometimes woven into a coarse cloth, especially that of U. japonica in Japan.

The elms are mostly tall trees, rarely shrubby, with alternate usually 2-ranked, medium-sized or sometimes rather small leaves and with inconspicuous generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy North, but U. crassifolia and U. alata are tender; U. parvifolia and U. serotina are of doubtful hardiness, although they have persisted near Boston. The elms are mostly tall and long-lived and are very valuable for park planting and for avenue trees, especially U. americana, which is the favorite tree for street planting and a shade tree for dwelling houses in the northeastern states. It is the most characteristic tree of this region and of characteristic beauty. Its habit is at once majestic and graceful, and the wide-spreading head, borne upon a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American elm several other species are used as avenue trees, as Ulmus fulva, U. racemosa, and the European U. campestris, U. hollandica, and U. foliacea. Of U. hollandica, the vars. belgica, superba, Klemmer are among the best for street planting; of U. foliacea, the vars. stricta, Wheatley, and Dampieri. In the southern states U. serotina, U. crassifolia, and U. alata are sometimes used as avenue trees. There are several varieties of striking and peculiar habit, as U. glabra var. fastigiata and U. foliacea var. monumentalis, with narrow columnar head; U. glabra var. pendula, with horizontal limbs forming widespread tiers; U. glabra var. Camperdowni with long pendulous branches. U. foliacea var. umbrosafera, with a dense, globose and rather small head, may be used as an avenue tree for formal gardens. Several species and varieties are interesting in winter on account of their branches being furnished with broad coryck wings. The foliage of most species turns pale yellow in fall, but that of the European species remains green much longer.

Unfortunately many insects and fungi prey upon the elm, especially on the American elm. One of the most
destructive is the elm leaf-beetle, which destroys the foliage. The canker-worm is also serious; to keep it from doing damage, band the trunks a few feet above, the ground with cloths covered with a sticky substance, which prevents the ascent of the wingless female. The trees should be sprayed. A borer, Saperda tridentata, sometimes does considerable damage to the wood. The elms grow best in rich and rather moist soil, and the American elm especially requires such a soil to attain its full beauty, but some species, as *U. racemosa* and *U. alata*, do well in drier situations. Elm trees are not difficult to transplant, and rather large trees may be moved successfully if the work is done carefully. They bear pruning well, but generally do not need much attention of this kind. Propagation is by seeds ripening usually in May or June and sown at once. Most of the seeds will germinate after a few days, but some remain dormant until the following spring. In spring, also by layers, which are usually put down in autumn and are fit to be removed in one year. A moist and rather light soil is best for this method. Trees raised from layers are said to bear seed less early and less profusely and are therefore especially recommended for street trees, as the foliage of trees that fruit under glass, the cuttings growing most readily from forced plants. *U. campestris*, *U. foliacea*, and some of their varieties are also propagated by suckers. In nurseries most of the varieties are propagated by grafting, either by budding in summer or by whip- or splice-grafting in spring outdoors or on potted stock in the nurseries most of the varieties are propagated by grafting under glass, the cuttings growing most readily.

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<td><em>prophasces</em></td>
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**KEY TO THE SPECIES**

A. Blooming in spring, before the lvs.: calyx not divided below the middle.

B. Fls. on slender pedicels, drooping: fr. ciliate.

C. Fr. glabrous except the ciliolate margin: branches do not cory: margins of lvs. ciliolate.

D. Lvs. widest above the middle, densely pubescent beneath: buds elongated, pointed, pubescent.

E. *levis* | 1

F. *americana* | 2

G. *pumila* | 3

H. *racemosa* | 4

I. *alata* | 5

J. *foliacea* | 6

K. *praestans* | 7

L. *proceras* | 8

M. *pumila* | 9

N. *hollandica* | 10

O. *heterophylla* | 11

P. *venusta* | 12

Q. *heptapetala* | 13

R. *fruticosa* | 14

S. *vulgaris* | 15

T. *pumila* | 16

U. *vulgaris* | 17

V. *americana* | 18

W. *pumila* | 19

X. *americana* | 20

Y. *pumila* | 21

Z. *americana* | 22
Tall and wide-spreading tree, attaining to 120 ft., usually with high light gray trunk, limbs gradually outward-curving with pendulous branches; branchlets pubescent when young, glabrous in fall; buds acute, glabrous: lvs. ovate-oblong, unequal at the base, acuminate, doubly serrate, pubescent when young, at length glabrous and rough above, pubescent or almost glabrous beneath, 5–6 in. long; fls. in many-flid. clusters; stamens 7–8, exserted: fr. oval or elliptic, viscid, usually with 2 opposite very broad wings; branchlets almost glabrous: buds acute, glabrous: lvs. ovate-oblong to oblong-lanceolate, often falcate, acute or acuminate, doubly serrate, subcoriaceous, glabrous above, pubescent beneath, 1.4–2 in. long; fls. in short, few-flid. racemes; stamens usually 5: fr. elliptic-ovate, with narrow wing and with 2 incurved horns at the apex, villous, ± glab. Va. to Fla., west to Ill. and Texas. S. 7:718.—Tripod tree, sometimes used as an avenue tree in the southern states; not hardy N.

5. fülya, Michx. (U. rūbra, Michx. U. ellipitica, Hort., not Koch. U. Heyderi, Spae. U. sitûbra, Hort.). Slippery Elm. Red Elm. Figs. 3877, 3880. Tree, attaining 70 ft., with spreading branches, forming usually a broad, open, flat-topped head: branchlets pubescent and scabrous with minute tubercles: lvs. obovate to oblong, very unequal at base, long-acuminate, doubly serrate, of firm texture, very rough above, pubescent beneath, 4–7 in. long; fls. in dense clusters; stamens 5–9: fr. orbicular-oval, little notched at the apex, ± glab. Que. to Fla., west to Dakotas and Texas. S. 7:314. Em. 2: 334.—The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding.

horizontal branches, stunted branches, and small lvs., forming a hemispherical bush. Forms of *U. glabra* are frequently planted in the East.

7. *laciniosa*, Meyr. (*U. montana var. laciniosa*, Trautv. *U. major var. heterophylla*, Maxim.). Tree, usually not exceeding 30 ft., but occasionally taller: branches sparingly hairy or glabrous, finally pale yellowish brown or grayish brown, older branches brownish, smooth, or more or less intermediate between the parents, in some specimens the mature branchlets glabrous or slightly pubescent white and by the presence of 3-lobbled lvs. even on the fruiting branchlets of mature trees, while in the variety of *U. glabra* the mature branchlets are reddish brown and quite hairy while young and the 3-lobbled lvs. appear chiefly on vigorous shoots.


Pyramid tree: lvs. thicker and firmer; more cuspidate; in a more open notch at the apex; seed touching the base of the notch. England, W. and S. Eu. H3;has been at the apex, seed touching the base of the notch. Eng­


Pyramid tree: lvs. thicker and firmer; more cuspidate; in a more open notch at the apex, seed touching the base of the notch. England, W. and S. Eu. H3;has been at the apex, seed touching the base of the notch. England, W. and S. Eu. H3;has been

3879. A feathered elm.—*Ulmus americana.*


8. *japonica*, Sarg. (*U. campesiris var. japonica*, Rehd.). Tree, to 100 ft., with a broad head and often more or less pendulous branchlets: young branchlets densely pubescent and rough with minute tubercles, pale yellowish brown, sometimes developing corky ridges: lvs. obovate or elliptic, acuminate, oblque at the base, scabrous and hairy above, pubescent beneath with slight axillary tufts of hairs, 3-5 in. long; pairs of veins 12-16; petiole % in. long, densely pubescent: fls. nearly sessile, tetramerous: fr. obovate-oblong, about % in. long, gradually narrowed toward the base, with an open notch at the apex; seed touching the notch. Japan, Manchuria, Amurland. G.F.6:327. S.T.S. 2:101.—Intro. into the Arnold Arboretum in 1895; it has proved perfectly hardy there, grows rapidly, and promises to become a valuable ornamental tree.

10. *holfandica*, Mill. (*U. Dippeliana, Schneid. U. glabra × U. foliacea*). Under this name are united here a number of elms which are apparently hybrids between the Scotch elm and the smooth-leaved elm. They are more or less intermediate between the parents, in some forms resembling the first, in others the second parent. As the type of this collective group the following variety may stand, as it is probably not different from Miller’s *U. hollandicca*. Var. *major*, Rehd. (*U. major*, Smith. *U. sebra var. major*, Smirke. *U. campéstris var. major*, Plant.). DUTCH ELM. Tree, to 100 ft. or more, with a short trunk and wide-spreading branches, suckering: bark of trunk deeply fissured: young branchlets glabrous or with few hairs: buds ovoid, minutely pubescent: lvs. broadly oval, acuminate, very unequal at the base, dark green, lustrous and nearly smooth above, sparingly and minutely pubescent and glandular beneath, with conspicuous axillary tufts, 3-5 in. long; pairs of veins 12-14; petiole % in. long, densely pubescent: fls. nearly sessile, tetramerous: fr. obovate-oblong, about % in. long, gradually narrowed toward the base, with an open notch at the apex; seed touching the notch. R.F.G.12:665. Var. *végeta*, Rehd. (*U. végeta*, Lindl. *U. glabra var. végeta*, Loud. *U. Huntingdonii*, Hort.). HUNTINGDON ELM. Tall tree with rough bark and forked st.; suckering: young branchlets stout, glabrous or sparingly hairy: lvs. oval, acuminate, very unequal at the base, smooth and glabrous above, glabrous below except small axillary

3880. Fruit of slippery elm.—*Ulmus fulva.* (× 2).
pendulous branchlets; suckering: bark gray, deeply fissured: young branchlets glabrous or nearly so: buds minutely pubescent: lvs. oval or obovate, acuminate, very unequal at the base, lustrous and smooth above, with white axillary tufts beneath and glandular, sparingly and minutely pubescent at first, doubly serrate, not ciliate, 2-3½ in. long; pairs of veins about 12; petiole ½-1½ in. long: fls. 4-5-merous: fr. obovate, cuneate at the base, broad and rounded at the apex; the seed nearly touching the closed notch at the apex. 

3881. Camperdown elm.—Ulms glabra var. Camperdownii. 

3882. Ulms glabra var. Camperdownii. (×3) 


13. parívólia, Jacq. (U. chinênsis, Pers.,) CHINESE ELM. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to oblong or oblong, very short-petiolate, nearly equal at base, obtuse or obtusish, subcoriaceous, simply serrate, glossy and glossy above, pubescent beneath when young, usually glabrous at length, 3½-4 in. long: fls. short-pedicelled, in clusters; stamens 4-6, much exerted: fr. oval to elliptic, notched at the apex, smooth above, about ½ in. long. July-Sept. N. China, Japan. S.I.F. 1:37. R.H. 1909, pp. 398, 399. —Has proved hardy near Boston. The recently described U. sibélica, Davieau, and U. Sibériquina, Davieau, are probably only forms of this species; they are said to differ in their deciduous lvs. and the former, besides the persistent deeply fissured bark, excelling in the other two species and the larger fr. exceeding ½ in. (B.S.D. 1914: 24, 25); the latter differs in the crenate-dentate lvs. with 8-10 pairs of veins and in the contracted fr. (B.S.D. 1914: 24; also S.I.F. 1:37 represents this form).

14. crassífolia, Nutt. CEDAR ELM. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished when older with 2 opposite corky wings: lvs. short-petiolate, ovate to ovate-oblong, usually very unequal at the base, obtuse or acute, doubly and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath, 1-2 in. long: fls. in 3-5-fld. very short racemes; stamens 5-8, little exerted: fr. oval-elliptic, pubescent, notched, ½ in. long. Aug. Miss. to Ark. and Texas. S.S. 7:315. —Tender N.

15. serícola, Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular corky wings: lvs. oblong to obovate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2-3 in. long: fls. in 3-5-fld. pendulous racemes, each 5-6-parted to the base: fr. elliptic, deeply notched, densely ciliate, ½ in. long. Sept. Tenn. to Ga.; sometimes planted in simple pendunculate umbels, which in the bud are surrounded by an involucre of 6 caducous bracts; perianth-tube very short; limb with 6 segments; stamens 9, filaments with an orange-colored gland at base, anthers opening by uplifted valves: drupe subglobose or ovoid with a hard endocarp.—One species, Calif. Prop. by seeds.

3853. California laurel.—

UMBELLULARIA (from Latin umbella, a sunshade; referring to form of inflorescence). Lauraceae. California Laurel. Tall umbrageous tree, glabrous, used as a shade tree in California and similar regions. Leaves alternate, evergreen, petiolated, slightly coriaceous: fls. small, greenish,
places, particularly along streams in the Coast Range foothills and mountains, and attaining its greatest size in the cool fog-moistened alluvial valleys of the coast of N. Calif. and S. Ore.; it is but rarely seen in the drier interior valleys of the state. It often crowns the highest points of the coast-range hills, up to about 2,500 ft. altitude and far from the nearest spring or other visible sign of moisture, but in such cases the rock strata are nearly vertical and easily penetrated by the long roots which are able thus to reach hidden supplies of water. In such places it usually forms dense clumps or thickets of shrubs or small trees which are frequently shorn by the cutting ocean winds as though by a gardener's shears, suggesting its adaptability for clipped-hedge and windbreak work. It is used in boat-building, for jaws, bits, cleats, cross-trees, and the like. The branches are occasionally used for poles for chicken-roosts, as the strong odor pervading wood and bark as well as lvs., is said to keep away lice. The lvs. are used for flavoring soups and bland-manges but are too strong to give as agreeable flavor as those of Laurus nobilis or Prunus Laurocerasus. The tree is sometimes cult. for ornament in S. European parks and gardens. Sargent describes it as 'one of the statelest and most beautiful inhabitants of the North American forests, and no evergreen tree of temperate regions surpasses it in the beauty of its dark dense crown of lustrous foliage and in the massiveness of habit which make it one of the most striking features of the California landscape and fit it to stand in any park or garden.'

JOSEPH BURTT DAVY. F. TRACY HUBBARD.


UMBILICUS: Cotyledon.

UNGANÁDIA (named for Baron Ungnad, who in 1576 introduced the common horse-chestnut to western Europe by sending seeds to Clusius at Vienna). Sapiencia. MEXICAN BUCKEYE. Small tree or shrub which has been grown abroad in the coolhouse, but is hardy in the S. U. S., where it is used as an ornamental. Lvs. alternate, without stipules, odd-pinnate; ifs. 3-7 pairs, serrate, terminal long-petioled; ifs. polygamous, irregular, aggregated in lateral fascicle or corymbose; calyx subequal, campanulate, 4-5-parted, lobes imbricate; petals 4-5, subequal, clawed, apex connate-cristate; disk 1-sided, oblique, tongue-shaped; stamens 7-10, unequal in length; ovary stipitate, ovoid, 3-celled: caps. 3-lobed, loculicidally 3-valved, leathery, cells 1-seeded; seed emetic.—One species, Texas. The seed, or "bean," has a sweet taste, but is considered emetic and poisonous. The fr. does not have a prickly husk like the horse-chestnut.


F. TRACY HUBBARD.†

UNOINA (an ancient Latin name of some unknown plant, derived from unio, unity). Gramineae. Perennials with loose usually showy panicles: spikelets broad and very flat, several-fl'd., some of the lower lemmas empty; glumes and lemmas keeled, nerve'd, pointed, but awnless.——Species 5, all American. Cult. for the ornamental panicles, which are suitable for dry bouquets.

LATIFÓLIA, Michx. SPIKE-GRASS. Fig. 3884. Culms 2-4 ft.: lvs. broad and flat, often 1 in. wide: spikelets large and thin, at maturity drooping on slender pedicels, forming a very graceful and ornamental panicle. Pa. to Kan., and southward.—Often grown in Hardy borders. One of the best of our hardy native perennial grasses.

PANICULÁTA, Linn. SEA OATS. Fig. 3885. Culm taller, 4-8 ft.: lvs. narrow and convolute: spikelets broader, upright on short pedicels, forming an elongated drooping panicle. Sand-hills along the seashore of the southern states; can be grown as far north as S. Ont. Dept. Agr., Div. Agr., 7:271. U. Palmieri, Vasey, a dicesorous perennial with extensive root-stocks, growing in sand-flats along rivers of N. Mex., is harvested by the Cocopa indians who use the grain for food. G. F. 2:463.

A. S. HITCHCOCK.

UNÓNA (imitation of Anona). Annonaceae. A genus based by the younger Linnaeus on an American plant belonging to the previously established genus Xylopia, and afterward incorrectly applied to the Old World genus Desmos, of which it becomes a synonym. U. discolor, Vahl, cult. in tropical gardens for its sweet-scented ifs., is identical with the
URCEOCHARIS (from the genera Ureolina and Eucharis). A hybrid between *Ureolina pendula* and *Eucharis grandiflora*, or in gardener’s language *Ureolina aurea* and *Eucharis amazonica*. A flower of the hybrid and of each of its parents is shown in Fig. 3886. It is a tender winter-blooming bulbous plant with broad lvs. a foot long and half as wide, and large white bell-shaped 6-lobe’d fls. a dozen or so in an umbel, and each 2 in. across. The hybrid gets its white color from Eucharis, the fls. of Ureolina being yellow. The shape of its fl. is so singular a mixture of the two as to be very different in appearance from either. The hybrid lacks the beautiful staminal cup of Eucharis, and has a distinctly bell-shaped perianth. The showy part of Ureolina is the urn-shaped portion of the fl., the spreading tips being very short. The perianth of Eucharis is funnel-shaped, the spreading portion being large and showy. The perianth-tube and ovary of the flower of the hybrid and of each of its parents is shown in Fig. 3886.

3886. At the left, Eucharis grandiflora; middle, Ureolina pendula; at the right, the hybrid *Urceocharis Cibranii*. (All half size.)

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URARIA (Greek oura, tail, referring to bracts). *Leguminosae*. Subshrubby perennials, adapted to the warmhouse; 1 species has been tried in S. Fls. Lvs. pinnately 3- or 5-7-foliate or the lower rarely all 1-foliate; lfts. usually large, stipellate; stipules free, acuminate: fls. purplish or yellowish, arranged in terminal hirsute racemes which are sometimes close and elongated, sometimes dense and spike-like; calyx-lobes subulate acuminate, 2 upper teeth short, 3 lower usually elongated; standard broad; wings adhering to the obuse keel; stamens diadelphous; ovary sessile or stipitate, few-ovuled: pod of 2–6 small, turgid, 1-seeded indelphous. Joes. About 17 species, Trop. Asia, Afr., and Austral.

**crinita**, Desv. Erect little-branched subshrubby perennial, 3–6 ft. high, distinguished from other species by having its upper lvs. composed of 2–7 oblong lfts., and pedicels clothed with long bristles; lfts. 4–6 x 1/2–2 in.: racemes dense, 1 ft. long, 1–11/2 in. thick; standard ovate, violet-purple within, pale blue outside; wings pinkish. Bengal to Assam, eastward through Burma to China, south to Malacca and the Malay Isls. to Java.

**URBOURIA** (named for Dr. Manuel Urumba). *Crassulaceae*. Perennial succulent herbs, caulescent or aculescent: lvs. closely imbricated, thick and rigid; inf. rather few-fl., cymose: calyx small, 5-lobed, lobes ovate to lanceolate, equal or unequal, much shorter than the corolla which is somewhat cone-shaped, lobes united at base into a tube; corolla 10, 5-parted, 10-carpelled. Mexico. Three or 4 species, Mex. See also *Cotyledon*, Vol. II, p. 868. *U. obscura*, Rose. Caulescent: st. about 4 in. high; lvs. ovate, about 3 x 2 in., thick but flattened, somewhat rounded at base; fls.-sts. thickish, with maroon lvs.: inf. 1-fl. or in a 2-branched raceme; fls. about 10; calyx-teeth lanceolate; corolla about 1/2 in. long, bright rose yellow below, lobes slightly spreading, yellow. Habitat unknown. *U. Pürpurei*, Rose. Aculescent: lvs. forming a very compact rosette, broadly ovate, acuminate, 11/2 in. long and nearly as broad at the base, gla-

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F. TRACY HUBBARD.
URCEOLINA (Latin, small pitcher, alluding to the pitcher- or urn-shaped flowers). Amoryllidaceae. Bulbous herbs, used both in the greenhouse and for summer and autumn blooming out-of-doors.

Species: lvs. flat or petiolate, long or narrow, contracted to the petiole: fls. in an umbel, numerous, rather long-pedicelled; involucral bracts 2, scarios; perianth erect, finally recurved or pendulous, tube contracted above the ovary, then suddenly dilated, lobes subequal, spreading; ovary 3-celled: caps. ovoid-globose or subpyramidal, 3-angled or nearly 3-lobed.—About 3 species, S. Amer.

The species of urceolina are attractive plants and easily grown, flowering every year, but for some reason they are rather scarce. The bulbs are about 3 inches across and during the growing season have one or two leaves. The plants flower in December. After flowering the bulbs may be removed from the greenhouse to the intermediate house and placed in a spot where they will be kept dry. Just before growth begins in the spring, the bulbs should be taken out of the pots and the exhausted soil removed. The bulbs may then be replaced, one bulb in a 3-inch pot, using clean pots, plenty of drainage material and a rich light porous soil. Place the top of the bulb level with the soil. Remove the pots to the stove, and as soon as growth begins water freely. In the fall when the leaves turn yellow, water sparingly and finally withhold water altogether. The flowering season should begin in April or May by watering the plants freely. The plants flower in December. After flowering the bulbs may be removed from the warmhouse to the outdoors.

URDANA (from Uren, the Malabar name). Malvaceae. Herbs or shrubs of little horticultural interest: plants more or less covered with rigid stellate hairs: lvs. elongated or lobed: fls. clustered: calyx 5-cleft; petals 5, often tomentose at the back, free above, connate below; staminal tube truncate or minutely toothed, anthers nearly sessile: ovary 5-celled, cells 1-ovuled: ripe carpels covered with hooked bristles or smooth, indehiscent.—About 8 or 9 species, natives of the tropics and subtropics. U. lobata, Linn. Herbaceous, more or less hairy: lvs. rounded, angled, not divided beyond the middle, cordate, 5-7-lobed, lobes acute or obtuse, about 1-2 x 2-3 in.: fls. pink: carpels densely pubescent, spiny. Species of both hemispheres. Very variable. U. stelliptica, Linn. Shrubby with a few elongated, fulvous-pilose branches: lvs. distant, rather short-petioled, cuneately ovate-lanceolate, base somewhat cordate, stellate, hairy, commonly circinate-dentate: fls. rather large, 1-2 in., across, white, in axillary clusters; calyx-segms. lanceolate, acute; petals spatulate. Brazil. J.F. 3:281.

URERA (derivation not obvious, possibly from uro, to burn, alluding to the stinging hairs). Urticaceae. Trees or shrubs, rarely subshrubs, with stinging hairs usually scattered, one of which has been rarely cult. as an ornamental greenhouse shrub. Lvs. alternate, entire, dentate or lobed, feather-venined or 3-5-nerved; stipules free or more or less connate in one: panicles dichotomous, cymose or irregularly racemose, unisexual: fls. dioecious or rarely monoeccious; perianth of male fls. 4-6-parted, segms. ovate, stamens 4-5, ovary rudimentary; perianth-lobes or segms of female fls. 4, subequal or outer smaller, ovary straight or oblique: achene straight or oblique, compressed or ventricose.—About 40 species, Spec. Amer., Afr., also Mascarene Isls. and Pacific islands.

URSELIA, Gaud. (Urtica caracasana, Jacq.). Tree or shrub: lvs. broadly ovate, acuminate, basal sinus wide and open, crenate-dentate: fls. dioecious, in regularly dichotomous cymes; male cymes 4-6 times dichotomous, stinging or not, rose-colored; female fls. many times dichotomous, the fls. solitary or in 3's. Spec. Amer.

URGINEA (from the name of an Arabian tribe in Algeria). Lilidceae. Bulbous herbs used both in the greenhouse and out-of-doors.

Leaves radical, sometimes very narrowly linear, sometimes broadly strap-shaped or almost oblong: scape simple, leafless: lvs. in a terminal raceme, usually numerous, rather small or medium-sized, whitish, or rarely pale yellowish or rose, color more intense in the center of the segms.; bracts small, scarios; perianth finally deciduous, segms. 6, distinct, campanulate-connnivent or spreading after anthesis; stamens 6; ovary sessile, 3-celled, usually 3-cornerted: caps. 3-cornerted, grooved, or intruded between the angles, septicidally dehiscent.—About 75 species, Spec., Eu., Medit. region, India and Trop. and S. Afr. The sea-onion is closely related to the genus Scilla, but seems to be much closer to Ornithogalum, especially in habit, infl. and color of fls. The seeds of Urginea are numerous in each locule (in the sea-onion 10-12), strongly compressed and winged; in Ornithogalum and Scilla they are not compressed or winged and in Scilla they are solitary or few in each locule.

The sea-onion, known to apothecaries by the name of squill, and to gardens as Urginea maritima, is a bulbous plant native to the Mediterranean region. It has the same style of beauty as Ornithogalum pyramidalis but unfortunately it is only half-hardy. As an ornamental plant it is little known in America. The name seems not to appear in American catalogues, but the Dutch bulb-growers offer the bulbs in different sizes. A plant erroneously called sea-onion is Ornithogalum caudatum. This is considerably different in appearance and is a native of both hemispheres. Very rare the sea-onion blooms, but the plant is generally considered an autumn bloomer, and it is clear that the leaves appear after the flowers. In England the plant is said to have flowered as early as July and August. Baker writes that the leaves appear in winter. Some English cultivators say the leaves appear as early as October and November; others say not until spring.
URGINEA

The plant grows near the seashore and inland, in dry sandy places from the Canaries to Syria. It is also found in South Africa, which is unusual, as the North and South African species of any genus are not usually identical.

The bulbs of Urginea are collected in large quantities in the Mediterranean region for the drug trade. They sometimes attain a maximum weight of fifteen pounds. The bulbs, when eaten, contain about 22 per cent of sugar and are used in Sicily in the manufacture of whiskey.

Squills have emetic and cathartic properties. Sirup of squills has emetic and cathartic properties. Sirup of squills has been deprived of its outer scales and cut into thin slices, the central portions being rejected.

UROSTIGMA: Ficus. The following species now in cult. abroad was not included under Ficus in Vol. III, p. 1229. Ficus subtripinervia, Mart. (Urostigma; subtripinervia, Mart.). Large tree; lvs. chartaceous, ovate or lanceolate-elliptic or oblong, 1-2 x \( \frac{3}{2} \) in. 

URSINA (John Ursinus, of Regensburg, 1608-1666; author of "Arboretum Biblicum"). Composite: Here belongs the hardy annual known to the trade as Sphenogyne speciosa.

Annuals, perennials, or subshrubs; lvs. alternate, serrate, pinnatifid or usually pinnatisect; rays the same color on both sides or purplish brown beneath; involucre hemispherical or broadly campanulate; achenes often ribbed. -A genus of about 60 species, all native to S. Afr. One species, U. annua, is also found in Abyssinia. In Ficus Calyptris, vol. 3 (1864-65), Sphenogyne and Ursinia are treated as separate genera, the distinctions being as follows: the achenes are cylindrical in Sphenogyne, but obovate or pear-shaped in Ursinia, distinctly tapering to the base: the pappus is uniseriate in the former, biseriate in the latter, the inner series consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursinia.

pulchra, N. E. Br. (Sphenogyne speciosa, Knowles & Weste.). Fig. 3887. Annual. 1-2 ft. high, with lvs. pinnately dissected into linear lobes and yellow or orange fl.-heads 2 in. across: rays about 22, 3-5-toothed; fls. yellow, with 2 pairs of sepals and a single erect ovary; lvs. simple, opposite, strongly nerved, dentate or crenate or incised. Several species of nettle are native in N. Amer. and a few are intro. weeds. The plants have very little ornamental value.

URVICEA (classical name, alluding to the burning hairs). Urticaceae. Nettle. About 30 annual and perennial erect simple or branching slender herbs, widely distributed, little if at all planted because of the stinging hairs and stts. and lvs.: fls. small, greenish and inconspicuous, racemose, spicate or clustered in the axils, monocious or dioecious, sometimes hemiphrö-dite; sterile fls. with 4 sepals and 4 stamens; fertile fls. with 2 pairs of sepals and a single erect ovary: lvs. simple, opposite, strongly nerved, dentate or crenate or incised. Several species of nettle are native in N. Amer. and a few are intro. weeds. The plants have very little ornamental value.

URVILLA (bears the name of Capt. Dumont D'Urville, French botanist and naval officer). Sapindaceae.

About a dozen species of climbing shrubs of Trop. Amer. Lvs. alternate, ternate, the lfts. entire or coarsely dentate and more or less pellucid-dotted: fls. whitish, on jointed pedicels, in axillary racemes, the peduncles ending in a pair of tendrils; sepals 5, the 2 outer ones smaller; petals 4; diak of 4 glands; stamens 8: fr. a 3-winged samara. Probably no species is in cult., the U. ferruginea, Lindl., of lists being Serjania cuspidata.

URTICÁRIA (Latin, a little bag or skin, referring to the bladders). Lentibulariaceae. Bladderwort. As known to gardeners, the bladderworts are of two rather distinct groups,—the aquatic mostly native kinds sometimes used in pools and aquaria, and the tropical terrestrial kinds sometimes grown in warm-houses with orchids and other special plants. The whole group is of little importance horticulturally.

As commonly understood, Utricularia is a genus of some 200 aquatic and terrestrial kinds of cosmopolitan distribution. Recently, however, the genus has been split into several genera, and the name Utricularia retained for certain aquatic species; with this taxonomic innovation, however, we are not concerned in this brief account. Under the older and prevailing definition,
Utricularia comprises plants with numerous slender wiry scapes bearing one or many fls.: calyx large, 2-parted or 3-lobed; corolla with a spur which is usually long and curved under the fl.; posterior lip erect, entire, emarginate or 2-fid; anterior lip often large, broad, and showy; spreading or reflexed, entire, crenate or 3-lobed, or the middle lobe various: lvs. of the aquatic species much dissected, sometimes disappearing at flowering-time, very delicate: plant floating or rooting in the mud, the lvs., branches, and sometimes the roots bearing minute bladders; lvs. of terrestrial species linear or spatulate and rosetulate at base of plant. The bladders trap small aquatic animals. These bladders have a valve-like door through which the animals enter when looking for food or when trying to escape from other creatures; they are most numerous and effective in the species which float in stagnant water. They are fewer in the marsh-inhabiting species. The terrestrial kinds often have minute deformed and useless bladders; these kinds are common in the tropics and are characterized by erect foliage of the ordinary type. These often form little tubers by which they may be propagated. The native aquatic species propagate themselves by seeds and also by winter buds. (A winter bud of another aquatic plant is figured under Elodea, p. 1110.) Some of the utricularias are epiphytic in a way. Those who are familiar with bromeliaceous plants know how who are familiar with bromeliaceous plants know how the water gathers in the axils of the lvs. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the If.-axils of Vriesia and other bromeliads live certain utricularias with fully developed and effective bladders. Occasionally they send out a long “feeler” or runner-like shoot which finds another bromeliad and propagates another bladerwort.

The aquatic utricularias are sometimes cultivated in aquaria, but their flowers are not showy, nor are those of any of the hardy kinds. A number of them are native in lakes and ponds in the United States and Canada. The showy species are the terrestrial and epiphytic kinds of the tropics. These, for complexity of floral structure, beauty of color and lasting qualities, vie with certain orchids. In fact, they are usually grown by orchid-lovers in orchid-houses. Perhaps the most desirable of the genus are U. montana, U. Endresii, and U. longifolia, each of which represents a different color. Well-grown baskets of these plants have numerous scapes a foot or so high bearing five to twenty flowers, each 1½ to 2 inches across. In general, such plants are grown in greenhouses. U. Endresii requiring a stove temperature, while some of the others may thrive in an intermediate house. As a class they are grown in baskets, near the light, using a compost of fibrous peat and sand. The plants are kept constantly wet during the growing season and until the flowers are gone. During the winter they are rested, being kept in a cooler place and given just enough water to keep the tubers from shriveling.

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americanus, 1.  janthina, 5.  montana, 3.
bifida, 4.  longifolia, 9.  pinguicula, 2.
Endresii, 8.  punctata, 9.  reniformis, 6.
Forgotania, 9.  macrorhiza, 1.  vulgaris, 1.
Humboldtii, 7.  major, 8.

AA. Habit aquatic.

1. vulgaris, Linn. Hardy aquatic: sts. a few inches to 3 ft. long, with crowded 2-3 pinnately divided floating lvs. ½-1 in. long, provided with numerous bladders and yellow fls. ½ in. long or more, borne in few-fld. racemes: scapes 6-8 in. high: corolla closed, with reflexed sides and a conical blunt spur. Eurasia, in ponds and channels. Gn. 28, p. 403.—Sometimes listed among aquatic plants. What is considered by some to be the same species occurs far northward in N. Amer.; represented in the U. S. by var. americana, Gray, with a more slender and rather acute spur. Some authors consider the American plant to be distinct, and it then takes the name U. macrorhiza, LeConte, distinguished from the Eurasian material by longer sts., shape and direction of spur and reduced or rudimentary stolons. Sometimes collected for aquaria.

BB. Foliage ribbon-like.

2. prehensilis, E. Mey. An aquatic plant with fls. shoots twining above the water: lvs. (often disappeared at flowering-time) linear-lanceolate to lingulate, obtuse, sometimes nearly 1 in. long, narrowed into a slender petiole: bladders numerous on the lvs. and rhizoids, with the mouth near the stalk, nearly or quite globose, almost ¼ in. in diam.: fls. yellow, 1-6; upper lip of corolla broadly oblong-spatulate; palate erect, crested; spur straight and acute, descending, ¼ in. or more long. Trop. Afr. G.C. III. 48: 447.—A rapid grower and profuse bloomer in cult. Annual.

AA. Habit terrestrial or epiphytic: foliage entire, erect.


BB. Color of fls. yellow, with an orange palate.

4. bifida, Linn. Terrestrial species from Trop. Asia, with minute bladders and small fls. resembling a diminutive linaria: lvs. densely matted, erect, thread-like, 1-2 in. long: fls. yellow, with an orange palate, ½ in. long, 5-8 in a raceme: pedicels drooping fr.: scape about 6 in. or less high. India, Malay, China, Japan, Philippines. B. M. 6899.
UTRICULARIA

...with the seeds usually numerous and fleshy berries somewhat like those of Artabotrys or stamens, and developing into a cluster of pedicelled cluster of carpels projecting from the center of the mass terminating in a crest: gynecium formed of a parallel pollen-sacks on the back, very much as in Desmos), often connate at the base; stamens rows imbricate, or overlapping in the bud (not edge-to-edge as in Deemoo), often connate at the base; stamens numerous, short, cuneate or nearly truncate, with stellate-pubescent hairs, and with

posed of Old World tropical plants, more or less clothed with stolons and rhizoids. The species thrives under conditions suitable for nepenthes.

UTRICULARIA (Latin, ura, palate, referring to the hanging flowers). Lilitoea. BELLWORTH. "Wild Uvas" in some parts. Graceful woodland hardy perennial herb, useful in the wild border or in heavy shade; not showy, and little planted.

Uvularia (Latin, from ura, gape, on account of the grape-like clusters of the fruit). Arumudacea. A group very closely allied to the American Asimina, but composed of Old World tropical plants, more or less clothed with stellate-pubescent hairs, and with a climbing or scrambling habit.

Flowers either solitary or in few-flowered clusters, either terminal or if-opposed; sepals 3, often combined into a cup-shaped calyx; petals 6, in 2 rows, one or both rows imbricate, or overlapping in the bud (not edge-to-edge as in Deemoo), often connate at the base; stamens numerous, short, cuneate or nearly truncate, with parallel pollen-sacks on the back, very much as in Asimina, but with the connective either truncate or terminating in a crest-like crest; gynostemium formed of a cluster of ovaries projecting from the center of the mass of stamens, and developing into a cluster of pedicelled fleshy berries somewhat like those of Artabotrys or Canarium, but with the seeds usually numerous and arranged in 2 vertical rows, as in Asimina, or sometimes apparently 1-seriate. Few of this genus are in cult. For the principal Philippine species, see E. D. Merrill, in Philippine Journ. Science, Section Botany, 10:223-30 (1915). The following species is the only one occurring about Manila.

**Uvularia** (U. purpurea, Blanco), SUSONG CALABAO. CABALAO'S TEATS. Fig. 3889. A scandent shrub, often 16-20 ft. in length, the younger parts and lower surfaces of the lvs. rather densely and softly pubescent with radiating starlike clusters of short rusty hairs; lvs. oblong-ovate to oblong-lanceolate, 3-6 in. long, apex acuminate, base rounded or cordate, the petioles very short: fls. extra-axillary or If-opposed, solitary or 2 or 3 together in depauperate cymes: frs. a cluster of 18-28 pedicelled oblong velvety berries, red when mature; seeds many, in 2 rows, surrounded by whitish, aromatic, acridulous fleshy pulp.—According to P. J. Wester the fr. of this species together with that of an allied species having an orange-yellow, velvety skin and yellowish, granular, somewhat sweetish flesh is offered for sale in the markets of Manila. See The Philippine Agricultural Review 6:321, pl. 7, figs. a and b (1915) for further information.

W. E. SAFFORD.
UVULARIA

a. Lvs. pubescent beneath.

*grandiflora*, Smith. Sts. 1-1½ ft. high, with 1 or 2 lvs. below the fork: lvs. oblong, oval or ovate, somewhat acuminate: fls. pale yellow, 1-1½ in. long; segms. usually smooth on both sides: stamens exceeding the styles: caps. obtusely 3-angled, truncate. May, June. Rich woods, Que. to Minn. south to Ga., Tenn., and Iowa. B.B. 1:409.

AA. Lvs. not pubescent beneath.

*perfoliata*, Linn. Fig. 3890. Sts. more slender than in *U. grandiflora*, with 1-3 lvs. below the fork: lvs. oval-oblong or ovate: fls. pale yellow, about 1 in. long; segms. glandular papillose within; stamens shorter than the styles: caps. obtusely 3-angled, truncate. May, June. Rich woods, U. S.

*U. sessilifolia*, Linn.—Oakesia sessilifolia.

F. W. BARCLAY.
VACCINUM (ancient Latin name of the blueberry). Ericaceae. Blueberries, Bilberries, Deerberries, and Cranberries. Erect or creeping shrubs, often with green speckled twigs, well known in this country as the source of excellent wild berries; sometimes planted for ornament.

Leaves alternate, evergreen or deciduous, coriaceous or herbaceous; fls. solitary, axillary or terminal or in racemes; sepals 4–5 or obsolete; corolla gamopetalous, urceolate, cylindrical, campanulate, or rotate, 4–5-toothed or -parted, white or pink; stamens 8–10; anthers dehiscing by pores at the tips of long slender terminal tubes, epigynous; carpels 4–5; ovary inferior, 4–5-celled, or 8–10-celled by intrusion of the midrib of each carpel; fr. a many-seeded berry capped by the persistent calyx.—The genus consists of about 130 species of wide geographic distribution, extending from the Arctic Circle to the higher mountains of the tropics. They are most common in North America and the Himalayas. The genus is almost without representation in the southern hemisphere.

The well-known confusion in the popular names applied to Vaccinium is stated by Munson as follows: 'The terms 'bilberry' and 'whortleberry' usually mentioned as 'common names' by American writers are seldom or never heard among the common people in this country; while 'huckleberry' is reserved for species of Gaylussacia, 'blueberry' is usually applied to Vaccinium. 'Huckleberry,' 'bearberry,' and 'cranberries' are often persisting much longer than the bright-hued leaves of a large number of other plants. Of the ornamental species none is more strikingly beautiful late in autumn than the common high-bush blueberry, V. corymbosum. When well grown it is a stout, thick, spreading bush 8 to 10 feet high. The plant is beautiful when in flower; the fruit is attractive and of the best quality, and the bright scarlet and crimson effects in late autumn, rivaling the sumach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden. V. pensylvanicum also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an undershrub. The name is true of V. canadensis, which in many respects is similar. V. stamineum, though early deciduous, is attractive when in bloom and throughout the summer by reason of its graceful habit. It is particularly adapted for sterile sandy or gravelly situations, and it is one of the very few ornamental shrubs specially suited for densely shaded situations. It has the peculiarity of never forming a true flower-bud, the blossom being open from the first. V. arborescens forms an irregular shrub too diffuse and straggling to be of value except when planted in masses at the South. V. arborescens is as beautiful in its autumn coloring as is V. corymbosum and, like that species, retains its foliage late in the season; V. bilobum and V. uliginosum, with their shining box-like foliage, can be used very effectively as edging for the shrubbery border. (W. M. Munson.)

For the most part, Vacciniums are plants of peaty or sandy acid soil, and will not thrive in soils of a richer nature. Many species are very sensitive to the presence of lime, and they require special attention as to soil. See Blueberry.
VACCINIUM

1. arboresum, Marsh. FARBEBERRY. SPARKLEBEERRY. Spreading shrub or small tree, 6-25 ft. high, with glabrous or somewhat pubescent branchlets; lvs. 1-2 in. long, evergreen in the S., somewhat coriaceous, smooth and shining above, paler and sometimes pubescent beneath, obovate to ovate, acute or obtus, entire or obscurely dentilicate; fls. profuse, axillary, and leafy-racemose, pendulous, articulated with the slender pedicel; corolla open-campanulate, 5-lobed, white; stamens included; berry small, globose, black, rather astringent, inedible. Sandy soil along river banks, Fla. and Texas to N. C. and Ill. l.B.C. 19:1885, B.M. 1607 (as V. diffusum). B.B. 2:580.—"It forms an irregular shrub too diffuse and sprawling to be of use except in masses, for which purpose it is useful at the South."

2. stamineum, Linn. DEERBERRY. Squaw HUCKLEBERRY. Fig. 380. A divergently branched shrub, 2-5 ft. high, with pubescent twigs, not white-speckled; lvs. 1-4 in. long, oval to obovate-oblong or elliptical, entire, palle, glaucescent and pubescent beneath; fls. very numerous in large leafy-bracted racemes, showy, pointed with the slender spreading or pendulous pedicles; calyx glabrous; corolla pure white, rarely purple-tinged, open-campanulate, 5-angled, anthers and leafy-racemes, deciduous, of rather firm texture; fls. white or rose-color, in fascicles or very short racemes, developed with or a little before the lvs. from large and separate scaly buds, short-pedicelled: scaly bractlets as well as bracts mostly caduceous or deciduous.

3. melanocarpum, Mohr. SOUTHERN GOOSEBERRY. Similar to the last but more white-pubescent; calyx white-tomentose: berries twice as large, shining black, with a juicy purple pulp, sweetish and slightly tart. Southern states.

Section II. CYANOCoccus. Corolla from cylindraceous to campanulate-oblong or ovoid, 5-toothed; filaments hairy; anthers included, awned; ovary and berry completely or incompletely 10-celled by a spurious partition or projection from the back of each carpel; berry blue or black with a bloom, juicy, sweet, and edible, many-seeded; fls. white or rose-color, in fascicles or very short racemes, developed with or a little before the lvs. from large and separate scaly buds, short-pedicelled: scaly bractlets as well as bracts mostly caduceous or deciduous.

A. Berries thick, evergreen; bracts reddish, firm, tardily deciduous.
B. Septals obtuse; teeth of lvs. glandular; berries black.
C. Berries very pubescent at least beneath.
E. Plant tall.
D. Berries glabrous or nearly so except sometimes the midrib.
F. The lvs. elliptic, acute, green.
nearly cylindrical, ⅓-½ in. long, white or pink; bracts small, deciduous, berry black, almost or quite destitute of bloom. Swamps, S. Va. to Fla. and La. B.M. 3522. B.R. 302 (as V. fuscatum).—The distinction between this species and V. corymbosum is very slight. It is probable that, possibly excepting var. tenellum, this is only a southern form of V. corymbosum and should be reduced to varietal rank.

Var. tenellum, Gray (V. tenellum, Ait.). A low form, mostly less than 2 ft. high, with smaller lvs. and nearly white fls. in short close clusters. S. Va. to Ark., Fla., and Ala.

7. corymbosum, Linn. High-Bush Blueberry. Swamp Blueberry. Fig. 3892. A tall handsome bushy shrub, 4-12 ft. high, with yellowish green warty branchlets; lvs. large, ⅔-3 in. long, ovate-oblong to elliptical, acutish, glabrous, half grown at flowering time; corolla long-cylindraceous, ⅓-⅔ in. long, white, berries blue-black of excellent flavor. Moist woods or bogs, N. E. N. Amer. Em. 2:456. Amer. Agric. 1886:364.—Exceedingly variable, and many natural hybrids occur between this and other species, rendering the taxonomy very difficult. V. corymbosum is one of the most valuable species both for fr. and as an ornamental shrub. It thrives in peaty acid soil.

Var. amänum, Gray (V. amänum, Ait.?). A form with lvs. bristly ciliate or serrulate, bright green on both sides, shining above. „Mainly in the Middle Atlantic states.“ B.R. 400. B.M. 3433 (as V. corymbosum). Probable of hybrid origin.

Var. pallidum, Gray (V. pallidum, Ait. V. albiflorum, Hook. V. Constablæri, Gray). A pale and glaucous or glaucous form with or without some pubescence; plant generally low, 2-4 ft. high; lvs. ciliate-serrulate. Common in mountainous regions southward. B.M. 3428.—Probably a distinct species.

Var. fuscatum, Gray (V. fuscatum, Ait.). A tall form with the nature entire lvs. fuscos-pubescent beneath; fls. virgate, somewhat scapate on the naked flowering trusses. In and about swamps, Ga. and Fla. to La. and Ark.

8. atrocoecum, Heller (V. corymbosum var. atrocoecum, Gray). Downy Swamp Blueberry. A tall branching shrub similar to the last species; lvs. elliptic-oblong, acute, entire, dark green above, densely pubescent beneath, unexpanded at flowering-time; fls. in dense racemes; corolla shorter, greener, and often redder than in the last; berries said to be always black without bloom, smaller than in the last, of good flavor. Moist woods and bogs of E. N. Amer.—Apparently distinct from V. corymbosum, but seeming to hybridize with it.

9. canadense, Kalm. Canada Blueberry. Low erect shrubs, 1-2 ft. high, much branched: the branches very downy: lvs. entire, dark green, ⅔-1½ in. long, oblong-lanceolate or elliptical, acute. Ait. A form with mucr bloom. Low woods and bogs, New England, mountains of Pa., northwest and northwestern. B.M. 3446.—“This species, commonly known as ‘velvet-leaf’ or ‘sour-top’ because of the character of its foliage and the somewhat acid fr., usually grows in rather boggy localities. The fr. is more acid than the other low forms and matures from 1-3 weeks later. It is not so popular in the market as the sweeter kinds, but it is very prolific and its lateness in ripening is in its favor.”

10. pennsylvanicum, Lam. Low Blueberry. Fig. 3893. A dwarf shrub, 6-15 in. high; branchlets glabrous or hairy northward: lvs. membranous, oblong-lanceolate or elliptical, acute, distinctly serrulate with prickly pointed teeth, shining and green on both sides but often hairy on the midrib beneath: fls. on short pedicels; corolla short-cylindraceous, greenish white; berries large, bluish black with a bloom, sweet, the earliest to ripen in the North. E. N. Amer. B.M. 3434. Em. 2:456. Rep. Me. Exp. Sta. 1898:171. Var. angustibladium, Gray. A dwarf form with more decidedly lancesolate lvs. Newfoundland, mountains of New England and northward. Var. nigrum, Wood (V. nigrum, Brit.). Foliage very glaucous: berries black, without bloom. Usually found in colonies in the same situations as the typical form and occasionally the two are found intermingled. Rep. Me. Exp. Sta. 1898:171. The fls. are said to appear earlier than those of V. pennsylvanicum.—„This species is extremely variable in size and shape of fr. and fls., but, with the exception of the varieties noted, the variations do not appear sufficiently constant to warrant making separations. In general the plant is of low, semi-prostrate habit, is extremely prolific, and thrives well on dry sandy hills. It furnishes the bulk of the blueberries found in the eastern markets. When mown down or

burned, the new sweet shoots produce, the following year, a long spike-like race of bloom and fruit, which may be stripped off by the handfuls. Because of its character and early ripening habit, it is known on the blueberry plains as ‘Early Sweet’ or ‘Low Sweet.’ “

11. vaclians, Kalm. Low Blueberry. Erect, glabrous, widely branched, ½-3 ft. high: lvs. 1-2 in. long, ovate or oval, scarcely acute, entire or sparingly serrulate, pale or dull glaucous on both sides: fls. in
Rather dense clusters generally on the leafless summits of twigs; calyx reddish; corolla short-cylindrical, greenish white, often tinged with red; berries large, with much flavor, ripening late with V. canadense. Dry sandy or rocky places, N. E. N. Amer. Em. 1: 454.—"One of the most common species of the northern and central states, particularly west of the Alleghanies. One of the two commonest upland dwarf blueberries."

12. hirsutum, Buckl. Hairy Blueberry. Bear Blueberry. Fig. 3894. Low shrub, 1-2 ft. high. Ats. green, grooved, obscurely 4-angled; branches hirsute with spreading white hairs; lvs. oblong-lanceolate to ovate, acute or cuspidate, ½-1⅔ in. long, entire, deep green above, paler beneath, pubescent or hirsute on both faces, very short-petioled: racemes few-fl.; ovary, calyx, and corolla densely hirsute; sepals acute; corolla large, ovoid, campanulate, pale or reddish; berries purplish black, glanular-hirsute. Shaded mountain slopes, N. C. to Tenn. and Ga. G. F. 2: 205 (adapted in Fig. 3894).—"This species, discovered about 1840, was lost sight of for half a century until rediscovered by Sargent, and transferred to the Arnold Arboretum. It is readily distinguished by the hairy lvs. and fr. The fr. is described as fully as large as that of Gaylussacia baccata, shining black, and of an agreeable flavor. Under cult., it is not so densely hairy as in the wild state. It gives promise of being valuable under cult. as one of the latest of its kind to ripen. At the Arnold Arboretum the period of greatest fruitage is in the middle of Aug., berries remaining into Sept."

Section III. Euvaccinium. Corolla from ovate to globular and more or less urceolate, 4-5-toothed, rose-color or nearly white; filaments glabrous; anthers 2-awned on the back; ovary and berry 4-5-celled, with no false partitions: lvs. deciduous: fls. on drooping pedicels, solitary or 2-4 together, developing with or soon after the lvs.

A. Fls. 2-4 in a fascicle, from separate scaly buds, 4-merous............. 13. uliginosum
AA. Fls. solitary, axillary, usually 5-merous.

b. Branchlets not angled............. 14. cespitosum
BB. Branchlets angled.

c. Shrubs low (1½ ft. or less)........... 15. Myrtillus
c. Shrubs tall (3-6 ft.).

d. Lvs. serrate: berries blackish, without bloom............. 16. membranaceum
e. Lvs. entire or nearly so; corum

13. uliginosum, Linn. Bog Bilberry. A low spreading much-branched shrub, ¾-1½ ft. high; lvs. thickish, obovate or oval, obtuse or retuse, ½-1 in. long, entire, nearly sessile, pale and glaucous on both sides, slightly pubescent beneath: lvs. 2-4 together or sometimes solitary; calyx 4-parted, rarely 5-parted; corolla urn-shaped, 2-5-lobed, pink: berries bluish black with a bloom. Arctic and alpine N. Amer., Eu., and Asin. B.B. 2: 576.—"The plant is useful for the shurbbery border in cold wet acid situations and its fr., though of poor quality, is used for food by the natives of the Northwest."

14. cespitosum, Michx. Dwarf Bilberry. A dwarf tufted shrub, 3-12 in. high, nearly glabrous throughout: branches rounded: lvs. ½-1⅔ in. long, obovate, cuneate-lanceolate or cuneate-spatulate, narrowed at base, obtuse or acute, serrulate, smooth and shining: fls. solitary, on short axillary peduncles, nodding; corolla urceolate, small, rarely 4-5-toothed, pink or red: berries large, blue with bloom, sweet. Gravelly or rocky woods and shores, Maine, Vt., Wis., Col., Calif., and northward; also on alpine summits of New England and N. Y. B. M. 3429.—May be used in rock-gardens.
Section IV. 

VACCINIUM. Corolla from ovate to globular, and more or less urceolate, 4-5-toothed, rose-color or nearly white; filaments hairy; anthers awnless on the outer faces; ovary and berry 4-8-celled, with no false partitions: lvs. coriaceous and persistent; ils, in short racemes or clusters from separate buds, bracteate and 2-bracteolate. 

A. Corolla 5-lobed; stamens 10.  
B. Branchlets pubescent: plant erect.  
D. Branched glabrous: plant procumbent.  
E. Corolla 4-toothed; stamens 8.  
F. Corolla 3-toothed.  
G. Corolla 5-toothed.  
H. Corolla 6-toothed.  
I. Corolla 7-toothed.  
J. Corolla 8-toothed.  
K. Corolla 9-toothed.  
L. Corolla 10-toothed.  
M. Corolla 11-toothed.  
N. Corolla 12-toothed.  
O. Corolla 13-toothed.  
P. Corolla 14-toothed.  
Q. Corolla 15-toothed.  
R. Corolla 16-toothed.  
S. Corolla 17-toothed.  
T. Corolla 18-toothed.  
U. Corolla 19-toothed.  
V. Corolla 20-toothed.  
W. Corolla 21-toothed.  
X. Corolla 22-toothed.  
Y. Corolla 23-toothed.  
Z. Corolla 24-toothed.  

22. erythrocárpus, Michx. (Oxycoccus erhythrocárpus, Pers.). An erect, divergently branching shrub, 1-4 ft. high: lvs. 1\(\frac{1}{2}-3\) in. long, oblong-lanceolate to ovate, acuminate, finely bristly serrulate, thin, green both sides, paler beneath; petals solitary, axillary, shorter than the lvs., recurved, bracteate: corolla flesh-color, \(\frac{1}{2}\) in. long, 4-cleft, the lobes narrow, acute, revolute: berries globose, \(\frac{1}{2}\) in. diam., bright red turning darker, acid, scarcely edible. Higher Alleghanies, Va. to Ga. B.M. 7413.  

23. Oxycoccus, Linn. (Oxycoccus oxyccoccus, MeM.). SMALL CRANBERRY. CRANBERRY of the Old World. Slender creeping plants with short filiform sts., 4-10 in. long: lvs. ovate, acute, \(\frac{1}{2}\) in. long, with strongly revolute margins, coriaceous, evergreen, dark green and glossy above, white-glaucous beneath, glabrous; pedicels 1-4, terminal: filaments one-half length of anthers: berry red, \(\frac{1}{2}\)-\(\frac{3}{4}\) in. diam. Splashing swamps in sub-arctic and alpine regions of Old and New Worlds. — "Though smaller, its fr. is by many considered superior to that of the next."  

24. macrocarpón, Ait. (Oxycoccus macrocarpus, Pers.). LARGER AMERICAN CRANBERRY. Sts. slender, creeping, elongated, 1-4 ft. long, somewhat coarser and stouter than in the last, the fl. branches ascending: lvs. oblong or oval, obtuse or retuse, \(\frac{1}{2}-\frac{3}{4}\) in. long, in texture and coloration similar to the last, margin less revolute: pedicels several, axillary and lateral: fls. larger; filaments shorter than in the last; berry red, larger, \(\frac{1}{2}-1\) in. long. N. N. Amer. B.M. 2586. Emm. 2-456. See Cranberry.  

Section VI (Position of this species doubtful)  

Anthers mucilaginous: branches red.  

25. erythrinum, Hook. An erect, glabrous, evergreen shrub, with bright red twigs: lvs. ovate, obtuse, coriaceous, entire: lvs. in long, 1-sided, terminal racemes; corolla globose-campanulate, small (\(\frac{1}{2}\) in. long), rose-red, rarely whitish; berries black. Sandy moist pine lands, N. C. to Ga. B.M. 1152. — "Useful for the shrubbery border South."  

21. Vitis-idaea, Linn. (Vitis-idaea Vitis-idaea, Brit.). MOUNTAIN CRANBERRY. COWBERRY. PAINTBRIDGE BERRY in the N. FOXBERRY. Fig. 3806. Plants low, 6-10 in. long, creeping, glabrous: lvs. coriaceous, evergreen, obvate or oval, \(\frac{1}{2}-\frac{3}{4}\) in. long, obtuse, dark green and shining above, with blackish bristly points beneath: fls. in short subterminal racemes; corolla bell-shaped, white or rose-colored, 4-cleft: berries dark red, acid. Arctic region, to the coast and mountains of New England, Minn., and Brit. Col. L.B.C. 7:816 (as var. major); 11:1023 (as var. minor). — "The frs., which are rather larger than the others, are in allusion to that of the next,"  

VAGARIA (derivation obscure), Amaranthàceae. Large tunicate bulbous herb, useful for autumn-flowering: lvs. strap-shaped, appearing rather late: fls. in many umbels, short-pedicelled, white; perianth narrowly funnel-shaped, tube slender, lobes narrow, spreading; stamens affixed to the throat, slightly shorter than the perianth: ovary ovoid-globose, 3-celled: caps. membranaceous, somewhat valvately dehiscent. —One species, Syria.  

parviflora, Herb. Bulb globose, about \(\frac{1}{2}\) in. through: fls. white. Offered by European bulb-growers for outdoor planting.  

F. Tracy Hubbard.  


VALERIANA (Latin radix, to be strong, in allusion to medicinal uses), Valerianacea. VALERIAN. Gla­brous or rarely pubescent or villous perennial herbs, subshrubs, or shrubs, which are erect or scendent, most of them hardy and showy garden plants.  

Roots strong-smelling: lvs. especially the radical ones, entire or dentate, or the cauleine or all pinnatifid or once-, twice-, or thrice-pinnatisect: cymes sometimes dense, few-fl. and terminal, or clustered in dense or interrupted spikes, sometimes laxly corymbosely or variously panicled: fls. small, white or rose; calyx-lobes
before anthesis not conspicuous, after flowering divided into 5-15 plumose-ciliate sets; corolla-tube
attenuate at base, limb 5-cleft; stamens 3, rarely by
abortion 1 or 2; fr. a compressed achen with the rear
face 1-nerved, the front face 3-nerved.—About 265
species, mostly in the temperate and colder regions of
the northern hemisphere but a few in the tropics and
in the extra-tropical regions of the southern hemisphere.
The valerians in the American trade are hardy per-
essials of easiest culture. Only V. officinalis is well
known. This is one of the characteristic plants of old
gardens, being prized for the spicy fragrance of its
numerous flowers in spring. It spreads rapidly from
suckers arising from the roots, soon forming large
colonies. The common species are from seeds.

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- V. alba, 11.
- V. rubra, 7.
- V. officinalis, 12.

A. Rootstock perpendicular, branching below.

1. edulis, Nutt. Perennial, 2-4 ft. high, glabrous or
nearly so; rootstock perpendicular, fusiform, branching
below; lvs. thickish, not serrate, slightly pubescent;
radical oblanceolate to spatulate, entire or some spa-
ringly laciniate-pinnatifid, tapering into a margined color,
the sterile fls. larger. Moist soil. Eu. petiole; cauline
rarely none, commonly 1-3 pairs, ses-

b. St-lvs. not compound or lobed, but sometimes dentate.

4. montana, Linn. Perennial, glabrous or nearly so,
about 1 ft. high: rhizome slender, many-branched: lvs.
entire or dentate; those of the sterile young shoots and
the lowest ovate-rotundate or ovate, suborbicular, rather
long-petioled; cauleine lvs. triangular-oblong, acute or
acuminate; uppermost linear-lanceolate: corymp termi-
nal, compound or simple: fls. bright rose, dioecious. Eu.

b. St-lvs. (at least the lower ones) pinnate or
pinnately lobed.

c. Fls. dioecious or polygamous.

5. alpstris, Stev. (V. alpina, Adams). Perennial,
glabrous, about 6 in. high: rhizome horizontal, short,
slightly branched: radical and lower lvs. ovate-oblong,
repand-dentate; intermediate lvs. acuminate, subsessile,
equaly 2-3-paired or often undivided; uppermost linear,
small; corymp terminal, clustered and head-like:
fls. pink; ovary glabrous. Caucasus region.

6. dioica, Linn. Marsh Valerian. Perennial,
rather glabrous, about 1-2 ft. high: rhizome slender,
stoloniferous, long-creeping: lower lvs. and those of the
sterile shoots ovate-suborbicular, elliptic or spatulate,
entire, rather long-petioled; cauleine lower lyrato-pi-
uate-parted; upper pinnatisect with linear segms. in
3-5 pairs: corymp terminal: fls. dioecious, pale rose-
metal, the sterile fls. larger. Moist soil. Eu.

cc. Fls. hermaphroditic.

d. Radical lvs. (at least some of them) pinnatisect or
pinnate.

7. officinalis, Linn. COMMON VALERIAN. GARDEN
Heliotrope. Cay’s VALERIAN. St. GEORGE’S HERB.
Fig. 3896. Perennial, glabrous or more or less pubescent
below, 2-5 ft. high: rhizome truncate, sometimes
stoloniferous: sts. erect, simple below, somewhat
branching above, sulcate: lvs. all-pinnatisect; segms.
7-10-paired, usually dentate-serrate, those of the lower
lvs. ovate-oblong, of the upper lvs. lanceolate, acumi-
rate: corymp broadly paniculate, long-branched: fls.
numerous, white, pinkish or lavender, very fragrant.
Eu., N. Asia. G.W. 12, p. 472.-Varible. The medi-
valian valerian is obtained mostly from the roots of this
species. Var. alba, Hort., is a white-fld. form. Var.
rubra, Hort., is a red-fld. form.

8. excelsa, Poir. (V. sarable, Mikan). Perennial,
with long runners ending in rosettes: st. channelled,
glabrous; lvs. pinnate; lfts. 3-5-paired, usually serrate
dentate, rarely entire, terminal lfts. largest:
inf. rather crowded: fls. reddish or white, rather larger
than V. officinalis. Eu. Gn. 67, p. 3.

9. sitchensis, Bong. Perennial, 1 ft. or less high:
rootstock ascending, thick: radical lvs. ovate or oblong,
simple or somewhat lobed; cauline lvs. short-petioled,
3-5-foliate, divisions or lfts. orbicular to oblong-ovate
or in the upper ones ovate-lanceolate: fls. white, very
fragrant, in contracted cymes; corolla funnel-form,
about 3 in. long. Rocky Mts. to Alaska. G.F. 9: 515.—
A very early bloomer.

d0. Radical lvs. entire or merely dentate.

10. arizonicza, Gray. Perennial, glabrous, 6 in. high:
rhizome creeping, rather thick: sts. erect: lvs. succulent,
basal ovate, entire or nearly so, 1 in. long, intermediate
few, long-petioled, 2-4 lobed; cauleine sub-sessile, 3-5-
paired: cyme glomerate-congested: fls. whitish or
pinkish; corolla 3 in. long, turnicular broad, becoming

11. Phu, Linn. Perennial, glabrous or pilose, not so
tall as V. officinalis: rhizome inclined, simple, fusiform:
st. stout, tall, simple or slightly and shortly branched:
radical lvs. ovate-oblong, long-petioled, entire or at base.
VALERIANA

3-cut, segms. decate, terminal larger and ovate-cor- date, lateral 2 (rarely 4 or 5) obliquely elliptic: cyme large, corymbose: fls. pale rose: fr. glabrous, linear- oblong. Pyrenees.

V. alba, Maxiz., is Centranthus ruber var. alba—V. coccaea, Hort., is offered (Centranthus?)—V. cocvina alba, Hort., is offered in the trade.—V. Cornucopia, Linn., is Fella Cornucupia.—V. macrocorpus, Linn., is Centranthus macrocorpus.—V. ribea, Hort., is offered in the trade.—V. rubra, Linn., is Centranthus ruber.

3897. Valeriana olitoria.—Corn salad.

VALLISNERIA (diminutive of Valeriana). Valer­rianacea. Annual dichotomously branched herbs, chiefly spring plants, sometimes planted in wild-garden or rock-garden; one is a salad plant. Leaves, lower, in a radical rosette, entire; cauline, entire, dentate or rarely incise-pinnatifid; cymes sometimes corymbose paniclately fastigate, sometimes densely globose at the ends of the branches: fls. whitish, pale blush, or rose; corolla-tube short or rarely elongate, limb 5-serrated, spreading; stamens 3: fr. 3-celled, 2 of which are empty.—About 35 species, Eu., Aftr., W. Asia, and N. Amer., mostly in the Medit. region. Corn salad is both a salad plant and a pot-herb, chiefly for the proper time the stam. their stalks and rise to the bottom of the water. At the proper time the pseudo-fls. break away from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pistillate fls., and in this haphazard way the blossoms are fertilized and seed is produced.

VALLISNERIA (Antonio Vallisneri, 1661-1730, Italian naturalist). Hydrocharitaceae. Two species of aquatic plants, including the well-known eel-grass or tape-grass. This plant is found in fresh water around the world. It is a submerged plant with linear lvs. 1½-6 ft. long, depending on the depth of the water. The flowers terminate in a tuft at the bottom of the water, and the plant spreads by runners sent out from these tufts. Eel-grass is usually found in quiet waters. It has no horticultural rank, except as an aquarium plant. Like many other aquarium plants, it has special interest for students of botany. The pistillate fls. are borne on very long spiral threads and come to the surface, as shown in Fig. 3898. The stamine fls. are borne on very short stalks near the bottom of the water. At the proper time the stamine fls. “break away” from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pistillate fls., and in this haphazard way the blossoms are fertilized and seed is produced...
Both kinds of fls. are very small, and they are borne on separate plants. Eel-grass is readily collectable or can be procured from dealers in aquarium supplies or from collectors of native plants. The plant is sometimes called "wild celery," because it is said to impart a celery-like flavor to wild ducks that feed on it.

spiralis, Linn. EEL-GRASS, TAPPE-GRASS. Fig. 3808. Hardy submerged aquatic plant: lvs. thin, linear, 5-nerved, sometimes serrate near the apex: fls. white, Aug.-Sept. N. S. to Fla. and westward; Eurasia; Austral. R.B. 20, p. 194. V. 4:157.

WM. THICKER
WILHELM MILLER

VALLOTA (named for Pierre Vallot, French botanist). Amaryllidaceae. Scarborough Lily. Greenhouse tunicate bulb: scape robust, hollow: fls. large, in many umbels, sessile or shortly pedicelled; perianth funnel-shaped, straight, erect, tube short, throat large, lobes oblong-ovate; stamens affixed at the base of the lobes and shorter than them; ovary 3-celled: caps. oblong-ovate, dehiscent from the base.—One species, S. Afr. It has been proposed that Vallota be considered a subgenus of Cyrtanthus. The latter is a group of about 20 species of plants with fls. of various colors and naked at the throat. Cyrtanthus proper and the subgenus Monella have beautiful pendulous fls. in umbels, but the plants are not so easy to grow as Vallota. It has been suggested that they be crossed with the more robust Vallota in the hope of combining their varied colors and pendulous grace with the strong constitution of the Vallota. Such a process would be similar to the one by which the noble race of Hippeastrum hybrids has been given to the world. Vallota is undeniably related to Cyrtanthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus C. sanguiineus is in the trade (p. 945).

The Scarborough lily is generally rated as a greenhouse bulb, but it can be grown by the amateur who has no glass, provided the plant can be kept over winter in a well-lighted cellar. Many persons have had no success with vallota. Such failures are generally due to the plants being kept too dry during winter. Although Baker says the leaves die down at the Cape in autumn, the plant acts like an evergreen in cultivation. Unlike most bulbous plants, the vallotas should never be dug off but kept moderately moist about the roots throughout the year. The vallota is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health for three or four years without repotting, simply by applying liquid manure to the roots occasionally during the summer. The culture of vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance below the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when shifting to a larger pot. The final potting is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is the potting soil that the plant in its greatest care in handling the roots. Allow the bulbs to project a little beyond the surface. Some gardeners prefer to repot vallota in June or July when root-action has started, but before the flower-stems have pushed up. V. purpurea likes full sunshine at all times of the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. Amateurs sometimes raise vallotas in the window-garden, one bulb in a 6-inch pot with one or two flower-stalks, but a large specimen is well worth years of care. The Scarborough lily has been cultivated by rich and poor for over three centuries, and its popular name is supposed to have been derived in the same way as the Guernsey lily.—A Dutch bark having been wrecked off the coast of England, some bulbs washed ashore and became established as garden plants. Vallota is considerably grown for the London market, and it is said that some growers succeed in blooming their plants twice the same year, in winter and summer. At the Cape, the species is said to be native to peat-hogs, which fact would account for the special winter treatment which it needs. In California the plant blooms at various times of the year. (Michael Barker.)

purpurea, Herb. SCARBOROUGH LILY. Fig. 3899. Bulb large: lvs. appearing with the fls., strap-shaped, 1½-2 ft. long, drooping down in autumn: peduncle hollow, slightly 2-edged, 2-3 ft. long: fls. scented. G. Z. 18: 348; 3: 479; 9: 333; 10: 77; 37: 89. Gn. 30, p. 245; 42, p. 253; 53, p. 44; p. 71, p. 544. G. Z. 15: 32. J. H. III. 15: 453. R. H. 1870: 31; 1871: 33. G. A. B. grandiflora). A. F. 9: 211. Gn. 2: 361. A. G. 14: 81. —The typical form has the scapes about 1½ ft. high and blood-red fls. 2½ in. across. Var. alba, Hort., is a white-fl. form. G. C. III. 36: 150. Var. major, Hort., is 3 ft. high and has fls. over 3 in. across. B. M. 1430 (as Amaryllis purpurea). Var. minor, Hort., is smaller than the typical in all parts. B. M. 552 (as Amaryllis purpurea var. minor). Var. eximia, Buli., has fls. 4 in. across, with white, feather-like blottches on the base of the perianth-segs. Var. magna, Hort., is probably the best and most robust form: fls. 5 in. across, with a white eye. Colors said to be brighter and more uniform than in any other kind. Gn. 30: 244. G. C. III. 3: 240. —V. purpurea is a S. African representative of the American genus Hippeastrum, popularly known as "amaryllis." It has individual fls. being 3-4 in. or more across. V. purpurea has a large red funnel-shaped 6-lobed fls., blooming in Sept. and later. A pair of well-grown specimens in large pots or tubs make a showy ornament for the porch. Plants have been grown with over 50 fls.trusses, each truss bearing an umbel of 4-9 fls., the individual fls. being 3-4 in. or more across. V. purpurea is a monotypic genus and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the fl. is longer than in the typical Hippeastrums and at the base of each perianth-seg., is a cushion-shaped callus somewhat different from the minute scales or distinct neck that is often found at the
VALLOTA 3429

VALLOTA VANDA 3429

VANDA (native name in India). Orchidaceae. One of the most attractive groups of East Indian orchids, nearly all species having large handsome flowers. Dwarf and short-stemmed or tall and branched, sometimes climbing to a considerable height; erect species forming compact plants, with sts. and branches well clothed with 2 opposite rows of Ivs.; species like V. teres with the leafy stem often branched, with lvs. flat or cuneate and keeled or terete, sometimes fleshy and deeply channelled; apical pointed, lobed or toothed; fls. in racemes from the axis of the lvs.; sepal and petals similar, spreading, narrowed at the base almost to a claw; labellum firmly united to the column, spurred, lateral lobes small, erect, middle lobe spreading; pollinia on a common stipe.—About 25 species, natives of India and the Malay Isls., with outlying species in China and New Guinea.

Notwithstanding the various conditions surrounding the different species of vanda in their natural habitats, the plants may nearly all be cultivated successfully under the same general treatment. When a general collection is grown, a house of east and west aspect will be found best suited to the wants of vandas. The plants require plenty of light and do not need any shade from November until the middle of February. A house of east and west aspect will require less shading during late fall and early spring than one of southern exposure, and there will be fewer ill effects from direct solar heat at all times. From February until November shading will be necessary, but it should never be too heavy or black-spot is likely to appear. The winter temperature should range from 60° to 65° F. by night and 70° to 75° by day, with a gradual increase of 10° during the summer months. A few degrees more with solar heat and ventilation will do no harm. The atmosphere must be kept moist by damping the benches and paths freely once or twice a day, and ventilation should be given whenever possible, in greater or less degree according to outside conditions. Especially during wet cheerless weather is ventilation important, even if fire heat has to be applied to retain the desired temperature. Vandas may be grown well in either pots or baskets, but the latter are preferable, as they admit air more freely to the roots, whereby they are not so liable to decay from overwatering during severe weather. The best potting or basketing material consists of chopped sphagnum moss freely interspersed with pieces of charcoal. This material should be pressed in rather firmly about the roots, leaving a convex surface when finished. A plentiful supply of water is essential at all seasons with copious syringing over the foliage in bright weather. The compost should never be allowed to remain dry for a long time. V. tricolor and similar species grow very well among foliage plants in the warm-house, where their large aerial roots, which are freely emitted from the sides of the stems, may ramble among the foliage and thereby retain moisture a long time after syringing. A few species, such as V. Amesiaca, V. currela, and V. Kimballiana, with one or two other alpine species, require about the same treatment as other species of the genus. Stock is increased by removing a foot or more of the leading growth with a sharp knife, allowing several roots to remain attached to each growth and being kept in the usual manner. These new pieces should be frequently syringed overhead until they become established or they are likely to shrivel. The old stems will nearly always send out several new growths. The principal insect enemies of vandas are several species of scale, which breed fast in a dry atmosphere. They can be kept in check by syringing with strong tobacco-water and by sponging the plants with a 20 per cent solution of alcohol. (Robt. M. Grey.)

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E. Color blue............ 1. currela
e. Color yellow.......... 2. parviflora
F. Color white or pale yellow, but streaked and shaded with brown........ 4. lamellata

KEY TO THE SPECIES.

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G. Color white or yellowish, but spotted with purple or brown........ 5. B. x amesiaca
H. Color white or pale yellow, but streaked and shaded with brown........ 4. lamellata

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VANDA (after Capt. George Vancouver, commander of the Discovery in the voyage to the north-west coast in 1791-1795). Berberidaceae. Low hardy perennial herbs, grown in the garden border.

Bhzome cespitae: lvs. pinnate, 2-3-ternately compound: scape leafless, racemose or somewhat paniculate at the summit: sepals 6, in 2 rows, obovate, petal-like, reflexed; petals 6, ligulate; stamens 6: fr. a follicle, dehiscet by a dorsal suture.—Three species, natives of the Pacific coast of N. Amer. The lvs. are somewhat like maidenhair or rue, and the fls. are rather small and white or yellow. Vancouverias demand a rich soil in rather shady positions. They are not showy plants, but have foliage of an elegant and refined type.

WILHELM MILLER.

F. TRACY HUBBARD.

3. spathulata, Spreng. St. 2 ft. high: Ivs. 2-4 in. long, waved and var. Schroederiana, Hort! Fis. white, 2 in. across; sepals and petals 27: 1136. n. . : 7. . .: . .. . . : .

13. Parishii

19. Cathcartii

20. Sanderiana


2. parvifiora, Lindl. St. 4-6 in. high: Ivs. strap-shaped, 4-8 in. long, unequally obtuse 2-lobed: racemes erect, many-fld.: fis. small, yellow; sepals and petals obovate-spatulate; labellum shorter than the sepals, middle lobe cuneate-obovate, with 2 thickened ridges. Lata

10. tricolor

18. Hookeriana

12. limbata


4. lamellata, Lindl. Lvs. channelled, leathery, obliquely and acutely bifid at the apex: fis. pale yellow, stained with red; sepals and petals obovate, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the labellum obcuneate, retuse, auriculate, having a pair of red elevated plates and 2 red tubercles just below the apex. Aug.-Nov. Philippines.


Var. Sanderiana, Hort. Tips and margins of sepals tinged with magenta-pink, the petals flushed with same color; lip deep magenta. G.C. III. 45: 415. Var. Wiegels, Hort. Fis. smaller than type; sepals and petals pure white; lip rose-pink.

VANDA

10. tricolor, Lindl. St. branched, tall, erect and leafy: lvs. strap-shaped, 10-12 in. long, channeled; raceme drooping, longer than the lvs.; fls. 2-3 in. across; sepals obovate, attenuated at the base, yellow with numerous brownish crimson spots; petals similar to the sepals in form and color but narrower; labellum about as long as the sepals, lateral lobes small, rounded; middle lobe pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6173.

13. Pariihi, Reichb. f. St. very short: lvs. few, 8-10 in. long, 2-3 in. wide, obvolutely 2-lobed; raceme drooping, 6-8-fld., on a short peduncle: fls. 2 in. across, fleshy, greenish yellow, freely spotted with reddish brown; sepals broadly ovate-oblong; petals orbicular; labellum half as long as the sepals, white striped with orange at the base; lateral lobes rounded, middle lobes labelliform. Summer. Moulmein, India. C.O. 11. Var. Mariottiana, Reichb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum white at base, with yellow spots and mauve lines. C.O. 11a.


12.imbata, Blume. St. about 3 ft. high: lvs. linear, keeled, 6-8 in. long, unequally bilab at the apex; racemes 10-12-fld., 6-8 in. long, on peduncles of equal length; fls. 2 in. across; sepals and petals spatulate, bright cinnamon-
VANDA

6-10 in. long, bearing a drooping raceme 8-10 in. long: fls. 2-3 in. across; petals and dorsal sepal oblong-obovate, spotted, lateral sepals smaller, rhomboid obovate, colored like the dorsal sepal; lateral lobes of the labellum forming a cup-like spot, middle lobe broader, ovate, white tinged with rose; petals a little larger, deep rose; side lobes of the labellum broad, incurved, yellow spotted with crimson, middle lobe exceeding the sepals, fan-shaped, reniform, purple or rose-colored. Spring. Himalaya. B.M., 5845.

17. teres, Lindl. Fig. 3903. St. long, climbing; fls. terete, 6-8 in. long; peduncle 6-12 in. long, bearing a 3-6-fld. raceme: fls. 4 in. across; sepals nearly orbicular, yellow, veined and tessellated with brownish crimson; petals smaller, yellowish, with brownish crimson, purple outside; labellum crim­son, richly colored. July-Sept. Philippines. B.R. 34:332; 17:69; 31:384. F.S. 18:1921.-By some authorities retained in Vandopsis. They have been united with Vanda or with Stauropsis. They are distinguished from allied genera by the labellum, which is firmly united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble robust vandas, with which they are usually classed for horticultural purposes. Treatment the same as for Vanda.}

VANDOPSIS (like Vanda). Orchidaceae. Includes two or three species of orchids which have been united with the genera which are characterized by the labellum, which is united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble robust vandas, with which they are usually classed for horticultural purposes. Treatment the same as for Vanda.
pyremes 5–3 in number or putamen 5–3-celled.—About 70 species, tropical and subtropical regions of the world, Austral. excepted. Considered a section of Epimedium by Prantl, in Engler & Prantl, Pflanzenreich III. 2.

The voa vanga of Madagascar is a tropical fruit that has been recommended by the American Pomological Society as worthy of cultivation in southern Florida. The fruit is imperfectly described in horticultural writings. It is said to be a delicious berry ½ inch thick, but in Mauritius it becomes 1½ inches thick. It is a globose drupe, shaped something like an apple and contains five large "stones" or bony pyremes. The plant is a shrub 10 to 15 feet high. The species is widely spread in the tropics of the Old World. It was introduced to American horticulture by A. J. Bidwell, of Orlando, Florida. In 1887, the late H. E. Van Doman reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It grows readily from imported seeds.

madagascariensis, J. F. Gmel. Glabrous shrub, 10–15 ft. high; lvs. very large, oblong, obtuse or acute, membranous, short-petioled; fls. in copious, peduncled, axillary dichotomous cymes; corolla funnel-shaped, ½in. long, with 5 spreading deltoid teeth. Madagascar.

infausta, Burch. Shrub, 4–10 ft. high, twenny-tomentose, unarmed, sometimes a small tree: lvs. ovate, oval, or suborbicular, horizontal, usually rounded or obtuse at base, greenish above, rather paler beneath; fls. greenish, 5-merous, ½in. long; calyx lobes ovate or oval; corolla-tube cylindrical, glabrous, lobes ovate; ovary 5-3-celled; fr. globose, smooth, glabrous. Trop. Afr. B.M. 3014 (as V. selagitana).—Fr. said by some to be edible. Intro. into S. Calif. F. TRACY HUBBARD.

VANHOÜTTEA (named for Louis Van Houtte, a Belgian nurseryman). Syn., Houettea. Gesneriaceae. Low branching approach-hairy shrubs, probably adapted only to warmhouse culture: lvs. opposite, fleshy, crowded at the ends of the branches, lower surface more or less canescent-felted: fls. solitary, axillary, long-peduncled, red or speckled; calyx-tube adnate to the ovary, 5-ribbed, lobes elongated, acute; corolla-tube elongated-cylindrical, lobes 5, rounded, spreading disk broad with 5 glands, the 2 posterior usually grown together; ovary almost entirely inferior: caps. with a twisted beak. About 5 species, Brazil. V. calcarata, Lam. (Houettea pardina, Decne. Gesneria pardina, Hook.). St. about 1½ ft. high, erect, rather stout, terete, brown, branched: lvs. rather stoutly petioled, elliptical, acute, rather thick and fleshy, strongly serrated, downy above and more so beneath: peduncle axillary, solitary, 1-fld., shorter than the lvs.; calyx-tube turbinate, adherent with the lower part of the ovary, segms. large, acute, spreading; corolls 1½ in., or more long, ochre-red, yellow within, spotted with deep red, especially the limb and tube inside; ovary semi-inferior, hairy, with 5 yellow glands. Brazil. B.M. 4448. H.U. 6, p. 289. Cult. probably as for achimenes and similar plants. F. TRACY HUBBARD.

VANILLA (Spanish, little sheath or pod). Orchidaceae. VANILLA. Climbing orchids whose branched stems ascend to a height of many feet, ornamental but known mostly as the source of vanilla used for flavoring and which is produced from the seed-pods. Nodes bearing lvs. or scales and aerial roots in alternate arrangement; fls. in axillary racemes or spikes, without an involucre at the top of the ovary; sepals and petals similar, spreading; labellum united with the column, the limb enveloping the upper portion of the latter; column not winged.—About 20 species in the tropics. The genus was monographed in 1887 by R. A. Rolfe in Journ. Linn. Soc., vol. 32.

The most important species is V. planifolia, the vanilla of commerce. It is a native of Mexico, but is now widely cultivated in the West Indies, Java, Bourbon, Mauritius, and other islands of the tropics, its chief requirement being a hot damp climate. The plants are propagated by cuttings varying in length from 2 to about 12 ft, the longer ones being the more satisfactory. These are either planted in the ground or merely tied to a tree so that they are not in direct connection with the earth. They soon send out aerial roots, by which connection with the soil is established. They are usually trained on trees so that the stems are supported by the forked branches, but posts and trellises are also used as supports. In most places where vanilla-culture is practised, pollinating insects are lacking and the flowers must be pollinated by hand. Plants bear their first fruit about three years after setting. They then continue to fruit for thirty or forty years, bearing up to fifty pods annually. The vanilla pods are picked before they are ripe, and dried. The
VARIEGATION. This term is usually applied to a class of variations, especially in leaf-coloration, in which the leaves become striped, banded, spotted, or otherwise variegated by yellow, white, red, or various other colors in connection with the normal green of other portions of the leaves. In the case of yellow and white variegation, the term albiflora is sometimes used, especially when the plants are largely marked with white or yellow, as in Abutilon sellowianum, Pelargonium zonale, and variegated forms of Eunymus japonica, Hydrangea hortensis, Hedera helix, Polyscia hirsuta var. Victoria, and others.

Among the dracaenas, caladiums, and codieums, besides the white variegation, there are developed beautiful reds, pinks, yellows, and so on. As a rule, the term variegation is not used in cases of color variation in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (S. thyrsiflora and S. zeylanica), Allocaasia cuprea, Cissus discolor, and others. In many such plants the markings are due in part to hairs, scales, or air in the cuticle or epidermal cells, as in sansevierias and begonias.

In some begonias, many varieties of calathea (as C. ornata var. alboflora), the epidermal cells develop decided color variation, though the plants do not usually involve the mesophyll or inner cells of the leaf. In some genera, however, especially calathea, all gradations are found between purely epidermal variegation and changes involving the deeper layers of the leaf. In Codiaeum variegatum, C. Veitchii, and C. Makoyana, the same is true of many other genera. Different kinds of variegation are shown in Figs. 3906, 3907.

True variegations may be distinguished from ordinary colorations, chlorosis, and the like, by the fact that the colored areas are usually quite sharply defined. They do not gradually blend into each other, but have definite boundaries. Cells in the variegated areas are found, as a rule, to contain the same chlorophyll bodies (chromatophores) as the ordinary green cells of the plant. However, in the variegated parts, the green color is not developed, and the chromatophores are often smaller or are somewhat swollen and vacuolated. In other cases, as in Codiaeums, modified chlorophyll is developed in the variegated parts. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and they thus store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

White or albino variegation is of course due to a lack of any coloring in the chromatophores, and sometimes to the entire absence of these bodies. The cells seem to have lost completely the power of making chlorophyll. These albicant variegations are to be looked upon as the more extreme forms of variegation, and usually arise through a feeble or atrophied condition of the plant. Seedlings raised from parents both of which are variegated in this way are usually very weak. High feeding and favorable conditions of growth, while they will not cause a variegated plant to return to its normal condition, will often stimulate the development of a normal green shoot that takes most of the nourishment and thus causes the variegated and disappearing parts. In practically all cases, as in codieums, modified chlorophyll is developed. Large yellowish oil-like drops occur in the substance of the chromatophores, and the various changes that these undergo under the action of light and the acids and oxidizing ferments of the leaf, produce the remarkable and beautiful colors of this group of plants. The coloration here, as in dracaenas and caladiums, is intensified by strong light and nourishing food. The more of the modified chlorophyll there is produced and the more rapid the changes in the modified chlorophyll brought about through the action of light and the acids and oxidizing ferments of the leaf, the more highly developed will be the colors, though here again high feeding is likely to cause the plant to revert to its normal condition.

Variegated plants or parts of plants are usually of slower growth and smaller than green plants of the same variety or the green parts of the same plant.

Variegation occurs either by bud-variation or by variations in seedlings. In the former, a variegated branch is likely to appear on an otherwise perfectly normal plant. Such variegations are easily reproduced by budding, grafting, or cuttings, but generally do not develop as seeds produced on such branches. On the other hand, when variegation develops in seedlings, the seeds of such plants usually give a number of variegated individuals, even the cotyledons being sometimes affected. In some cases the proportion of variegated plants from seeds is very large and can be increased by selection. As a rule, the form of
spotting or marking is not constant in seedlings, often being very different from the parent. In certain groups of plants which have for many years been selected on account of the horticultural value of these markings, the variegated condition has become almost a fixed feature of the plant, as in dracaenas, caladiums, and codieums. While the plants of these genera are not usually propagated from seeds, still when they are so propagated, a large number of seedlings show more or less variegation.

Darwin and many of the earlier investigators believed that these variations were started in the plant by unfavorable nutritive conditions, and much has been written on the subject as to whether or not variegation should be considered as diseased conditions.

The question as to whether a variegated condition could be transmitted to normal plants by budding and grafting has also been much disputed, but the weight of evidence indicates that in many cases such transmission certainly takes place. This has been thought to indicate the presence of some micro-organism, living either parasitically or symbiotically in the plant, and causing the changes known as variegation.

Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by micro-organisms, but is due to a deranged condition of the nutrition of the cells. Without going into the details of the matter, it may be said that the condition is characterized physiologically by a marked increase in the oxidation processes in the cells, caused by the presence of an abnormal amount, or an abnormal activity, of oxidizing ferment in the protoplasm.

These changes must, in most cases, therefore, be considered as pathological in their nature, as the vitality and vigor of the plants are reduced as a result. It is further evident that the initial causes of variegation may be quite diverse, some of the most usual being seed of low vitality; unsuitable nourishment, especially a lack of elaborated nitrogen; rapid growth in very moist soil; severe injury to the roots during a period of rapid growth of the upper parts of the plant; severe cutting back, and the like.

Though started at first through the influence of environment, variegation, when of value horticulturally, has in many cases been increased and fixed by selection till it has become almost a specific character in some groups of plants, and is considered in the botanical description of them.

A word might be said in this connection regarding autumn coloration. The production of color in autumn foliage is, as is well known, due in part to the gradual destruction of the chlorophyl when the leaves have reached maturity and approach the period of death, and in part to the action of acids on anthocyanin. Many of the destructive changes which take place in the chlorophyl are oxidation processes, the same as occur in the cells of highly colored variegated plants, and physiologically they are not very different from the changes occurring in calatheas, caladiums, codieums, and the like. The approach of maturity in the leaf, and the coming on of cool weather in autumn, stimulates the production of oxidizing ferments, and the action of these and the acids of the cell-sap on the chromogen, or color contents of the leaves, especially the chlorophyl and anthocyanin, causes many of the brilliant colors of autumn foliage (p. 431).

ALBERT P. WOODS.

VARNISH TREE: Calceolaria paniculata, Astrolabias alteissima, Rhus verniciflua, and other plants.


VEGETABLE-GARDENING. In horticultural usage a vegetable is an edible herbaceous plant or part thereof that is commonly used for culinary purposes. The product may or may not be directly associated, in its development, with the flower: the root, stem, leaf, flowerbud, partially developed seed-receptacle, mature seed-receptacle, or seeds (either immature or mature), may constitute the edible part. Some vegetables are edible only after being cooked, others (such as melons), are eaten either cooked or raw, while others, as melons, are used only in the fresh state, and are really dessert articles. In some countries, melons and tomatoes are regarded as fruits, though American usage classifies them as vegetables. Although it is difficult to make a general definition that will include all vegetables and exclude none, the use of the term "vegetable" is so well understood that there is little difficulty in making proper application of it in common speech.

All the art and science that has to do with the growing of the plants commonly called vegetables is popularly known as vegetable-gardening. The Latin term, olericulture, is sometimes used in formal writings as a synonym of vegetable-gardening, but has never become popular. Vegetable-gardening is usually considered as a branch of horticulture,
coordinated with pomology (fruit-growing) and floriculture. However, certain vegetables, such as potatoes, when grown in large areas in rotation with general farm crops, are sometimes looked on as agricultural rather than horticultural subjects. Some vegetable crops may be classified as horticultural or agricultural depending on the uses for which they are to be employed. For example, beans that are grown for the green pods are horticultural subjects, but if the same varieties were to be grown for the mature seed for sowing in the general market, they may be known as agricultural products. In like manner turnips may be horticultural subjects when grown in small areas for home or table use, but agricultural subjects when grown for fodder.

Vegetable-gardening may be divided into two great categories, depending on the disposition that is to be made of the products; namely, commercial gardening (see page 1967, Vol. IV, the article Market-Gardening), of which the purpose is to make money from the industry; and home- or amateur-gardening, in which the purpose is to raise a supply for family use. Commercial vegetable-gardening may be divided further into four fairly well-defined types: market-gardening proper, truck-gardening or truck-farming, forcing (see Vol. III, page 1254), and the growing of vegetables for canning or pickling purposes.

Market-gardening proper involves intensive methods of culture, and is most highly developed near large cities. Truck-gardening involves the growing of one or a few special vegetable crops, often as an adjunct to a system of general farming. These are usually grown in relatively large areas, and at considerable distance from market. Questions of climate, soil, and shipping facilities largely determine the location of truck-gardening areas. The South produces early vegetables for northern markets; the North produces cool-climate crops for winter storage, such as onions, cabbage, turnips, sweet corn, tomatoes, and peas for canning purposes, and cucumbers for pickling, are grown where the soil and climate are especially adapted to their culture.

Particular regions have become famous for the production of certain vegetable crops. Some examples are: Eastern Long Island for late cauliflower; Kalamaoozoo, Michigan, for celery; Rocky Ford, Colorado, and the Imperial Valley, California, for muskmelons; certain areas in Georgia for watermelons; southern Texas for the Bell pepper type of onion; Norfolk, Virginia, for spinach, kale, and early potatoes; Ontario for turnips and other root-crops. Long-distance transportation has revolutionized vegetable-gardening in this country (see Packing, Transportation), and crops which were formerly grown only near market and had a limited season are now shipped across the continent, and may be procured in the same market, from some source, twelve months in the year. Head lettuce is an example.

The practices.

While in commercial vegetable-gardening the location is determined to considerable extent by soil and climate, in the home-garden the climate and the soil are largely beyond the control of the gardener, since these matters are determined by the location of the homestead. The general effort in the home-garden is to secure products of high quality and to have a more or less continuous supply throughout the season. In market-gardening, emphasis is placed on a few varieties, whereas in home-gardening it is placed on a great variety of crops.

The old-time home vegetable-garden or "kitchen-garden" was generally unsuited to the easy handling of the soil and to the efficient growing of the plants. Ordinarily it was a small confined area in which horse-tools could not be used (Vol. III, page 1738). The rows were short and close together, so that finger-work was necessary. The custom arose of growing crops in small raised beds, probably because such beds are earlier in the spring than those that are level with the ground. With the evolution of modern tillage tools, however, it is now advised that even in the home-garden finger-work be dispensed with as much as possible. The earliest crops may be grown in raised beds to advantage, but in general it is better to secure earliness by means of glass covers or by ameliorating the entire soil by subsoil drainage and the incorporation of humus and by judiciously in the fall.

Vegetables are usually large users of manure. Near the large cities the manure is bought in carload lots or hauled with four-horse teams, and it is used every year or even two or three times a year. The reason for this frequent and heavy use of manure is the necessity of improving the physical texture of the land so that it will be loose, open, and mellow, "be early" or "quick," and hold an abundant supply of moisture. In intensive vegetable-gardening there is no "resting" of the land and no green crops to be plowed under. The vegetable matter, therefore, has to be almost entirely by barn-manures. In the larger and less intensive vegetable-growing farther removed from large cities, general agricultural practices can be employed to better advantage, such as rotation and green-manuring.

In intensive vegetable-gardening it is important to start many of the crops under glass to transplant the young plants to the open as soon as settled weather comes. See Transplanting. This is particularly true of tomatoes, very early lettuce, sweet potatoes, egg-plants, peppers, and the early crops of celery, cabbage, and cauliflowers. In the northern states muskmelons and sometimes watermelons and cucumbers are started under glass, being grown in pots, venereal "dirt bands," or upon inverted suds, whereby they are transferred to the open without disturbing the roots. Formerly the plants were started under hotbed or coldframes, structures, but of late years there has been a great increase in the extent of glass-houses or forcing-houses. These are primarily for the purpose of growing certain crops to maturity outside of their normal season in the given locality, but are often used a part of the season for starting plants intended for transplanting. In these structures conditions can be controlled better than in hotbeds, and they are especially valuable for the starting of very early plants in cold weather. However, hotbeds and coldframes are still exceedingly important adjuncts to the vegetable-garden. They are almost indispensable for the reception of early plants that have been started in a greenhouse and require "hardening-off" before transplanting into the open ground. They can be moved when the person shifts to other land, and the space that they occupy can be utilized for outdoor crops later in the season. They are extensively used for starting early plants. Much vegetable-gardening in large cities is producer, on rented lands, therefore it may not be profitable to invest in such permanent structures as forcing-houses. The first cost of hotbeds and coldframes is less than that of forcing-houses, and this is often a very important item. For management of glass structures, see Greenhouses, Coldframes, and Greenhouses.

The seed and variety problem is most complex. A mistake in the selection of a strain or kind may mean inability to meet a market demand either as regards characteristics or season. A round cabbage crowds out a pointed form. As soon as they mature, better varieties crowd out the Earliana tomato. Therefore the gardener must know varieties. Many seedsmen are making sincere efforts to provide good seed, and each
CXV. A market-garden of the modern type near a city; overhead irrigation.
year sees progress. Much remains to be accomplished in study and classification of varieties and types, and in the improvements of methods of seed-breeding and production. These problems are especially difficult because the crops are chiefly annuals, and changes take place with great rapidity. Experiment stations are now taking up this work on a sound scientific basis, a thing that could hardly be said of most early taxonomic studies. They are enjoying the cooperation of seed houses.

There are great numbers of insect and fungous pests that attack the vegetable-garden crops. See article on Diseases and Insects. The spray-pump has now come to be a necessary adjunct to any efficient vegetable-garden. However, there are many difficulties beyond the reach of the spray, particularly those that persist year by year in the soil or which attack the roots rather than the tops. For such difficulties, the best treatment is to give rotation in the cultivation and to avoid carrying diseased vines back on the land the next year in the manure. Even the club-root of cabbage can be starved out in a few years if cabbages or related plants are not grown on the area.

In its best development vegetable-gardening is essentially an intensive cultivation of the land. Often it is conducted on property that is too high-priced for ordinary farming. Land that demands rent on a valuation of $500 each, and 4,220,045 farms less than 500 each. Denning in the United States are those of the Thirteenth Census, 1910. According to the report of this census, based on the crop of 1909, the acreage devoted to vegetable production was 7,073,779 acres, including 3,698,856 acres of potatoes. The total value of all vegetables reported for that year was $418,110,154. Of the total number of farms in the United States, 4,969,540, or 78.1 per cent reported having farm-gardens; 4,261,776 gave the acreage devoted to vegetables and the value of the product, 41,731 farms reporting, vegetables to a value of over $500 each, and 4,220,045 farms less than $500 each. "Farms of the former group usually produce vegetables chiefly for sale, while on a large proportion of the other farms vegetables are raised only for home consumption." In 1909, the value of the vegetable crop (including potatoes) in the following states amounted to over 10 per cent of the total value of all crops in the respective states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Michigan, Delaware, Maryland, Virginia, West Virginia, Florida, Colorado, Nevada.

According to the figures, the production of vegetables between 1899 and 1909 increased from $237,000,000 to about $418,000,000. This includes the potato, which is grown partly as a farm crop and partly as a vegetable-garden crop. With this most important commodity omitted, the corresponding figures for the miscellaneous vegetables are $139,000,000 and $251,000,000. The increase in the production of all other horticultural products, including fruit, flowers, nursery products and nuts, is from $152,000,000 to $273,000,000. A map showing centers of vegetable production in the United States would show changes too less marked. New districts have been established almost without number in all sections of the country. The business is much more evenly distributed throughout the United States than formerly, and the states that have been regarded as great trucking states are no longer holding their preeminence without question. Thus, Illinois and Indiana have become great vegetable states, with the market-gardening for Chicago, trucking in southern Illinois for both Chicago and St. Louis, muckland trucking in the swamplands (see Muckland-Gardening, Vol. IV), and production of crops for the canny. Similar statements might be made of other states. Ten years ago, truck-farming was thought of principally as production of vegetables in the South for shipment North. The advance in the importance of vegetables in the dietary, together with the rapid growth of the more southerly cities, has brought about a marked development of the crop in the southern states and eastern parts for shipment southward, particularly the cool-season crops for consumption when the gardens of the warmer climates are practically unemployed on account of the heat. The production of cabbage and potatoes in the North for shipment southward has long been a great industry, but of recent years important centers in the growing of cucumbers, peas, beans, and of the muckland crops, celery, lettuce, and onions, have been developed. Improved transportation facilities have made California an important source of supply for eastern markets.

The canning industry as connected with vegetable-gardening has been an important factor in making possible a continuous supply of vegetables throughout the year, and this industry has recently made much progress. Three phases of this industry utilize vegetable-garden crops—factory, farm, and home canning. Factory canning, based on very extensively large acreage of crops on the truck-gardening or general farming scale. Corn, tomatoes, peas, and string beans are extensively handled by canning factories. Farm canning promises to be a means whereby the market-gardener or truck-farmer may turn his crops into greater profit when markets are glutted. Home canning is a means of preserving a supply of perishable vegetable products from one's kitchen-garden for home use.

The introduction of the ramification system of vegetables through all the months has made possible the construction of greenhouse ranges, many of which are now measured in acres. The crops are lettuce, cucumbers, tomatoes, and radishes in the order named. While the business is not so satisfactory in the autumn months, because of poor growth conditions and on account of light demand, the returns after the first of the year are sufficient to render the business profitable and to justify increases in the areas under glass. A market-garden has kept pace with the growth of the cities, although some of the famous centers are declining on account of the great increase in real-estate values. The auto truck is an important factor in making it possible for the gardener to take advantage of the lower interest charges incident to the use of more distant lands.

In the practice of vegetable production, the most conspicuous development has been the introduction of overhead irrigation. Hundreds of acres are now watered in this way. The value of this practice is evident when it is considered that moisture is more often than otherwise the factor which prevents the gardener from rea-
ing returns from improvements which are far more costly than in other lines of agriculture.

The present principle of cooperation in vegetable producing is becoming a larger factor in the selling of produce on distant markets, and garden districts not yet ready for cooperative selling are finding material advantage in unionization. In matters of the gathering of information as to their methods, in the purchase of supplies, the standardization of packages, the improvement of local market conditions, and of transportation facilities, in overseeing legislation and securing assistance through the national agencies in the solution of local problems. The Vegetable Growers' Association of America was organized in 1908 and has brought into contact with one another a large group of men from all sections of the country. The New York State Vegetable Growers' Association, formed in 1911, has been the pioneer in state organization. All of these societies, national, state, and local, are finding new fields of usefulness and are each year serving directly an increased proportion of the men in the business, while all find advantage through their promotion of the general welfare.

Education; literature.

For many years a course in vegetable-gardening has been included in the curricula of most of the agricultural colleges of the United States and Canada, and more or less attention has been given to research in vegetable-gardening problems on the part of agricultural experiment stations. However, until within the last few years, both the teaching and research in reference to this subject were in most institutions conducted as incidental matters by some member of the staff whose principal energies were demanded by other horticultural interests. At the present time much of the attention formerly is being given the subject of vegetable-gardening in educational institutions, and many of the agricultural colleges and stations now have one or more men devoting their entire time to vegetable interests. In some of the institutions several courses are offered in vegetable work, including an introductory course, an advanced course in market-gardening, and courses in vegetable-forcing, systematic vegetable crops, and under research. Professional graduate work in problems bearing on vegetable-gardening.

Vegetable-gardening is also found to be especially adapted for use as a basis for giving instruction in the fundamental principles of crop production in schools, especially in those having only a limited area of land available for "laboratory" purposes. The simple equipment involved, the possibility of using odd bits of ground, the relatively short time in which results can be expected, and the high value of the product to be derived from a small area, together with its easy adaptation to educational purposes, all render this phase of agriculture especially serviceable in such activities. The work is conducted on special plots laid out for that purpose, and on the home farms and back yards.

There is a large literature devoted to vegetable-gardening, although much of it applies chiefly to amateur or home growing. Leading current books on the general subject of vegetable-gardening are those by Greiner, Green, Landreth, Bailey, Warburton, Lloyd, and Corbett. For California one should consult Wickers' "California Vegetables in Garden and Field," and for the Atlantic South, Rolfs' "Vegetable-Growing in the South for Northern Markets," and Somer's "Farming at the South," and Rolfs' "Subtropical Vegetable-Gardening." There are many books devoted to special topics, and there are many others which in their time were of great practical value, but which are now chiefly known as recording the history of the epoch in which they were written. Only one or two works have been devoted to descriptions of varieties of vegetables, as the works of Downing, Thomas, and others have to varieties of other crops. The work is Fearing's "Field and Garden Vegetables of America," Boston, 1863, and the abridgment of it in 1866, called "Garden Vegetables and How to Cultivate Them." A list of the American vegetable-gardening literature to that date may be found in Bailey's "Principles of Vegetable-Gardening," 1901. See also Horticulture, Literature of, Vol. III. Persons who desire a cyclopedic account of vegetables should consult Vilimorin's "Les Plantes Potagères," an English translation of the first edition of which is published in London as "The Vegetable Garden." Odd and little-known vegetables are treated in Paillieux & Bois, "Le Potager d'un Curieux," Paris, 3d ed. 1899.

L. H. B.

JOHN W. LLOYD.

PAUL WORK.

Vegetable-growing in California.

It is an interesting fact that although California's horticultural prominence now rests on fruit products, the first attraction to the new state, after the gold discovery, was the wonderful growth of garden vegetables. The reports of immense size, of acreage products, and of prices secured, were so much in advance of ordinary standards, but the statements were so fully authenticated that many were drawn to California by them. These horticultural pioneers, however, soon found that immigrants from Asia and the Mediterranean region, by their cheap labor and by doing their own work, could cut under American growers who had to employ high-priced labor, and so the latter retired from the field, leaving the opportunity to the frugal and thrifty foreigner. Thus vegetable-growing from an American point of view, came to be conducted on a basis of new, and largely retains such disadvantage at present. The result is that the American largely avoids market-gardening, while Asiatics and South Europeans are thriving on it. There has been a reflection of the same disfavor in the farm growing of vegetables for home use, and our farming population, including the fruit-growers who should know and do better, is largely dependent on alien vegetable peddlers or products of canneries instead of fresh home-grown esculents, which would be cheaper and inexpressibly better than canned or transported supplies.

Fortunately there arose about twenty-five years ago a large industry in growing vegetables for overland shipment and for canning, and for which clothed in some of the pride involved in this trade with a new dignity and importance attractive to American growers. Cabbage, cauliflower, and celery for eastern shipment, asparagus for canning and for shipment, tomatoes for canning, and the like, have all become large special crops, while some other plants, like lima beans, which are chiefly grown in gardens elsewhere, have become field crops in California covering very large acreage. Such enterprises have enlisted American citizens and changed the popular conception of the dignity and opportunity of vegetable-growing. A measure of this influence, as well as of the extent of the product, may be had in the average annual shipments of green vegetables beyond state lines for several years ending with 1914:

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Carlots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichokes (Globe)</td>
<td>190</td>
</tr>
<tr>
<td>Asparagus</td>
<td>300</td>
</tr>
<tr>
<td>Celery</td>
<td>2,500</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>1,000</td>
</tr>
<tr>
<td>Cabbage</td>
<td>1,000</td>
</tr>
<tr>
<td>Potatoes</td>
<td>1,000</td>
</tr>
<tr>
<td>Lettuce</td>
<td>300</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>2,000</td>
</tr>
<tr>
<td>Mixed vegetables</td>
<td>1,000</td>
</tr>
</tbody>
</table>

The canned-vegetable output of 1914 was 2,373,182 cases (each containing twenty-four 2½-pound tins).
VEGETABLE-GARDENING

VELOZIA

divided as follows: asparagus, 800,380; string beans, 81,552; beets, 1,905; tomatoes, 1,193,705; other vegetables, 119,525.

In addition to the foregoing there is the dry-bean product, which reached a total of 3,670,000 bales of 80 pounds each in 1915, and of sugar beets which was 203,260 bales in 1914.

California conditions affecting vegetable-growing are wide and various. Nowhere else perhaps is it more essential that certain things should be done just at the right time and in the right way. If these requirements are fairly met the product is large and fine; if they are neglected the failure is sharp and complete. This fact has given rise to the impression that California is a hard place to grow vegetables, which is not true unless one lacks local knowledge or the nerve to apply it. One of the chief causes of failure is in following seasons and methods which have yielded success under conditions prevailing in the states east of the Sierra Nevada Mountains. If one begins gardening in the springtime the plants do not secure deep rooting, which is necessary to carry them to success in the dry season, and the garden is likely to be a disappointment. If, on the other hand, all the harder vegetables are sown in succession from September until February or March, there will be continuous produce throughout the winter and into the early summer. The chief shipments of vegetables from California are made during the late fall and winter and are taken right from the ground to the cars without protection or storage. Tender vegetables, like corn, beans, tomatoes, and the like, however, can be grown in the winter only in a few frostless places. They must either be pushed to a finish in the fall or sown early in the spring and carried into the dry summer as far as necessary either by natural moist land or by irrigation. There are a few localities, however, where tomatoes fruit early in the spring from fall plantings, and peppers will live through the winter and bear a second season’s crop on the old plants.

The possession of an irrigation supply is the secret of full satisfaction in California vegetable-growing, but a small amount of water, if skillfully applied, will work wonders. Irrigation will enable one to have something crisp and delicious in the garden every day in the year in the California valleys. It is true, however, that much can be done without irrigation by beginning at the close of the rainy season in September, growing the harder vegetables while moisture is ample even on the drier lands during the late fall and winter, and keeping the lower leaves and cultivated to prevent evaporation until the tender vegetables can be trusted in the open air, and continuing cultivation assiduously afterward so that moisture can be conserved in the soil as long as possible for them. That this is thoroughly practicable is seen in the fact that the large luna-bean product is grown almost entirely without irrigation from plantings made as late as May and the whole growth of the plant is achieved without a drop of water except that stored in the soil. The same is true of the corn crop; perfect corn can be grown without a drop of rain or irrigation from planting to husking. In such cases, however, the winter rains are retained in the soil by cultivation. If winter growth is made by rainfall, summer growth can be had on the same land by irrigation. It is true that irrigation demands more labor in securing all-the-year growth, which cannot be had by rainfall. With good soil and abundant irrigation it is possible to secure four garden crops in rotation within the year—the hardy plants in the fall and winter months; the tender plants in the spring and summer. Hence the adjustment of all these means to desired ends requires good perception and prompt action, and explains why those who have been accustomed to plant at a fixed date and do little but cut weeds afterward may find it hard to secure the best results in California. And yet the Californian grower has great advantages in his deep rich soil, in freedom from many diseases (which thrive in a humid atmosphere) and in an exceedingly long growing season.

Local adaptations for different vegetables are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to them. The result is that the earliest vegetables come from practically frostless places in the Colorado River region of southeast California; almost all the lima beans are grown on a coast plain from Santa Barbara southward; the celery for eastern shipment is nearly all grown on the peat lands of Orange and San Joaquin counties; the cabbage comes largely from San Mateo County; asparagus and tomatoes from Alameda County and river islands of Sacramento and San Joaquin counties, and so on. Smaller areas of these products and others not mentioned are more widely scattered, but everywhere the local soil, exposure, and climate are chief considerations.

There is prospect of great increase in all the vegetable products of California. Fresh and dried vegetables enter largely into the foreign trade with distant Pacific ports. Interstate trade is constantly increasing and canned vegetables are contracted in advance to European distributors as well as to dealers in all the Americas.

E. J. WICKSON.


VEITCHIA (James Veitch, of Chelsea, famous English nurseryman). Palmaeae. About 4 species of pinate palms native to the Fiji IsIs. and New Hebrides. The genus belongs to that section of the Arecaceae tribe characterized by a parietal ovule which is more or less pendulous and ffs. spirally disposed in the branches of the spadix, and is distinguished from Hedyscepe and allied genera by the following characters: sepals of the male fIs. chartaceous, connate at base; female fIs. much larger than the males. It is doubtful whether any species is now in the trade. V. Jodornis, H. Wendl., was cult. early in 1880-90. Lf.-segs. with a wide and rather shallow notch at the apex or obliquely truncate; sheath, petiole and rachis a dark blood-color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales: fr. 2½ x 1¼ in., oval-liguloid, orange, with a red base. G.C. II. 20:205. R.H. 1883, p. 344. Has been cult. in S. Calif., but is tender there. It has been conjectured that Kentia Van Houttei advertised in 1885 by American dealers may be a species of Veitchia. The genus is imperfectly known and of minor importance horticulturally.

VELOZIA (Vellos, a Portuguese naturalist). Vellosiaceae; or Amaryllidaceae. Usually shrubs, sometimes arborescent, adapted to the warmhouse. Sts. fibrous-woody, usually dichotomously branched: lvs. linear, rigid, tufted at the ends of the branches: peduncles 1-ft.: ffs. usually white; perianth funnel-shaped; segms. subequal, ovate-lanceolate; stamens 6, sometimes many; ovary clavate, 3-celled; ovules many, supersoned: caps. coriaceous, dehiscing at the apex.—About 65 species, Trop. and S. Afr., Madagascar and Brazil. Vellozia is closely related to Barbadecia distinguished by having more than 6 stamens, whereas Barbadeccia has only 6. V. trichophylla, Hemsl. (V. equisetoides, W. Wats., not Baker. V. equisetoides var. trichophylla, Baker). Shrub having a thick caudex, 1 ft. or more diam. and short primary branches; lvs. numerous, grass-like, scarcely stiff, 3-9 in. long in cult. specimens (often 1-2 ft. long and more rigid in wild specimens), about ½ in. wide: peduncles usually in 3’s, 1-ft.: fls. reddish lilac, very fragrant, perianth-segments acute, 1½ in. long. E. Trop. Afr. B.M. 7982. G.C. III. 34:426. Very little known in cult.
VELTHEIUMIA (named for the Count of Veltheim, 1741-1801). *Litideae*. Greenhouse and half-hardy tufted bulbous perennials; spring and summer. Leaves radical, several, oblong or strap-shaped, rather thick, herbaceous, lower longer than the upper, sheathing the base of the simple leafless scape: fls. showy, pendulous, densely grouped in a terminal raceme or spike; perianth tubular, cylindrical, persistent, lobes 6, very short, tooth-like; stamens 6; ovary sessile or subsessile, oblong, 3-celled; caps. membranaceous-scarious, the angles strongly dilated and wing-like, locally ciliolate 3-valved.—Three species, S. Afr. They are easy of cult. and are but little known in Amer.

A. *Les. green,* 2-3 in. broad.

*VIRIDIFOLIA*, Jacq. Lvs. oblong-lunate, wavy-margined, finally 1 ft. long: scape mottled with purple; raceme very dense, 3-6 in. long, 25-30-fld.: fls. 1½-1¾ in. long, yellow or reddish, with greenish tips. L.B.C.


AA. *Lvs. glaucous,* 1½ in. broad.

*Glaucia*, Jacq. Lvs. oblanceolate-lunate, acute, glaucous: scape less stout: fls. "yellow or bright red," according to Baker. B.M. 1091 (fls. white, dotted red toward the tips); 3156 (fls. reddish purple, dotted yellow below).

F. Tracy Hubbard.

**VELVET BEAN**: *Seslabium*. V. Tree: *Gynura aurantiaca*.

**VENIDIOUM** (name not explained by its author). *Compositae*. Annual or perennial herbs, grown for ornament.

Rays female: receptacle honeycombed, mostly nude; involucral scales in several rows, the outer narrower and herbaceous, inner scarious: achenes glabrous, dorsally 3-5-winged or -ridged, the lateral ridges inflexed, the medial straight, narrower; no hairs at the base of the achenes: pappus either none or of 4-5 very minute, unilaterial scales.—Eighteen species, S. Afr., 7 of which are annuals. By Hoffmann (Engler & Prantl, Pflanzenfamilien) united with Arctotis.

The following account of *V. calendulacenum* of the gardens as a garden plant is adapted from Gn. 21, page 405. It is a graceful single-flowered composite which flourishes under the ordinary treatment accorded half-hardy annuals, making a compact rounded mass 2 feet high and 3 feet wide. There is considerable diversity in its seedlings both as regards habit and the size, shape and shading of its blossoms, and careful selection in seed-saving is needful in order to secure the best forms. It is admirably adapted for cutting, as the flowers open and shut as regularly as when on the plant. This species has also been treated as a greenhouse perennial, continuing to bloom until near midwinter. The flower-heads are fully 2 inches across.

**VAR.** Differences. Less. Diffuse canescent perennial, 1-2 ft. long: lvs. mostly lunate, the terminal lobe ovate or rounded, sinuate-lobed or rounded, at first cobwebbed, afterward nude and punctate above, white-tomentose beneath; petiole 2-2½ in. long, amply cared at base, the ear decurrent along the st.—The type does not seem to be cult. but the following variety is offered as a half-hardy garden annual with dark-centered sunflower-like golden yellow heads 1-2½ in. across:

*V. calendulacenum*, *Harvey* (*V. calendulacenum* Less.), differs in having the petioles not cared at the base or with only a small ear. R.H. 1857, p. 123. Gn. 21, p. 405. G. 5:345.—Opinions differ as to its merits, and it is variable in quality. Some consider it coarse and weedy. In pots it does well; for spring bloom, sow in Aug. to Oct. in a frame in light soil and prick off into pots; if well grown it is very free-flowering.

—William Miller.


**VERATRUM** (ancient name of hellebore). *Lilacée*. FALSE HELLEBORE.

VERATRUM (name not explained by its author). *Compositae*. Annual or perennial herbs, grown for ornament.

Rays female: receptacle honeycombed, mostly nude; involucral scales in several rows, the outer narrower and herbaceous, inner scarious: achenes glabrous, dorsally 3-5-winged or -ridged, the lateral ridges inflexed, the medial straight, narrower; no hairs at the base of the achenes: pappus either none or of 4-5 very minute, unilaterial scales.—Eighteen species, S. Afr., 7 of which are annuals. By Hoffmann (Engler & Prantl, Pflanzenfamilien) united with Arctotis.

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VERBASCUM

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VERBASCUM

KEY TO THE SPECIES.

A. Anthers of the lower and longer stamens adnate-decurrent. (Section 1. Thapsus.)

B. Fls. clustered. (Subsection 1. Thapsus.)

C. Anthers very short-decurrent: corolla conoate at the throat

D. The fls. subsericeous.

E. Cauline lvs. long-decurrent... 2. thapsiforme

F. Cauline lvs. short-decurrent... 3. phlomoides

G. The fls. petiolate, pedicels about as long as or longer than the calyx.

H. Lvs. 6-9 in. long..

I. Lvs. 6-9 in. long.

J. Lvs. 6-9 in. long.

K. Lvs. 6-9 in. long.

L. Lvs. 6-9 in. long.

M. Lvs. 6-9 in. long.

N. Lvs. 6-9 in. long.

O. Lvs. 6-9 in. long.

P. Lvs. 6-9 in. long.

Q. Lvs. 6-9 in. long.

R. Lvs. 6-9 in. long.

S. Lvs. 6-9 in. long.

T. Lvs. 6-9 in. long.

U. Lvs. 6-9 in. long.

V. Lvs. 6-9 in. long.

W. Lvs. 6-9 in. long.

X. Lvs. 6-9 in. long.

Y. Lvs. 6-9 in. long.

Z. Lvs. 6-9 in. long.

aa. Fls. blackish purple.

bb. Fls. white.

cc. Fls. yellow.

dd. Fls. purple.

ee. Fls. red.

ff. Fls. pink.

gg. Fls. orange.

hh. Fls. brown.

ii. Fls. green.

jj. Fls. blue.

kk. Fls. violet.

ll. Fls. black.

mm. Fls. white.

nn. Fls. yellow.

oo. Fls. orange.

pp. Fls. red.

qq. Fls. purple.

rr. Fls. pink.

ss. Fls. brown.

tt. Fls. green.

uu. Fls. blue.

vv. Fls. violet.

ww. Fls. black.

xx. Fls. white.

yy. Fls. yellow.

zz. Fls. orange.

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califloricum, Durand. St. very stout, 3-7 ft. high; leaves ovate-acute, the upper ones lanceolate but rarely acuminate; petiole segments broader than in V. viride, obtuse, whitish with a greener base. Cole. and Wyo. to N. Calif. and Ore. G.C. III. 46:395. Gn. 62, p. 411; Intro. 1883. The long panicule of whitish, bell-shaped, drooping fls. is followed by ornamental frs. or caps.

ferruginruffi, 25, 20.

denstjlorum, 2,

glomeratum, 12.

crassifoHuID, 5.

blaitlNiold es, 8.

verba, 17.

ing with looser, more open-growing plants such as album, 3. 17. 18.26.

Boerhaavii, 11.

Blattana, 1, 8, 9.

the species will stand any amount of sun although some more showy and satisfactory species are rarely reproduce true. However, most of the hybrids naturally and freely they hybridize so readily that they question of height should be taken into account, as V. pyræntineum, 18.

Frcyntanum, 18.

VERBA-SCUM (old Latin name of the mullein used by Pliny). Scrophulariaceae. MULLEIN. Hardy biennial herbs, rarely perennial or subshrubs, more or less tomentose or floccose-lanate, sometimes grown in the garden or border for ornament.

Plants usually erect and tall: lvs. all alternate, usually soft, circinate, sinuate-dentate or pinnatifid: racemes or terminal, simple or branched: fls. yellow, fuscous, purple or red, rarely white; calyx deeply 5-cleft or parted, rarely shortly 5-toothed; corolla-tube about none, explanate-rotate, lobes 5, broad, slightly unequal; stamens 5: caps. globose, oblong or ovoid, septicidally 2-valved.—About 270 species, natives mostly of the Medit. region, widely intro. in other countries. Prop. by means of cuttings or division, although most of the mulleins usually self-sow freely. The mulleins are very easily cultivated, adapting themselves to almost any soil except a wet cold one. In America the name mullein calls to mind the common weed, V. Thapsus, but this same weed if massed in the wild border is a very showy plant and gives a tall columnar effect which is very pleasing when contrasted with looser, more open-growing plants such as farkspar, wild asters, and goldenrods. Another feature of the mulleins which makes them valuable in border planting is the generally predominating grey-green of the foliage, in fact of the whole plant, which contrasts with the bright or dark green foliage about it. The most serious drawback to the mulleins in general is that most of them are biennial and although they reproduce naturally and freely they hybridize so readily that they rarely reproduce true. However, most of the hybrids are as showy as their parents and as a whole they deserve a place in every border of size. Some of the more showy and satisfactory species are V. olympicum, V. phlomoides, V. Chaiiiii, V. nigrum, V. phlomoides, V. pannusum, and V. cupreum, although many others are almost equally as good. In choosing varieties the question of height should be taken into account, as some species grow much taller than others. Nearly all the species will stand any amount of sun although some of them, as V. phlomoides, do better in partial shade as the flowers do not open well in strong sunlight.

mucronatum, 14.

mucronatum, 14.

nigrum, 17.

tome, 10.

pyramidale, 19.

pyramidatum, 16.

rhodonanthus, 25.

Schulzer, 18.

semi-leianthum, 18.

simplex, 13.

sinuum, 15.

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Section I. THAPSIUS

1. Thapsus, Linn. (V. Blättraria, J. A. Schmidt, not Linn. V. giganteum, Willk. V. Schreber, Mey.), COMMON MULLEIN. Fig. 3909. Biennial, 2-6 ft. high, densely yellowish tomentose; radical lvs. oblong-elliptic or elliptic-lanceolate, crenate, attenuate to the petiole; cauline lvs. narrowly decurrent from If. to If.; fls. yellow, in a spike, shortly half-decurrent, the wings violet-bearded. Caucasus. G.C. III. 14:785. Gr. 40, p. 76.

2. thapsiforme, Schrad. (V. densiflorum, Bertol.). Biennial, about 2-5 ft. high, densely yellowish tomentose; radical lvs. oblong-elliptic or elliptic-lanceolate, crenate, attenuate to the petiole; cauline lvs. narrowly decurrent from If. to If.; fls. yellow, in fascicles forming a long raceme; calyx tomentose, segms. lanceolate; corolla small, concave. Eu., especially N. and Cent., and Cent. Asia, also naturalized in N. Amer. Gn. 28, p. 148.—A familiar weed in rocks and uncultivated fields. Hybridizes very readily with other species. There is also a white form of the species. This plant varies considerably in the color and size of its fls. and probably occurs under several trade names in Eu. A first-year rosette in a pot makes an attractive plant (Fig. 3909).

3. phlomoides, Linn. Biennial, 4-6 ft. high, whitish- or yellowish tomentose: radical lvs. crenulate, elliptic or oblong-lanceolate, attenuate to the petiole; cauline lvs. amplexicaul, usually coriaceous or very shortly decurrent: fls. yellow, in very short fascicles forming a long raceme; calyx tomentose, segms. triangular-lanceolate; filaments white-tomentose. S. Eu. and Caucuses. Gn. 40, p. 501; 41, p. 555. Var. album, Hort., has cream-colored fls.—The species has become naturalized in E. N. Amer.

4. longifolium, Ten. Biennial, 3-4 ft. high, covered with white or yellowish flocculent tomentum: lvs. numerous, densely superposed; lower 1½-2 ft. long, narrowly ovate or oblong-lanceolate, acuminate, base narrowed to a short petiole; upper sessile, base amplexicaul; all undulate: infl. sessile, 1 ft. long, 3½ in. diam., with innumerable short appressed branches: fls. golden yellow, about 1 in. across; calyx stellate-tomentose, segms. lanceolate. S. Eu. B.M. 7707. Var. pannosum, Hort. (V. pannosum, Vell., no Linn. V. Blattarioidea, Lam. V. globarium, Willd. V. vieidulum, Poir.). Biennial, 1½-3½ ft. high, whole plant green, somewhat viscid-hispid or nearly glabrous: fls. golden-yellow or glaucous-green or glaucous-hispid, especially beneath, oblong; lower petioled, dentate or subulate-pinnatifid; upper sessile, coriaceous-clasping or shortly decurrent: raceme glandular-hisrate, segms. lanceolate-linear; filaments purple-bearded. Caucasus. G.C. III. 14:785. Gr. 40, p. 76.

5. crassifolium, Hoffm. & Link. Biennial, about 3-4 ft. high, densely yellowish tomentose: lvs. obovate-spatulate, 6-8 in. long, crenulate; cauline long-decurrent: fls. fasciated in a spicate raceme, yellow; corolla flat-topped; filaments glabrous. Portugal.—Closely allied to and possibly only a variety of V. thapsiforme. One of the few species said to thrive well in a light sandy soil.

Section II. LYCHNITIS

10. niveum, Ten. Biennial, about 2 ft. high, possibly more, white-tomentose: lvs. ovate-oblong, ovate, undulate; lowest petioled, the others sessile, acuminate, rather spoon-like, shortly half-decurrent, the wings narrowly ovate, acuminate; raceme simple and very dense: fls. yellow, rarely white, solitary, subulate; calyx-segms. ovate, acuminate; filaments white-tomentose. S. Italy.

11. Boerhaavia, Linn. Biennial, about 2 ft. high, snow-white, tomentose-floccose, finally deciduous: st. reddish, leafy; lvs. crenate-dentate; lower ovate, obtuse, petioled; upper coriaceous-clasping, acute or acuminate; fls. in a long rigid spike-like raceme, yellow, in subulate fascicles; calyx tomentose and glandular-viscid; segms. lanceolate; corolla-violet-spotted at the throat; filaments violet-bearded. Medit. region.

12. glomeratum, Boiss. Biennial, 4-6 ft. high, densely grayish yellow, ragged, tall and stout: lower lvs. 1 ft. or more long, 3-4 in. broad, subentire, subulate, oblong-lanceolate, base attenuate; upper lvs. ovate, acuminate from a cordate-subauriculate base: infl. thyrsoid, subumbellate: fls. subulate in 3-4-flowered glomerules, yellow; calyx-segms. lanceolate; corolla strongly tomentose outside; filaments yellowish bearded. Asia Minor.

13. simplex, Labill. Perennial, about 2 ft. high, many-stemmed, base shaggy, densely white or yellowish, ragged: st. leafy below then prolonged into a long (6-12 in.) simple, strongly interrupted, rarely

VERBASCUM

Section 1. EUTHAPSI

1. Thapsus, Linn. (V. Blättraria, J. A. Schmidt, not Linn. V. giganteum, Willk. V. Schreber, Mey.), COMMON MULLEIN. Fig. 3909. Biennial, 2-6 ft. high, densely yellowish tomentose: radical lvs. oblong, crenate, petioled; cauline lvs. decurrent from If. to If.; fls. yellow, in a spike, crenate or rather entire, attenuate to the petiole; cauline diminutive, oblong, sessile; fls. yellow, in a simple raceme or slightly branched panicle, large, 1½ in. across, indigo-blue to purplish lilac; calyx densely glandular-hisrate, segms. broad-lanceolate; filaments orange- or purple-woolly. S. Russia. B.M. 1037. B.R. 558.

7. Wiedemannianum, Fisch. & Mey. Biennial, 1-3 ft. high, appressed, arachnoid woolly; st. stout, tall, leafy below; lvs. lanuginose; radical oblong or elliptic, 3-5 in. long, crenate or rather entire, attenuate to the petiole; cauline diminutive, oblong, sessile; fls. yellow, in a simple raceme or slightly branched panicle, large, 1½ in. across, indigo-blue to purplish lilac; calyx densely glandular-hisrate, segms. lanceolate-linear; filaments purple-bearded. Caucasus. G.C. III. 14:785. Gr. 40, p. 76.

Subsection 3. BLATTARIA

8. virgatum, With. (V. Blättraria, Vell., not Linn. V. Blattarioles, Lam. V. globarium, Willd. V. vieidulum, Poir.). Biennial, 1½-3½ ft. high, whole plant green, somewhat viscid-hispid or nearly glabrous: fls. golden-yellow or glaucous-green or glaucous-hispid, especially beneath, oblong; lower petioled, dentate or subulate-pinnatifid; upper sessile, coriaceous-clasping or shortly decurrent: raceme glandular-hisrate; pedicels in 2's or 3's, rarely solitary; fls. yellow, throat violet; filaments violet-woolly. Cosmopolitan.

9. Blättraria, Linn. MOTH MULLEIN. Biennial, 8 in. to 4 ft., glabrous and green; st. usually tall; lvs. oblong or oblong-lanceolate, dentate; lower attenuate to the pedicle, undivided or subulate-pinnatifid; upper sessile, coriaceous-amplexicaul, acute: raceme very long and lax: fls. rather large, yellow, rarely white, borne on solitary pedicels; calyx glandular, segms. linear-lanceolate; corolla-throat violet: caps. globose, longer than the calyx. Eu., N. Asia.—Distinguished from V. virgatum, which it resembles, by the solitary pedicels.

Section II. LYCHNITIS

Subsection 1. THAPSOIDEA

6. ovalifolium, Don (V. formosum, Fisch.). Biennial, about 2-3 ft. high, gray-tomentose: lvs. large, ovate, petioled, coarsely and rather double-crenate, coriaceous, petioled, hoary beneath; upper lvs. coriaceous-clasping: fls. sessile or nearly so, solitary, large, 1½ in. across, bright yellow, in a spike; calyx densely white-tomentose, segms. broad-lanceolate; filaments orange- or purple-woolly. S. Russia. B.M. 1037. B.R. 558.
slightly branched raceme: radical lvs. 1–2 in.; long, crenate, ovate- or oblong-lancedolate, very obtuse, long-petioled; cauline lvs. sessile or nearly so, arranged in remote glomerules of 2–5: fls. yellow; calyx white-tomentose, segms. oblong, mucronate; filaments white-bearded. Syria. G.C. III. 36:2.

Subsection 2. GLOMERATA.

14. mucronatum, Lam. Biennial, several feet high, densely white, ragged-tomentose; st. erect, crowded, leafy, large-petioled; lvs. thick; radical lvs. long-petioled, sometimes somewhat lobed and somewhat petioled; cauline lvs. oblong, rather long-decurrent; uppermost subtubularc, glomerules of fls. globose, forming a long virgate, interrupted raceme: fls. sub-sessile, white; calyx silky-lanate, segms. broad-lanceolate; filaments white-woolly. Asi Minor and Crete.

15. sinuatum, Linn. Biennial, 2–3 ft. high, more or less densely yellowish or gray-tomentose; radical lvs. oblong-glanulate, sessile, sinuate-pinnatifid, usually undulate; upper cauline lvs. oblong, acute, entire and short-decurrent; panicle pyramidal; branches elongated, twig-like: fls. yellow, rarely white, in remote glomerules; calyx tomentose, segms. short-lanceolate; corolla small; filaments white-woolly. Medit. region and Canary Isls.

Subsection 3. PYRAMIDATA.

16. pyramidatum, Bieb. Biennial, 2–4 ft. high, tomentose; st. stout; lvs. green above, canescent beneath; radical lvs. large, oblong, base long-narrowed, doubly and obtusely lobed or crenate; upper lvs. sessile, ovate, auriculate-cordate, long-acuminated; panicle pyramidal, sometimes 2 ft. long, crenate; branches finally rather lax; fls. yellow, solitary or in pairs; corolla tomentose, segms. oblong or ovate; corolla long; filaments purple-woolly. Caucasus.

Subsection 4. LYCHNITIDEA.

17. nigrum, Linn. (V. Hinski, Friv.). Biennial, 2–3 ft. high; st. tall, angled above; lvs. green above, more or less tomentose beneath; lower long-petioled, ovate or oblong, base cordate; uppermost sessile, base rotundate; infl. a simple or slightly branched elongated raceme: fls. small, yellow, in many-fl., lax, filaments; calyx hirsute, segms. lanceolate-subulate; inferior ovary; filaments purple-woolly. Eu. and Asi Min. Gn. 27, p. 173. Var. album, Hort., has white fls. G. 15:159. Gn. 41, p. 551.

18. Chatzii, V. Biennial, usually about 3 ft. high, whitish tomentose; st. somewhat angled above; lvs. ovate to oblong, green or tomentose below, canescent; lower 3–6 in. long, petioled, base cuneate, more or less crenate or rather incised; upper lvs. sessile, base rotundate; racemes paniculate, fascicled and laxly several-fl.; fls. yellow; calyx-segms. lanceolate-subulate; corolla-lbs. nearly rotund, filaments purple-woolly. S. Eu. Gn. 27, p. 172; 78, p. 435. Var. album, Hort., is a white-fl. form.—This species is said to reach a height of 10 ft. and to act like a true perennial in warm soils. V. orientale, Bieb., is considered the same by some authorities; apparently not in cult. The vars. sublanceatum, Hort., and Fremynatum, Hort., are really hybrids.

19. pyramidalae, Host. (V. speciosum × V. orientale). Biennial, 3–4 ft. high, white-pilose: lvs. rugose-crenate, acuminate, radical and lower cauline lvs. oblong, broad, upper smaller, remotely crenate; fls. small, collected in glomerules, yellow; calyx densely tomentose; corolla-lbs. obovate, red-brown-maculate at base; filaments white or purplish hairy. Austria.—Neither of the parents are in cult. and it is questionable what the material in the trade under this name really is; possibly it is V. pyramidatum.

20. Lychnitis, Linn. Biennial, tomentose: lvs. green above, slightly acutely palmatifid or linear-oblong, beneath; radical lvs. oblong-elliptic, narrowed to the petiole; upper lvs. sessile, lanceolate; infl. panicked; branches erect-spread, angled: fls. small, yellow or white; calyx tomentose, segms. lanceolate, acute, tips glabrous; filaments white-woolly. I. 37:468.

21. pulvurulentum, Vill. Biennial, 3–9 ft. high, densely white-floccose-tomentose: lvs. entire or obliquely crenate; radical lvs. oblong or elliptic, attenuate to a short petiole; upper lvs. ovate or rotundate, clasping: infl. a pyramidal panicle: fls. yellow, in slightly remote fascicled racemes; calyx densely floccose, segms. linear-lanceolate; corolla small; filaments white-woolly. Eu. Gn. 73, p. 422.

22. sondarinum, Schrenk. Biennial, several feet high, white-tomentose: lower lvs. lanceolate, acute, narrowed to the petiole; cauline sessile, oblong, cordate-lanceolate; uppermost subtomentose, cuspitate; racemes panicled: fls. in fascicled, yellow; calyx-segms. lanceolate; filaments white-bearded. Sonnegara.


Subsection 5. LEVANTIA.

24. leianthum, Benth. Biennial, up to 14 ft. high, covered with a dense white felt; basal lvs. very large, sometimes 4 x 2 ft.; cauline lvs. oblong, crenate, rugose, base decurrent, lax, whitish tomentose on both surfaces: infl. much branched up to 7 x 3 1/2 ft., laxly many-fl.; fls. bright yellow, ¾ in. across; calyx-segms. small, oblong-lanceolate, rather obtuse. Asia Minor. G.C. III. 44:171. Gn. 72, p. 500.

Subsection 6. BLATTARHOIDEA.

25. rubiginosum, Waldst. & Kit. Biennial, about 2–3 ft. high; st. glabrous or pubescent above; lvs. green, supersedent beneath; cauline lvs. ovate, petioled; upper petioled; superior ovary; calyx-segms. obtuse or ciliate-clasping; racemes laxly branched, somewhat paniculate; pedicels in 2's or 3's, rarely solitary, twice or many times as long as the calyx: fls. reddish purple; calyx-segms. linear-lanceolate; filaments purple-woolly. S. Eu. and Caucasus.—Boissier Flora Orientalis suggest that this is a hybrid between V. pharnaceum and V. nigrum. Var. ferrugineum, Benth. (V. ferrugineum, Mill.), has a long simple raceme and slightly larger and longer-peduncled fls. than the type. Horticultural form, possibly a hybrid.

26. phoeniceum, Linn. (V. ferrugineum, And.) PURPLE MULLEIN. Biennial, about 5 ft. high: lvs. glabrous above, short-puberulent beneath; radical rosulate, ovate or oblong-hispid, attenuate to the short petiole, obtuse, obtusely crenate or repand; cauline lvs. ovate, oblong or lanceolate, acute; fls. purple or red, in a simple slender raceme; calyx glandular, obtuse segms. elliptical; corolla glabrous; filaments purple-woolly. S. Eu. Eu., Caucasus, and Persia. G. 15:185. Gn. 22, p. 377; 27, p. 173; 41, p. 556. A.G. 13:639. The name phoeniceum was undoubtedly suggested by the Phoenician purple and not by the habitat. One of the parents of nearly all the hybrids having fls. of purple, violet, rose, pink, and lilac shades. The fls. open poorly in sunshine, preferring to the habitat. One of the parents of nearly all the hybrids having fls. of purple, violet, rose, pink, and lilac shades. The fls. open poorly in sunshine, preferring to the
In propagating general stock, sow the seed in February and pot to 2-inch pots as soon as the seedlings are up an inch. A temperature of 45° to 50° will answer, but they should have full light. There is no place equal to a mild hotbed for young verbenas. About April 15 plunge the pots in a few inches of soil in a mild hotbed. Lift them now and then until the roots which go through the bottom of the pot, in order to check growth and hasten flowering. Customers want to see them in flower before buying, and most of them wait till the end of May. However, verbenas may be planted out early in May, as a slight frost will not injure them.

The evolution of the garden verbenas has taken place in about seventy-five years. Although the history can be made out with considerable clearness, yet the botanical origin of the present florist's race, as to the species involved and the extent to which they have contributed, is not satisfactorily recorded. It is probable that four species have been more or less fused in the race or group known as *Verbena hybrid*.—*V. chaixii*, *V. phlomoides*, *V. officinalis*, and *V. cneorum*. In Fig. 3910. For an historical account of the development of the garden verbenas, see Cowen, "Cyclopedia of American Horticulture," Vol. IV.

It is impossible satisfactorily to classify the hybrid garden verbenas according to their botanical derivation. They are conveniently classed according to color of flowers into: (1) Selfs, or one-colored varieties; (2) Oculatas, or eyed varieties; and (3) Italians, or striped varieties. As to habit they may be divided into: (1) Standards, those of the ordinary loose, spreading growth; and (2) Compacts, which are much reduced in stature and of more condensed form. Verbenas now in cultivation are shown in Figs. 3910, 3911.

Latin trade names probably mostly or entirely belong with hybrid race of verbenas, such as *compacts*, *coecina*, *grandiflora*, *monstrosa*, *carulea*, *candidissima*, *italica*, *auriculeflora*, *striala*.
VERBENA

Branches erect; lvs. oblong-triangular, base cuneately truncate or subcordately attenuate into the evident petiole, pinnatifid lobed or deeply serrated and incised, upper lvs. sublanateolate, sessile, incisedly pinnatifid; spikes terminal, pedunculate, subternate, flat or convex; bracts ovate: calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs; corolla-tube glandular-pubescent, thrice as long as calyx; limb large, rose-purple, paler beneath, obovate lobes deeply emarginate. S. Brazil, Paraguay, and N. Argentina. B.M. 3628.

ccc. Fls. white.

4. teucrioides, Gill. & Hook. Fig. 3910. Characterized by fragrant white fls. in very long clusters: sts. cespitose, rooting at base, ascending, terete, openly and copiously hirsute; lvs. ovate to oblong-triangular, base entire, sessile or nearly so, obtusely serrate, margins revolute, veiny-rugose, glandular-pubescent above, subternately hispidulous on veins below; spikes terminal, solitary, glandular, hairy, lax, 5-9 in. long: bracts subulate-lanceolate, ciliate: calyx nerve, twice as long as bracts; corolla yellowish white or pinkish, long exserted, twisting in age, fragrant. S. Brazil, Uruguay, Argentina, Chile, and Peru. P.M. 5:243. B.M. 3904.

bb. Fls. purple or rosy purple.

c. Bracts half as long as calyx: plant a subshrub.

6. tenera, Spreng. (V. pulchella, Sw., not Hort.). Herbaceous perennial; sts. cespitose, decumbent, rooting; branches slender, 4-angled, ascending, sparsely hairy; lvs. deciduous into the short petiole, 3-parted and again pinnatifid into acute, linear, entire, subrevolute divisions, sprinkled with short hairs; spikes terminal pedunculate: calyx elongated, strigose pubescent or hairy, sprinkled at angles with short stipitate peltate-form glands, twice as long as bracts; corolla rose-violet; anther appendages barely exserted, clavulate, subcurved. S. Brazil and La Plata region. Var. Maonettii, Hort., by some supposed to be a hybrid between V. tenera and V. incisa and by others to be a form of V. tenera, has rosy pink or carmine fls. rayed with white-margined corolla-lobes. Intro. from Italy and some...
times called Italian verbena. The name is variously spelled. Gn. 73, p. 31.

cc. Bracts about as long as calyx or a little shorter: plant annual.

7. crinosoides, Lam. (V. multi{tida), Ruiz & Pav. V. pulchella, Hort., in part). Moase VERBENA. Annual or perennial: st. strigose hairy or somewhat hisrate, branching, decumbent, rooting; branches ascending; lvs. ovate in outline, cuneate base decurrent into the petiole, deeply 3-parted and the divisions pinnatifid into narrow linear acute lobes, subrevolute on margins.

Variable species characterized by distinct finely cut foliage and rosy lilac to deep purple fls., but the clusters and individual fls. are too small to make it popular.

bb. Fls. lilac: plants annual.

cc. Lvs. twice pinnatifid.

8. bipinnatifida, Nutt. (V. pulchella ssp. of some seeden. V. montana, Hort., in part). Perennial, prostrate and rooting at base; st. stout, upright, branched, 6-18 in. high: lvs. rather thick, petiolate, 1-2½ in. long, scabrous above, ovate in outline, bipinnately partited or 3-parted into numerous oblong, rather acute lobes 1-3 lines broad: spikes solitary, dense to rather lax, at first capitulate, becoming 2-4 in. long in fr.: corolla 5-8 lines long, purple or lilac, limb 4-5 lines broad, lobes emarginate to obsolete; throat of corolla provided with a palisade of short hairs; upper stamens bearing each a small oval to oblong purplish gland. S. D. to Mex. east of the Rockies.—Fls. become bluish purple in drying.

cc. Lvs. once pinnatifid.

9. canadensis, Brit. (Buchnera canadensis, Linn. V. Aubletia, Jacq. V. Aubletia var. Drummundi, Lindl. V. Drummondii, Hort. V. Lomberti, Sim's. V. mon­tana, Hort., in part). Fig. 3912. Perennial, pubescent, with rather stiff hairs or glabrate: branches ascending from a sometimes creeping rooting base, 6-18 in. high: lvs. ovate or ovato-oblong in outline, 1-3 in. long, truncate, broadly cuneate or subcordate at base and the petiole more or less margined, incisedly lobed and toothed, often deeply 3-lobed: spikes peduncled, dense, short and capitate in early fl., becoming 2-4 in. long in fr. :bracts subulate, mostly shorter than the calyx—these and the calyx densely glandular-appressed: calyx-teeth unequal, filiform-subulate; corolla 6-10 lines long, from bluish purple or lilac to rosy purple or white, frequently approaching blue in dried specimens; limb ½-¾ in. broad, lobes oblong or obovate, emarginate and more or less revolute near the sinuses, throat provided with palisade of short white hairs; upper anthers bearing each a light brown, oblong gland which is hardly exserted. Colo. and Mex. eastward across the continent. J.H. 308; 2200. B.R. 294; 1925.—Reported as producing many garden and spontaneous hybrids. Garden forms are of stouter habit, less inclined to root at base: lvs. larger, dark shiny green above, more conspicuously veiny, ciliolate and individual fls. larger, and the color variation more striking.

Many forms have a rich spicy fragrance quite different from that of the hybrid verbena. On account of the robust healthy nature of V. canadan­sis, it has been frequently recommended in horticultural literature as desirable for hybridizing with the hybrid verbena to improve their constitution. The cross would probably be too radical for best results. It is to be regretted that this charming species which is thought well of in Eu. should be neglected in its native country.

V. radicans is listed as an alpine species of trailing habit and with crimson fls., suitable for rock-gardens. The V. radicans of botanists (Gill & Hook.) is an Andean species with procumbent rooting st., glabrous divided lvs. with ultimate segments blan­colored fragrant fls. in short head-like spikes. J. H. COHEN. L. H. B.'

VERBENA, LEMON: Lippia. V., Sand: Aervaia.

VERBESINA (probably a meaningless alteration of Verbena). Composita. CROWNBEARD. Annual or perennial herbs, or some tropical species shrubby.

Leaves alternate or opposite, often decurrent: heads corymbose or solitary, of yellow or white fls.; rays sometimes wanting, pistillate or neutral: achene flattened or those of the rays 3-sided, their margins winged or not;
VERBASINA

pappus of 2 (1–3) awns, sometimes with 2 or 3 intermediate scales.—About 50 species, American. About a half dozen hardy perennial verbasinas have slight rank as garden plants, but the competition among yellow-flowered autumn-blooming composites is so great that verbasinas have little chance. They make acceptable wild-garden and back-border subjects.

occidentalis, Walt. (V. Siegbeschka, Michx. Phaethusa occidentalis, Brit.). Hardy perennial herb, 4–8 ft. high: lvs. ovate (uppermost oblong-lanceolate), acuminate, or rose, borne in the following species in terminal cymes: heads not glomerate, several to many exclusively tubular: involucre of dry or partly herbaceous, much-appressed, July–Sept. Rocky hills, W. Texas.

c. Plant about 1 ft. high.

Vernonia (after Wm. Vernon, an English botanist and traveler in North America). Compositae. Ironweed. Perennial herbs or in the tropics shrubs and trees.

Leaves alternate, pinnately veined: fls. usually purple or rose, borne in the following species in terminal cymes: heads not glomerate, several to many exclusively tubular-flowered: involucre of dry or partly herbaceous, much-appressed heads: peduncles not branched: involucre green, the filiform tips often red-dishe and the pappus often purplish. Plains, Mo., Kans. to Texas. July–Sept. Var. alba, Hort., has white fls.

a. Heads 60–70-fld.

b. Lvs. narrowly linear.

c. Plant about 1 ft. high.


cc. Plant 2–4 ft. high.

Lettmanii, Engelm. St. fastigiatly and cymosely much branched at the summit: lvs. 2–4 in. long, only 1 line wide, much crowded and very numerous; margins not revolute: fls. numerous, ½ to 1½ in. long, 10–14-fld. July–Sept. Sandy soil, Ark.

bb. Lvs. not narrowly linear.

c. Bracts of involucre tipped with slender awns.

noveboracensis, Willd. Fig. 3913. St. 3–6 ft.: lvs. oblong to oblong-lanceolate, 3–9 in. long: heads in an open cyme: involucre commonly brownish or dark purplish: fls. deep purple, rarely white. Usually in moist soil. July–Sept.—The only common species of the E. U. S. and often used in the wild-garden.

cc. Bracts not awned.

d. Plant tomentose.

Baldwini, Torr. St. 3–7 ft. high: lvs. oblong to ovate-lanceolate, 4–8 in. long, rather numerous: bracts greenish, acute or acuminate, tips spreading or reflexed: fls. purplish, blooming earlier than most species, in July and Aug. Prairies, eastern Mo. to Texas.

dd. Plant glabrous.

x. Lvs. thin.

altissima, Nutt. (V. maxima, Small). St. 5–10 ft. high: lvs. veiny, lanceolate or lanceolate-oblong, 4–12 in. long, usually long-acuminate and finely serrate: infl. loosely branched and open, the fls. purple: bracts obtuse or merely mucronate-tipped, closely appressed. July–Sept. W. Pa. to Ill., La., and Fla.

ee. Lvs. thickish.

fasciculata, Michx. St. 2–5 ft. high: lvs. somewhat obscurely veined, linear to oblong-lanceolate, 3–6 in. long: heads numerous and crowded on the branches of the cyme, 20–30-fld.: bracts obtuse or some of the upper mucronate-acut, closely appressed. July–Sept. Ohio and Ky. to the Dakotas and south to Texas. Grows on prairies and in moist soil; variable southward.

3913. Isolated specimen clump of ironweed. — Vernonia noveboracensis.
VERONICA

V. Arachnoidea, André. Glabrous shrub, 3-6 ft. high; lvs. sericeous, linear-lanceolate; f-ls. reddish violet. Uruguay.—V. glaucifolia, Hort. Robust: f-ls. in panicles, narrow of violet-tose.

P. W. BARCLAY.
N. TAYLOR.†

VERÓNICA (named in honor of St. Veronica). Scrophulariaceae. Speedwell. Annual and perennial herbs, shrubs, or rarely trees, one group of which, mainly European and American species, are hardy in the North, the other group, New Zealand species, are hardy in California and similar climates and are also somewhat used as greenhouse plants.

Leaves opposite, rarely whorled or rather few; cauline lvs. very rarely alternate; floral lvs. always alternate: fls. disposed in terminal or axillary bracteate racemes, or rarely solitary in the axes of alternate lvs., blue, purple, flesh-colored, or white, never yellow; calyx 4-6-parted, but they survive the winters outdoors, usually short, limb spreading, 4-5-cleft; stamens 2: caps. compressed or turgid, 2-grooved, loculicidally dehiscent, usually obtuse or emarginate.—About 300 species, mostly natives of the temperate and colder regions, a few in the tropics. Veronica was monographed by Bentham in DC. Prod. 10:453-491 (1846), 158 species being then known. About 200 species are now known, very widely distributed.

All are showy free-flowering plants, used, except the shrubs, as garden perennials or annuals, and are propagated by seeds, the perennials also by division, the shrubs by cuttings in spring or summer. They succeed in any good garden soil in a sunny situation. The low-growing forms are good rock-plants; the taller are adapted to the herbaceous border. The shrubby forms are greenhouse plants or grown only in warmer parts of the country, particularly California, where they are everblooming, and where they do well along the coast even in exposed places by the sea. The shrubby species are mostly natives of New Zealand. They are well reviewed in The Garden 45, page 506, and 28, page 292. Some of them have enjoyed a considerable popularity in England, where they are generally seen in cool conservatories, but they survive the winters outdoors in the most favored parts of the British Isles. The first hybrid was raised in 1848 by Isaac Anderson-Henry (then Isaac Anderson), a noted hybridizer. This gentleman continued his experiments for several years, using V. speciosa, V. salicifolia, and V. elliptica. His work was continued by others, and most of the hybrid veronicas of today have the parentage above indicated, with the blood of V. speciosa generally much in evidence. If a collective name for veronica hybrids is desired, V. speciosa var. hybrid is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but a harder race will probably be secured by using V. Traeriki and its allies, which have been introduced more recently. Some of these are V. Columnea, V. anomala, V. monticola, and V. pinelioleoides.—all well known to the American trade. A third and still harder group of the New Zealand speedwells is the truly alpine group known as whitepod veronicas. These should be hardy in many northern rockeries. They are unknown in America now. The best of the group is said to be a form of V. cupressoides, known to English trade as V. saliciniformis. Others in cultivation are V. Hectori, V. Armstrongii, and V. lycopeoides. (A. P. Wyman.)

The New Zealand veronicas (Cockayne).

In New Zealand the veronicas comprise a marked feature in the flora, being represented by many shrubby and semi-shrubby kinds. Several of these species are well-known evergreen garden plants in California and parts of Europe. The following comment on the New Zealand veronicas is by L. D. Cockayne, Wellington; and the systematic treatment of these species is also founded on manuscripts contributed by him.

Excepting the Tasmanian V. formosa, the shrubby species are natives of New Zealand where they occur in all kinds of stations and at all altitudes. In their native land, and in Great Britain and Ireland, they are now widely cultivated, but, unfortunately, none can be considered perfectly hardy in the northern states, though, where the cold of winter does not sink much below 12° F., many of the species should thrive admirably. All can be readily propagated from seeds or cuttings. If the latter are taken from adult plants in the autumn, they will bloom during the succeeding summer, and if boded out on the rockery are most effective.

The genus in New Zealand contains more than 100 species, while nearly all of these can be subdivided into several distinct varieties. There are also astonishing differences in their growth-forms. Some are trees and others shrubs, which latter are erect or prostrate, compact and ball-like or wide-spreading, densely leafy or the leaves reduced to adpressed scales so that the plant resembles a cypress (the whipcord veronicas). The flowers also differ considerably and may be in small heads, rosettes of different length, corymbbs, or long branched panicles. The usual color is white, but crimson, lilac, violet, and blue are met with. Usually the leaves are bright green and perhaps glossy, but in some species, and this is a sign of hardiness, they are of a pleasing pale glaucous hue.

The compact shrubby species lend an admirable effect to the garden landscape when massed together on banks, many looking as if trimmed into a ball-like form by the gardener's hand. Most forms tolerate clipping to any extent. Some, especially V. elliptica, V. angustifolia, and V. leptophylla, make excellent evergreen hedges. A small form of the polymorphic V. buxifolia can be used as an edging after the manner of the box.

The species are exceedingly difficult to determine and many are known in garden nomenclature, while unpublished names are frequent. Natural hybrids also occur and this brings in further confusion. Also, there are a number of garden hybrids in cultivation, mostly between V. speciosa and its nearer relatives. Much more important for colder countries are the
hybrids to crossing the more hardy alpine species. So far as American gardens are concerned the following, not introduced or rare in cultivation (some of them not here described), would be desirable novelties: V. Diefenbachii, V. gigantea, V. Barkeri, V. Lectiste, V. leucoxyla, V. Bolonii, V. anomala, V. ternerosa, V. monticola, V. Menziesi, V. decumbens, V. tetragona, V. Armstrongii, V. propinqua, V. loganioides, V. Lavaudiana, and V. Rauhii. Those desiring more information about the shrubby veronicas should consult Cheese­man’s Manual of the New Zealand Institute.

1. Bonarota, Linn. (V. chamadryfolia, Wetttat. Panderota Bonarota, Linn. P. chamadryfolia, Brign.) Perennial, pilose: sts. 4–6 in. high; lower lvs. orbiculate, scarcely 1 in. long; upper lvs. ovate or lanceolate, serrate or incised: spike globose or oblong, compact, 1–1 1/2 in. long; fls. blue, about 3 mm. across; calyx-segms. linear-subulate. Italian Alps and Tyrol.

2. virginica, Linn. (Leptandra virginica, Nutt. V. verticillata, Hort.) CULVER’S Root. Erect, simple, somewhat pubescent herb 2–6 ft. tall: lvs. in whorls of 4, lanceolate, 2 in. long. Stems above, pubescent below, acutely serrate, short-petioled; racemes terminal, erect, long, dense; fls. many, white or pale blue, short-petioled: caps. longer than broad, pointed, twice exceeding the calyx. Aug.–Sept. Eastern states. Gr. 79, p. 269.—Free-growing herb. Likes rich soil and much sun. While stiff and coarse, it is bold and stately. Var. alba, Hort. (V. verticillata var. virginica alba, Hort.) is offered in the trade as a form growing 4 ft. high, with erect spikes of white fls. Var. japonica, Makino (V. japonica, Steud. V. verticillata var. japonica, Hort.) has pedicelled blue or white fls., the pedicel equaling or exceeding the calyx. Var. sibirica, Makino (V. sibirica, Linn. V. verticillata var. sibirica, Hort.) has sessile or subsessile blue or white fls.; pedicels always longer than the calyx.

Section II. PSEUDOLYSIMACHIA.

1. A. Foliage and st. white-pubescent or white-tomento.
2. B. Base of lvs. cordate.
3. C. Foliage and st. nearly glabrous.
4. D. Lower lvs. petiolate.
5. E. Lower lvs. merely serrate or crenate.
6. F. Racemes panicled.
7. G. Racemes sericeous or fimbriate.
8. H. D. Lvs. lanceolate.
9. I. D. Lvs. ovate-oblong.

3. pinnata, Linn. Strong, upright plant 2–3 ft. high, glabrous or pubescent: lvs. sparse or somewhat clustered, finely cut, the lower lvs. with spreading segms., the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fl., elongated: fls. blue, June, July. Open mountain slopes, Russia.

4. Bachofenii, Heuff. Perennial, white-pubescent: sts. several, ascending or erect, 1–2 ft. high: lvs. opposite, petioled, 1–2 x 1 in., cordate-oblong, acute, coarsely serrate; racemes terminal, 1–2, opposite, elongate: fls. blue; calyx-lobes < linear, subequal; corolla-tube inflated, lobes broad-lanceolate: caps. small, obcordate, slightly compressed, about equaling the calyx. Hungary.

5. spuria, Linn. (V. paniculata, Linn. V. augustifolia, Fisch., not Bernh. V. tinea, Soland. V. amethystina, Wild.) BASTARD SPEEDWELL. Upright, slender, densely pubescent species 2 ft. high: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrate-crenate toward the apex, entire below, smooth, narrowly at the base, thickish: racemes numerous, panicked, long, densely many-fl.: fls. blue, pedicellate: caps. nearly round, thick, exceeding the segms. May, June. G.W. 7, p. 337. Woods, S. E. Eu. and S. Russian Asia.—Becomes weedy late in the season. Var. elegans, Voss ex Wyman (V. elegans, DC. V. paniculata var. elegans, Benth.), has the lvs. pubescent on both surfaces and is more branched than the type. Belgium. Variants of this variety are known in horticulture as V. elegans var. cárnea, Hort., a form growing 1 ft. high and having spikes of rich pink fls. and the variegated form as V. elegans cárnea variegata.

6. longifolia, Linn. (V. maritima, Linn. V. hybrida, Georgi, not Linn. V. persicifolia, Schott. V. bracteata, Opiz, not Wild.) Strong, leafy, upright, densely growing species 2 1/2 ft. high, with usually a smooth st.: lvs. lanceolate or oblong-acuminate, sharply serrate. lower
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opposite, upper more or less verticillate, pubescent below, very scaly. 2½-4 in. long; racemes long, erect, spiral, dense; fls. like, numerous; caps. longer than broad, notched, a little exceeding the linear sepals or sometimes exceeded by them. Becomes black in drying. July–Sept. Wet fields, Cent. and E. Eur. and N. Asia.–Much cult. and hybridized. Has several varieties. A fine border plant and the most common species, growing and flowering freely in any good soil. Var. alba, Hort. (V. maritima var. alba, Hort.), grows 1½-2½ ft. high; fls. white. Var. glauca, Hort., has glaucous blue foliage; fls. rich purple. Var. rosea, Hort. (V. rosea, Hort. V. hybrida rosea, Hort.). a probable variety with pink fls., 2½ ft. high and much branched. Hardy in Mass. Prop. by division and cuttings. Var. subsessilis, Miq. (V. subsessilis, Hoffm.). A Siberian form growing from a shortly creeping, almost woody root-stock: fls. smaller and narrower: raceme elongated, leafy, many-fid.; pedicels: caps. nearly round, slightly notched, exceeding the linear sepals or all material known as raceme usually somewhat elongated. (Subsection 3. Alpina.)

Plants 2½-6 in. high.

b. Fis. blue or violet. . . . . . . . . . . . 14. alpina
d. Fis. rose or white. . . . . . . . . . 16. repens

c. Plants ½-4½ ft. high (seldom less than 9 or 10 in.).

c. Fis. rose or white. . . . . . . . . . 16. repens

Subsection 1. Diffusa.

DD. Blades ovate, orbicular or oblong-spatulate.

DD. Blades linear-spatulate. . . . . . . 10. cespitosa

ER. Surface of leaf glabrous. . . . . . 9. Nummularia.

ER. Surface of leaf white-tomentose. . . 11. bombycina

CC. Inf. a very short (in fr. elongated)

raceme, few-fid. (Subsection 2. Fruticulosa.). . . 12. fruticulosa

Subsection 2. Fruticulosa.

12. fruticulosa, Linn. (V. saxatilia, Scop.). Perennial or shrubby; sts. diffusely branched, 2-6 in. high, woody at base: fls. ½-3½-in. long, oblong or ovate, entire or suberect; racemes lax, short, few-fid.; pedicels: fls. blue or flesh-colored; caps. ovate. July. Mountains of Eu. and Greenland. There is a white-flowered horticulturally known as V. saxatilia alba and also a form known in the trade as V. saxatilia Griseb.—Possibly not all material known as V. saxatilia belongs here.

Subsection 3. Alpina.

13. gentianoides, Vahl (V. gläber, Hort.). Erect, slender, tufted species 6–24 in. high, from creeping roots; lvs. ovate-oblong or ovate, some lanceolate or linear, thin-fibrous, entire or small crenate, smooth, 1–3 in. long; root-lvs. more or less in rosettes; upper lvs. bract-like, smaller and narrower; raceme elongated, leafy, many-fid., hairy; fls. pale blue, with darker streaks, on long pedicels; caps. nearly round, slightly notched, exceeding the calyx. Wet alpine fields, S. Eu. B.M. 1002. —A hardy species in any soil or location, shade-enduring though not necessarily shade-loving, blooming early. Prop. by division. Forms a mat and makes a good ground-cover for bare spots in midsummer; also a valuable border plant. One of the earliest. Var. alba, Hort., is a white-flowered form. Var. foliis variegatis, Hort.,
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see var. variegata. Var. pallida, Hort., is offered in the trade as a variety with pale porcelain-blue fls. Var. pallidiflora, Hort., is a trade name, perhaps the same as var. pallida. Var. stenophylla, Hort., is a narrow-leaved form. Var. variegata, Hort., is offered in the trade as having lvs. variegated with creamy white. G.M. 54:575.

14. alpina, Linn. A slender delicate plant growing from a creeping stock, branching at the base, becoming ascending or upright, the fl.-st. often solitary, 2-6 in. high; lvs. opposite, occasionally alternate, subsessile, elliptic or oblanceolate, entire or dentate, about 1/4-1 in. long, of varying size, the lowest small, orbicular; raceme short, spikeform, dense; fls. small, blue or violet; caps. 1/3 in. long, oblanceolate, broader than long, hairy, exceeding the calyx. Mountains of Eut., Cent. and N. Asia, and alpine and arctic regions in Amer. B.M. 2975.—Adapted to the rock-garden. It blazzenes when dried.

15. serpyllifolia, Linn. (V. alpestris, Hort.). St. Paul’s Speedwell. Slender, ascending, nearly smooth plant, growing irregularly in clumps 2-4 ft. high, the base prostrate and rooting; lvs. ovate or oblanceolate, 1/2-1 in. long, smooth, variable; racemes loose, with conspicuous bracts; fls. pedicelled, white or pale blue with deeper stripes; caps. wider than long, obliquely notched, exceeding or equal to the sepal. May-July. Roadsides and fields, Asia, Eut., N. Afr., and S. Amer. 

16. repens, DC. Prostrate, slender, compact plant growing in dense masses; lvs. 1/2-3/4 in. long, ovate, slightly crenate, shining green and moss-like; racemes slender, few-fld.; fls. rose or nearly white, with a trace of blue; caps. broader than long, slightly papillose-pubescent: branches numerous, thin and long pedicels, of long duration: caps. broader than long, deeply notched, exceeding the sepals. May--July. Fields, Cent. and S. Eut., Asia and naturalized in N. Amer. F. 1846. p. 112.

17. syraca, Roem. & Schult. (V. pedunculata, Labill., not Vahl). Ascending, diffusely branched pubescent annual, 6-12 in. high; lvs. ovate or ovate-lanceolate, incised or dentate, smooth; lower petiolate, upper subsessile, 3/4 in. long; raceme terminal, slender, 4-6 in. long; fls. blue, with thread-like pedicels 1/3 in. long; caps. broader than long, notched two-thirds of its length, exceeding the sepal. June. S. W. Asia. B.O. 1897. p. 311. F.S. 12:1259. Var. flore-albo, Hart., is a trade name, perhaps the same as var. pallida. Ascending, diffusely branched pubescent annual, 6-12 in. high: lvs. ovate or ovate-lanceolate, suberectely truncate. Greece. B.M. 7759.

18. glauc4., Sibth. & Smith. Annual, suberect, ascending or upright, the fl.-st. often solitary, 2-6 in. long, short-petioled, elliptic-oblong, acute angled, 2-lobed to the middle. Base of caps. Totundate. South Africa and S. Afr., Mex. and intro. in Calif. Allied to V. serpyllifolia but dwarfer and more prostrate; grows in the sun. Will cover the ground where grass does not grow, forming a sod in a moderately dry soil. Var. alba, Hort., is offered in the trade as a variety with pale porcelain-blue fls. Var. pallida, Hort., is offered in the trade as a variety with white-puberulent fls. Var. stenophylla, Hart., is a narrow-leaved form.

Section V. BECCABUNGA.

A. Calyx 5-parted. (See also No. 40.) The species of this group are closely allied and often hard to distinguish. (Subsection 1. Pentasepalae.)

B. Lvs. bipinnatifid.

C. Base of caps. rotundate.

D. Calyx-seosem8. ovate-lanceolate.

E. Margin of blade sharply dentate.

F. Base of caps. obovate-orbicular, turgid and glandular. Persia.

Section VI. CHAMEDRYS.

19. Tournesfortii, C. C. Gmel. (V. Buxbaumii, Tenore). Prostrate annual, with elongated slender pubescent stems, the lower branching and often rooting; lvs. ovate, subcordate, coarsely crenate-serrate, pubescent, shortly petiolate, 3/4 in. long, the lower opposite, the upper alternate and similar; racemes axillary: fls. small, blue, crenate-tonged, on long pedicles, of long duration: caps. broader than long, very widely notched, exceeded by the sepal. April--Sept. Fields, Cent. and S. Eut., Asia and naturalized in N. Amer. F. 1846. p. 112.


Section V. BECCABUNGA.

21. Michauxii, Lam. Perennial, 4-5 ft. tall, everywhere pubescent: sts. erect, or ascending from rooting bases; lvs. ovate, crenate-dentate, lower and those of the sterile branches petiolated, the others clasping: racemes few, rather dense, from the upper axes: fls. pale blue (drying reddish); calyx-seosem8. oblanceolate, acute; caps. ovate-ornicular, turgid and glandular. Persia.
Subsection 1. Pentaspale

22. orientalis, Mill. Perennial, shortly and crisply pubescent, rarely glabrate: sts. from woody rhizomes, decumbent or prostrate: lvs. sessile, short, lower, at least long or lanceolate, dentate-incised, rarely entire; upper usually narrower, lanceolate: racemes 2-4, from the upper axis, second: fls. flesh-colored or pale blue; calyx-segments 4 or 5, linear-lanceolate, very unequal; caps. glandular-pubescent, obcordate or truncate. July. Asia Minor and Persia. L.B.C. 5:419. Var. tenutiloba, Boiss. (V. taitica, Willd.), has narrowly linear lvs., with the margins sometimes somewhat revolute, entire, rarely acutely toothed. S. Armenia and Persia. L.B.C. 10:911.

23. latifolia, Linn. (V. urticaefolia, Linn.). Perennial, sparsely and crisply hirsute: sts. erect: lvs. sessile, ovate, sharply serrate, base often cordate; upper long-acuminate: racemes opposite, laxy-pilose: fls. light blue or reddish; calyx-segments minute, lanceolate, rather acute, caps. ovate-oblong, base round. Eu.—Habitat of the cultural material under this name is apt to be a broad-leaved form of V. Teearum.

24. Telearium, Linn. (V. dentata, F. W. Schmidt. V. nitiata, Hort., ex Poir., not Ehrh.). Perennial, pubescent: sts. numerous, ascending, up to 20 in. high: lvs. ovate to lanceolate, nearly entire, crenate to even bluntly dentate-incised, mostly sessile: racemes opposite, elongated: fls. white, blue-veined, large; calyx-base: lvs. sessile, pinnatisect, opposite, laxly many-fid.: caps. ovate, blotched, sharply serrate, base often cordate; upper long-acuminate; lvs. sessile, petiolate, very broadly ovate, sometimes narrower, sub-acute; corolla-lobes lanceolate-linear, rather acute; corolla-lobes lanceolate: caps. obcordate, acute, puberulent. S. Eu.

25. austriaca, Linn. (V. multifida, Jacq., not Linn. V. orientalis, Willd., not Mill. V. prénia, G. Beck). Perennial, 1-2 ft. high, pubescent: sts. erect, rarely ascending: lvs. sessile, ovate in outline, pinnatisect, serrate with their base narrow or linear, entire or incised: racemes 2-4, from the upper axis, elongated, many-fid.: fls. large, blue; calyx-teeth 5, rarely 4, linear, strongly unequal: caps. hisrate, obovate-obcordate. S. Eu. and Asia Minor. B.M. 1679.—Probably not common in cult. and some at least of the material so named is probably V. austriaca.

26. multifida, Linn. Perennial, shortly and crisply pubescent: sts. decumbent and indurated at base or diffuse: lvs. sessile, pinnatisect in linear, entire or dentate-segments: racemes 2-4, axillary: fls. flesh-colored or pale blue; calyx-segments strongly unequal: caps. glabrous or short-glandular, transversely broader. June, July. Asia and Asia Minor. B.M. 1679.—Probably not common in cult. and some at least of the material so named is probably V. austriaca.

27. filifolia, Lipsky. Sts. several, ascending or erect, 6-12 in. high, crispily pubescent: lvs. sessile, bipinnatifid, divisions long, slender almost filiform: racemes 4-8, opposite, laxly: fls. white, blue, yellowed to brown; calyx-segments 4, almost equal, nearly linear, acute: caps. shorter than the calyx, strongly flattened, obcordate, transversely broader. Caucasus.—Near V. multifida.

Subsection 2. Strictiflorae

28. pectinata, Linn. Prostrate, white-pubescent, hairy, spreading plant rooting at the nodes, the ascending branches producing single elongated racemes: lvs. obovate or spatulate, sometimes pinnatifid: fls. narrow at the base, sessile, racemes elongated, many-fid.: lower bracts like lvs.: fls. deep blue with a white center: caps. larger, longer than broad, notched, puberulent, thick, exceeding the sepals. May-June. Dry, shady hills. Asia Minor.—Suitable for dry spots in a rock-garden. Grows in almost any soil and position. Var. rosea, Hort., has numerous small spikes of rose fls.

29. officinalis, Linn. (V. Allionii, F. W. Schmidt, not Vill.). COMMON SPEEDWELL. FLEUELEN. Ground-Horse. Prostrate, leafy native with a pubescent stem, rooting at the nodes, slender, 6-18 in. long: lvs. elliptic, oblong or broadly oblong, ½-1 in. and more long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fid.: fls. pale blue, rarely pink, sessile: caps. broader than long, wedge-shaped, broadly notched, hairy, exceeding the hairy sepals. May-July. Forests and mountains of Eu. and N. Amer.—Grows under trees and in shade where no grass will grow, covering the ground with a permanent sod. Spreads rapidly and is easily grown. Prop. by cuttings.


Subsection 3. Multiflorae


32. piroleaformis, Franch. Perennial: sts. short, pilose below: lvs. nearly all clustered, petiolate, very broadly ovate, obovate or sub-spatulate, 3-fid.: corolla 3-fid.: fls. rose or pale violet; calyx-lobes glandular, ovate-oblong, obtuse: caps. rhomboid, broader than long. China.


34. scutellata, Linn. (V. angustifolia, S. F. Gray, not Bernh.). Perennial, 6-18 in. high, weak, glabrous or rarely puberulent: sts. slender: lvs. sessile, linear-lanceolate, acute, remotely and minutely denticulate: racemes filiform, flexuous, few-fid.: fls. whitish, bluish or flesh-color; calyx-segments oblong: caps. much wider than long, plano-compressed, 2-lobed, N. temperate regions.—Material offered in the trade as V. angustifolia should also be compared with V. austriaca and V. spuria.

Subsection 5. Petraeae

35. Baumgartenii, Roem. & Schult. (V. petrae, Baumg., not Stev.). Perennial, 3-6 in. high, possibly more, glabrous or minutely white-puberulent: sts.
slender, ascending: lowest lvs. minute; middle 6 lvs long, ovate or oblong, somewhat dentate; upper lanceolate, narrowed at base; fls. blue; calyx-segs. broadly lanceolate: caps. emarginate, glabrous. S. Hungary.—The material offered in the trade as V. petrea may belong here.

26. petraea, Stev. Perennial, cespitose, 4-5 in. high, minutely and crisply pubescent: sts. dwarf, diffuse and ascending: lvs. 6-10 lvs long, oblong or elliptic from a cuneate, subsessile base, few-toothed; upper lvs. sometimes entire: racemes axillary, solitary; peduncles rather long: fls. large and blue; calyx-segs. broad-oblong: caps. glandular-hirsute, 2-lobed, transversely broader, base rotund, apex retuse. Caucasus.—The material offered in the trade under this name may be V. Baumgartneri.

27. telephifolia, Vahl. Perennial, creeping or tufted, glabrous, glaucous: branches diffuse, filiform but rather hard and fragile, rooting: lvs. fleshy, bluish green, small, 2-3 lvs long, oblong-obovate or oblong, short-petioled: peduncles axillary, solitary, ending in a short sessile, obtuse, entire, both surfaces hispid; fls. solitary and axillary, pale blue (rich blue according to the trade); calyx 4-5-parted, segms. linear-oblong; corolla 4-lobed, lobes oblong: caps. small, broadly oblong, slightly compressed. Late-flowering. New Zealand.

3015. Veronica Andersonii (x3). No. 41.

30. Biddwillii, Hook. f. Perennial, about 3 in. high: sts. slender, prostrate and rooting, much branched, woody at base, 3-12 in. long; branches creeping, often matted, glabrous or pubescent: lvs. short-petioled or almost sessile, minute not more than 1/4 in. long, broadly oblong or ovate with 1 or 2 deep notches on each side or entire, coriaceous: peduncles axillary, slender, erect, 3-9 in. high, few- or many-fl.: fls. white, calyx-segs. 4, ovate or oblong, obtuse: caps. broadly oblong. June. New Zealand.

40. canescens, T. Kirk. Perennial, small creeping and rooting herb with intricately branched sts. 1-4 in. long, often forming broad matted patches, hispid with grayish white hairs: lvs. minute, short-petioled or nearly sessile, obtuse, entire, both surfaces hispid: fls. solitary and axillary, pale blue (rich blue according to the trade); calyx 4-5-parted, segms. linear-oblong; corolla 4-lobed, lobes oblong: caps. small, broadly oblong, slightly compressed. Late-flowering. New Zealand.

Section VII. Hebe.

a. Lvs. strictly scale-like, connate and appressed. (See also No. 54 which has somewhat scale-like but recurved spreading lvs.)

b. The lvs. densely imbricated ....... 50. Hectori

b. The lvs. in distant pairs ....... 60. cupressoides

AA. Lvs. not strictly scale-like and appressed. (No. 54 has somewhat scale-like but recurved spreading lvs.)

BB. Margin of lvs. coarsely serrate. ....... 58. Huileana

CC. Margin of lvs. entire or minutely incised.

d. Blades more than 3 in. long (occasionally less in No. 42).

d. Blades less than 3 in. long.

dd. Apeck of lvs. obtuse ....... 41. speciosa

dd. Apeck of lvs. acute or acutish.

ee. Caps. three length of calyx ....... 44. macrolepis

ee. Caps. twice or less length of calyx.

ff. Fls. 1/4 - 1/3 in. across.

ff. Fls. 1/2 - 1/3 in. across.

gg. Calyx-segs. narrow-oblong: fls. 1/4-1/3 in. diam. ....... 42. macrolepis

gg. Calyx-segs. lanceolate or wide-lanceolate to ovate-oblong: fls. 1/3-1/2 in. diam. ....... 43. salicifolia

hh. Apex of lvs. acute. ....... 51. buxifolia

hh. Apex of lvs. obtuse, red-margined. ....... 49. Balfouriana

ii. Fls. in a spike ....... 52. glaucophylla

ii. Fls. solitary in a spike; ....... 51. buxifolia

iii. Apeck of lvs. obtuse, red-margined. ....... 49. Balfouriana

iv. Apeck of lvs. not glossy.

v. Apeck of lvs. glossy; fls. in a spike ....... 51. buxifolia

vi. Calyx 4-parted. ....... 53. acaulis

vi. Calyx 5-parted....

vii. Calyx 5-parted....

viii. Calyx 5-parted....

ix. Color of fls. white ....... 50. pinguiifolia

ix. Color of fls. blue ....... 51. glauco-

x. Lvs. green. ....... [carolea

x. Lvs. green. ....... 55. chathamica

xx. The blades flat. ....... 53. chathamica

xx. The blades recurved. ....... 54. epacrida

xx. Blades broadly obovate. ....... 54. epacrida

xx. Blades broad-lanceolate. ....... 55. loganioides

41. speciosa, R. Cunn. Stout half-hardy shrub, 2-5 ft. high, with stout, spreading leafy branches and crimson-purple fls.: lvs. 2-4 in. long, ovate or obovate-oblong, sub sessile, dark green, thick, smooth, glossy, entire, rounded at apex: racemes axillary and opposite near tips of branches, stout, dense-fl.: fls. large, 1/2-1 in. diam., purple-crimson: caps. more than twice as long as the calyx. Summer. New Zealand. B.M. 4637. F.S. 1:19. R.I. 1844:60. H.U. 6, p. 349. Var. corombyfera, Hort., is offered in the trade as growing 2 ft. high with rosy fls. Var. rubra, Hort., is offered in the trade. Var. variagata, Hort., is offered as a form growing 6 ft. high with large lvs. variegated with creamy white; fls. light blue. Probably really the variegated form of V. Andersonii. Intro. into S. Calif.—V. imperialis, Hort. (V. speciosa var. imperialis, Boncharlat), seems to be merely a garden name for the true species. F.S. 22:
2317. *V. spectosa* hybridizes freely and there are several garden forms closely allied to it. The best known is *V. Andersonii*, Lindl. & Paxt. (V. salicifolia × *V. spectosa*. *V. spectosa* var. Andersonii, Hort. V. Hendersoni, Hort.)—Fig. 3915, is grown in the greenhouse and is also used as a bedding plant. It grows 18 in. high: lvs. oblong, sessile, entire or crenate, dark green above, bluish white beneath; racemes about 1 in. long, corymbosely branched; fls. white or pale lavender-blue, about 2 in. across; calyx usually 3-parted, rarely 4-parted; corolla 4-lobed: caps. ovate, turIDDLE. New Zeal. B.M. 7539. Gn. 43, p. 519.

47. *formosa*. Br. Evergreen corystemons, branching shrub, 2–4 ft. high, practically glabrous; lvs. rather crowded, thin, acute, narrowly oblanceolate, ½–1 in. long, acuminate, truncate at base, pale green, rather thick, margins with white pubescence, midrib prominent beneath; racemes near tips of branches, 1–1½ in. long, laxly 12-fl.: fls. large, blue for a brief period, then white, sweet-scented: caps. twice as long as calyx. Late summer. Sea-coast on rock or on ground mixed with other shrubs. Subantarctic S. Amer., Lord Auckland and Campbell Isls. and New Zeal. B.M. 242. J.H. III. 52:38.—V. Lévisii, J. B. Armstrong, a desirable half-hardy, late-blooming species is related to the above and may be a hybrid. It has larger lvs., denser-flowered racemes 2–2½ in. long and very large white fls.

49. *Balfouriana*. Hook. f. Erect, glabrous shrub, 3 ft. high: lvs. sessile, ½–¾ in. long, elliptic-ovate, subacute or obtuse, margins red-brown: racemes 2–3 in. long, many-fl.: fls. pale violet-blue, calyx-segments acuminate: caps. one-third longer than calyx-segments or less. B.M. 7556.—Raised in the Royal Botanic Garden, Edinburgh, from seed sent from New Zeal. but it has not been found growing wild as yet, nor is it cultivated in New Zeal.

50. *Traversii*. Hook. f. Fig. 3916. Shrub of dense habit forming a globose mass of leafy, slender sts. 3–4 ft. diam.: lvs. ½–1 in. long, elliptic-oblong to linear-oblong, green, leathery, acute: racemes near tips of branches, 1–3 in. long, generally tapering: fls. white, calyx-segments broad, ovate or oblong: caps. twice as long as calyx. Midsummer. New Zeal. B.M. 6390. G. L. 25:139. G.M. 45:84; 53:630. Gn. W. 12, p. 161.—V. monticola, J. F. Armstrong, includes a number of distinct plants much resembling *V. traversii*, but their lvs. are frequently obtuse and racemes much shorter. Gn. 43, p. 522. V. lúisii, Benth., is similar to *V. monticola* but it differs in its corymbosely-branched inflorescence. *V. subalpina*, Cockayne, has softer, brighter green lvs., shorter racemes and corolla-tube. It also blooms earlier than *V. traversii*.

51. *buxifolia*. Bentham. Under this name are included many most distinct plants, but all possess green, glossy, acute, thick, petioled lvs., truncate at the base and keeled beneath, which in one form are golden variegated when young, sessile fls. in spikes ½–1 in. long and if-like bracts as long as or longer than the calyx. Var. odória, T. Kirk (var. petens, Cheesem.), is perfectly globular in form. Var. prostrata, Cockayne, is quite prostrate with rooting branches.—Another form, not yet named, is erect, 2–3 ft. high, and sparingly branched. Late summer. New Zeal. V. anómala, J. B. Armstrong, distinguished from *V. buxifolia* var. odória by its sometimes 3-lobed corollas and its narrower lvs., with purplish tips is nevertheless a most distinct and handsome plant. B.M. 7360.

52. *glaucophylla*, Cockayne (V. Colésonii var. glaica, Hort.). Closely related to *V. Traversii* but at once distinguished by the small, narrow, not keeled, glaucous lvs., slender tapering racemes of white fls. short corolla-tube hairy with pubescent ovary. Summer. Dry montane and subalpine stations, New Zeal.
—There are several forms of this striking fairly hardy shrub quite distinct for garden purposes, one of which is known as V. Cotonea var. glauca fana, Hort. The species is not related to V. Cotonea, Hook f., a plant not yet in cult., which has been placed in section Chamredrys by some, in section Hebe by others.

53. Chamaecistis, Buch. A rather tender polymorphic species, the leaves of which are distinguished by the trailing, flexible branches, elliptic or elliptic-oblong, rather fleshy, pale green, often more or less pubescent lvs., and short, dense, obtuse racemes of violet lfs. Late summer. Chiefly in the southwest. (V. M. 7290).

54. Eperisubas, Hook. f. Prostrate, almost hardy shrub of spreading habit: lvs. closely quadriangularly imbricated, opposite pairs united at base, spreading, recurved, 3½–4 in. long, broadly ovate-oblong, leathery, cuneate, glabrous, keeled, rounded or subacute at apex: fls. small, white, in dense terminal ovoid heads. Early summer. Mountains, New Zealand. V. Halstonii, Hook. f., is closely related to the above but is a larger plant with the lvs. more fleshy and not recurved or keeled. Both are admirable rock-garden plants of a most distinct appearance.

55. Loganoides, J. B. Armstg. Dwarf shrub, 6–14 in. high: sts. woody, decumbent at base, erect above; branches grayish white-pubescent or almost villous: lvs. diam. ½–1½ in. long, glabrous, entire. or with 1 or 2 small teeth, dull green, keeled leathery: racemes forming a small corymb-like head: fls. ± in. across, white or white with pink veins; calyx deeply 4-parted, segms. ovate-oblong, ciliolate: corolla 4-parted, dillyom, turgid. New Zealand. B.M. 7404.—A species of doubtful systematic position, by some placed in section Chamaedrys.

56. Pinguifolia, Hook. f. (V. carnosula, Hort., not stricta, Bieb.). Branches stout, more or less decumbent, ringed with lfs.-sars. imbricating to erect-patent, sessile, narrow-oblong to almost orbicular, ½–3½ in. long, glabrous, usually thick, glaucous, generally margined red: spikes crowded near tips of branches, short, stout, dense-fl.: fls. white, ovary pubescent. Summer. Mountains, to 7000 ft., New Zealand. B.M. 6857.—A fairly hardy polymorphic species containing many most distinct plants admirably suited for rockeries. The forms with larger almost orbicular lvs. are generally termed V. cotonea in gardens, but this species, distinguished by its glabrous ovary and acute caps., is probably not in cult. V. amphicribalis, J. F. Armstg., is an extremely striking allied plant readily distinguished by its larger glabrous ovary, subacute, or serrate, rather obtuse, keeled; V. lyrripodium, Hook. f., branches acutely 4-angled, lvs. narrowed into a blunt point; V. Armstrongii, Koenig, branches filabellate, tereve, lvs. subacutate, fls. pale lilac; V. salicornioides, Hook. f., branches terete, lvs. united to much above middle, subtruncate, fls. white. V. prospina, Chelse. (V. cupressoides var. variabilis, N. E. Br.), was for many years cult., in gardens under the name of V. salicornioides but it is semi-dwarf, with slender branches about ¾ in. diam. and minute lvs.


V. amnica, Hort., not Bieb., is described as growing 1 ft. high, flowering early: fls. rose, in neat spikes. The true V. amnica is apparently not in cult.—V. angustifolia var. roena, Hort., is offered in the trade as shrubby with fls. bright rose in spikes; not determinable botanically as the specific name angustifolia has been used for several different forms.—V. bocholonomii, Hort., is offered in the trade as growing 4 ft. high: fls. white, ovary pubescent, possibly the same as V. Bischumii.—V. Bischumii, Hort., is offered as growing 1½ ft. high, of coarse texture, with the same name as V. Bischumii.—V. corymbosa, Don., is offered in the trade, but it is not now included in any of the Swiss botanists. The nomenclature passing under this name in the trade may be described as follows: Low, trailing perennial, growing in a dense mass: lvs. leathery, crenate to dentate, pubescent; corolla deep blue, racemes many, in 6 in. high, small, dark blue. May, June, Coneddest one of the best. Valuable as a ground-cover, or as a rock-plant, or at the front of an herbaceous border. Usually cultivated: V. tricolor, Don., is offered in the trade as a dwarf plant with small leaves, with pink, blue and white fls., growing less than ¾ in. high, with densely glomerate heads of dark blue fls. is offered in the trade under this name.—V. edeliana=V. Hectorii, Hort., 1835, pinneolidae.—V. elegansima, Hort., is a trade name.

—V. Fouchtii, Diels. Perennial, 6–10 in. high: stns. decumbent, creeping, branched and stoloniferous at base: lvs. petiolate, narrowly ovate or oblong, ½–3 in. long, glabrous, pubescent or almost pubescent, often purplish beneath: racemes terminal or axillary, fls. reddish, sepals oblong, chocolate-oblong, glandular-puberulent; calyx pubescent or hairless capsule oblong, rather oblong. Mountainous of W. Yunnan, China.—V. pinnatifida, Hort., is a trade name. V. galpinii, Hort., was a hybr1d, said to grow 9 in. high: fls. blue. V. keilbergii, Hort., is offered in the trade as having narrow foliages and starry blue fls.—V. koeini, Hort., is offered in the trade as having large trusses of pink fls.—V. Lithouardii, Hort., is a trade name. V. Listenfa, Hort., is offered in the trade under the name of V. salicifolia, Hort., 1835, pinneolidae.—V. elefantinae, Hort., is a trade name. V. Lavaudiana, Hort., 1840 presented as a dwarf variety, yellow, with strong racemes of purplish fls. borne in June and a four-parted calyx. The caps. are obconic. This plant has been offered by Rochester nurseriesmen ever since 1853. V. Lavaudiana, Hort., 1840, presented as a dwarf variety, yellow, with strong racemes of purplish fls. borne in June and a four-parted calyx. The caps. are obconic.
saries," which, when kept wet and placed in a current of air, cools and perfumes the atmosphere. The rhizome when laid away among them is said to keep clothing free from moths. For history of this grass, see Kew Bull. Misc. Inform. No. 8, 1906. A. S. Hitchcock.

**VIBURNUM** (the ancient Latin name). *Caprifoliaceae*. Ornamental woody plants grown for their attractive flowers, fruits, and foliage.

Deciduous or sometimes evergreen shrubs, rarely small trees, with opposite stipulate or cymose flowers; fls. small, in terminal panicle or mostly umbel-like cymes; calyx with 5 minute teeth; corolla rotate or campanulate, rarely tubular; stamens 5; ovary usually 1-seeded; fr. a drupe with a 1-seeded, usually compressed stone. In several species the marginal fls. of the cymes are sterile and radiate; such are *V. macrocephalum*, *V. tenumtosum*, *V. Opulus*, *V. americanum*, *V. Sargentii*, and *V. alnifolium*, and of the 3 first-named garden forms are known with all fls. sterile and enlarged.---About 120 species in N. and Cent. Amer. and in the Old World from Eu. and N. Afr. to E. Asia, distributed as far south as Java. For a key to the 65 species known from E. Asia, see Rehder, *The Viburnums of Eastern Asia*, in Sargent, Trees and Shrubs, 2:105-116.

The viburnums are upright mostly rather large shrubs or sometimes small trees with usually medium-sized deciduous or evergreen foliage and white or sometimes pinkish flowers in showy flat clusters or sometimes in panicles, followed by berry-like subglobous to oblong, red, dark blue, or black fruits. The viburnums rank among the most valuable ornamental shrubs. Besides showy flowers and decorative fruits they possess handsome foliage which mostly assumes a bright fall coloring. The plants are of good compact habit. Most of the deciduous species are hardy North, but *V. macrocephalum* var. sterile and *V. oblongum* are tender; also *V. tomentosum*, *V. Wrightii*, *V. theferum*, *V. cassinifolium*, *V. nudum*, and *V. dilatatum* are not quite hardy farther north than New England. Of the evergreen species, *V. rhytolphyllum* is the hardiest and at the same time one of the most distinct and handsome species of the genus, with its bold foliage and the large clusters of flowers and fruits; it is hardy as far north as Massachusetts in favorable positions; also *V. japonicum* stands several degrees of frost, but cannot be relied on north of Philadelphia; *V. odoratissimum* and *V. suspensum* are still tenderer. The viburnums are well suited for borders of shrubberies or planting along roads, and the more showy ones are handsome as single specimens on the lawn. They are mostly deciduous shrubs, 5-10 feet high, but *V. Lenoago*, *V. prunifolium*, and *V. rufidulum* sometimes grow into small trees, 30 feet high, while *V. cassinifolium* hardly reaches 5 feet. The most decorative in fruit are *V. Opulus*, *V. dilatatum*, and *V. Wrightii*, which mostly assume a bright scarlet or red berries which remain a long time on the branches. Besides the snowball forms, *V. dilatatum*, *V. tomentosum*, *V. Sieboldii*, *V. prunifolium*, *V. rufidulum*, *V. venosum*, and *V. den-
The familiar snowball is seriously attacked by aphids! Fortunately its place can be taken by a Japanese species that is even more satisfactory. (Fig. 3923.) The berries of its fertile type, V. tomentosum, are a brilliant scarlet, changing to black. The foliage of this snowball is also remarkably beautiful. The olive-green with brownish purple or bronzy margins, and their plicate character makes them very distinct and attractive. The bush is entirely free from insect pests. The single and double forms of the Japanese species differ as shown in Figs. 3922 and 3923. Unfortunately these "single" and "double" forms have been confused in many nurseries, and only the trained eye can tell them apart in the nursery row. The double or snowball type is, of course, the one destined to the greater popularity, though the single form is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as V. prunifolium, but its proper name is V. tomentosum var. plenum. While it is hardy in New England, it is not a shrub that can be transplanted as easily as many other species. Hence it should be transplanted every second year in the nursery until it is sold. The double form may be propagated by cuttings of half-ripened wood in close frames, or by layers, which in some soils would better remain two years. French nurserymen propagate it by layering. The layers seem to suffer from winter and, to be on the safe side, it is best to cover them well with moss or leaves when the ground is somewhat frozen, so that the frost may be kept in until spring. The clusters are about as big as oranges and pure white. They are in great demand for Decoration Day in New York. The single form, unlike the double, is easily transplanted. It is also readily propagated by layers or cuttings. Both kinds are hardy in the North and make compact bushes 6 to 8 feet high.

\[\text{KEY TO THE SPECIES.}\]

\begin{itemize}
  \item [A. Leaves, peninsular, not lobed.]
  \item [B. Cymes paniculate, broadly pyramidal or semi-spherical.]
    \begin{itemize}
      \item [c. Foliage deciduous................. 1. Sieboldii]
      \item [cc. Foliage evergreen.]
      \item [d. Corolla with cylindrical tube..... 2. suspensum]
      \item [ro. Corolla rotate-campanulate...... 3. odorati
    \end{itemize}
  \item [BB. Cymes umbel-like, flat (except in the snowball forms. See Nos. 12, 18, 28.]
  \item [c. Secondary veins curving anastomosing before reaching the margin: margin entire or finely serrate.]
  \item [d. Branches and leaf-glabrous, hirsute, or scarby.]
  \item [e. Foliage persistent, entire.]
    \begin{itemize}
      \item [v. Branches and leaf-glabrous or slightly pubescent. . . . 4. Tinus]
      \item [fr. Branches and leaf-hirsute. . . . . 5. rigidum]
    \end{itemize}
  \item [EE. Foliage deciduous or half-evergreen.]
  \item [f. Lee. entire or slightly undulate-te
dulate-dentate.]
    \begin{itemize}
      \item [a. Cymes sessile: lea. small. 6. obovatum]
      \item [go. Cymes pedunculated.]
    \end{itemize}
\end{itemize}
VIBURNUM

1. Sięboldii, Miq. Fig. 3918. Deciduous shrub, attaining 10 ft., with stout branches, pubescent when young; lvs. oval to oblong-obovate, coarsely crenate-serrate except toward the base, acute, dark green and shining above, paler and stellate-pubescent beneath, 3-6 in. long; frs. white, rotate-campanulate, in panicles 2½-4 in. broad; frs. pink, changing to blue-black. May, June. Japan. G.F. 2:559 (adapted in Fig. 3918). S.I.F. 1:86. F.E. 23:345. —Hardy shrub of vigorous growth with handsome dark green foliage, large for the genus, exuding a disagreeable odor when bruised. The frs. drop soon after ripening. It is known in some nurseries as V. japonicum, V. latifolium, or V. japonicus latifolium. Var. reticulatum, Rehd. (V. reticulatum, Hort.). Smaller in every part: lvs. of lighter green, less pubescent: half-hardy. Var. variagatum, Hort. Lvs. variegated with white.

2. suspensum, Lindl. (V. Sandakowa, Hassk.). Evergreen shrub, attaining 6 ft., with slender warty branches: lvs. oval to oblong-obovate, acute or obtuse, usually remotely crenate-serrate toward the apex, shining and bright green above, paler beneath, glabrous, 2-4 in. long; frs. white, tinged pink, in dense semi-globose panicles becoming 1½ in. high; corolla ½ in. long, with cylindrical tube twice as long as limb: fr. red, subglobose. June, July. Liu-kiu Isl. B.M. 6172. —Tender.

3. odorifæsimum, Ker (V. Awabickii and V. Awafuki, Hort.). Evergreen upright shrub, attaining 8 ft., with stout warty branches, glabrous: lvs. elliptic to elliptic-oblong, acute, remotely serrate toward the apex or entire, shining and bright green above, paler beneath, glabrous, 2-4 in. long; frs. white, tinged pink, in dense semi-globose panicles becoming 1½ in. high; corolla ½ in. long, with cylindrical tube twice as long as limb: fr. red, subglobose. May, June. India to S. China and Japan. B.R. 456. S.I.F. 1:88.:—Tender.

4. Thymus, Linn. (V. Laurustinus, Hort. Thymus laur-リフォinus, Boreckh.). LAURUSTINUS (or LAURESTINUS) Bushy, 10 ft., with glabrous or somewhat hairy branches: lvs. ovate-oblong or oblong, acute, dark green, shining and glabrous above, pubescent beneath usually only on the veines, 2-3 in. long: fr. white or pinkish white, slightly fragrant: cymes somewhat concave, 2-3 in. broad: fr. ovoid, black, rather dry. May-
CXVI. Viburnum tomentosum.
VIBURNUM

3459

Viburnum cassinoides. (X1/4)


12. macrocephalum, Fortune. Shrub, attaining 12 ft. and occasionally more, with spreading branches: lvs. short-petioled, oval to ovate-oblong, rounded at base, acute, dentate, almost glabrous and dark green above, stellate-pubescent beneath, 2-4 in. long: fls. yellowish white, in peduncled cymes, 3-5 in. across, with the mar-

4019. Viburnum macrocephalum. (X1/4)

brous above at length: fls. white or yellowish white: cymes rather long-peduncled, 3-5 in. broad: fr. globose, pink at first, changing to dark blue. June, July. Long Island to Fla., west to Ky. and La. B.M. 2281.—Not quite hardy. Var. nigricans, Zabel (var. angustifolium, Torr. & Gray). Var. nigricans, Willd. WITHE-ROD. Small. Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter buds more pointed, obtuse, rusty-pubescent: petals often with narrow margin, rusty-tomentose: lvs. elliptic to ovalate, usually obtuse, glabrous or scurfy at the veins beneath, 2-4 in. long: fls. pure white: cymes sessile, 2-5 in. broad: fr. oval, bluish black, with bloom. May, June. Hudson Bay to Man., south to Ga. and Miss. S.S. 5:223, 224.—Handsome arborescent shrub, keeping its lvs. until spring. Sometimes as V. prunifolium and V. ferrugineum in gardens. A garden hybrid, originated in Germany, is V. Vellern, Zabel (V. Lentago x V. nudum), similar in habit to this species but the cymes on short peduncles over 1/2 in. long.


12. macrocephalum, Fortune. Shrub, attaining 12 ft. and occasionally more, with spreading branches: lvs. short-petioled, oval to ovate-oblong, rounded at base, acute, dentate, almost glabrous and dark green above, stellate-pubescent beneath, 2-4 in. long: fls. yellowish white, in peduncled cymes, 3-5 in. across, with the mar-

3919. Viburnum cassinoides. (X3/4)

brous above at length: fls. white or yellowish white: cymes rather long-peduncled, 3-5 in. broad: fr. globose, pink at first, changing to dark blue. June, July. Long Island to Fla., west to Ky. and La. B.M. 2281.—Not quite hardy. Var. nigricans, Zabel (var. angustifolium, Torr. & Gray). V. nigricans, Willd. WITHE-ROD. Small. Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter buds more pointed, obtuse, rusty-pubescent: petals often with narrow margin, rusty-tomentose: lvs. elliptic to ovalate, usually obtuse, glabrous or scurfy at the veins beneath, 2-4 in. long: fls. pure white: cymes 3-5 in. broad: fr. oval, dark blue, glaucous, little over 1/2 in. long. April-June. Later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 5:225 (as V. prunifolium, partly).—Handsome arborescent shrub with dark green shining foliage, showy fls. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.


12. macrocephalum, Fortune. Shrub, attaining 12 ft. and occasionally more, with spreading branches: lvs. short-petioled, oval to ovate-oblong, rounded at base, acute, dentate, almost glabrous and dark green above, stellate-pubescent beneath, 2-4 in. long: fls. yellowish white, in peduncled cymes, 3-5 in. across, with the mar-

8. cassinoides, Linn. (V. nudum var. cassinoides, Torr. & Gray. V. aquinatum, Willd.). WITHE-ROD. APPALACHIAN TEA. Fig. 3919. Upright shrub, 2-6, occasionally 12 ft. high: lvs. oval to ovate, acute or bluntly acuminate, usually obscurely dentate, almost glabrous, rather thick, dull green above, 1-3 in. long: fls. and fr. almost like those of the preceding species, but peduncle shorter, usually shorter than cyme; blooming a little earlier. June, July. Newfoundland to Man. and Minn., south to N. C. G.F. 9:305 (adapted in Fig. 3919). M. D. G. 1901:85, 86. Em. 2:411 (as V. nudum).—A good shrub for borders of shrubberies; hardy.

9. Lentago, Linn. SHEEP-BERRY. NANNY-BERRY. Fig. 3920. Shrub or small tree, attaining 12 ft., with spreading branches: winter buds short, 3-4 in. long: fls. white: cymes large, in peduncled cymes, 3-5 in. across, with the margins nearly like those of the preceding species, but peduncle shorter, usually shorter than cyme; blooming a little earlier. June, July. Newfoundl.
3460 VIBURNUM

The wild form with only the marginal fls. sterile and enlarged; has proved hardy at the Arnold Arboretum.
hardy than the type.
13. rhytidophyllum, Hemsl. Evergreen shrub, to 10 ft., with stout upright branches; branchlets densely
stellate-tomentose: lvs. thick, ovate-oblong to oblong-lanceolate, acute or obtuse, rounded or subcordate at
the base, dark green, glabrous and lustrous and deeply wrinkled above, covered with a thick gray or yellowish
tomentum beneath and reticulate, entire or indistinctly dentate, 3–7½ in. long: fls. yellowish white, ¾in.
across, in terminal cymes 4–8 in. across formed in autumn and expanding the following spring: fro ovoid,

most charming viburnums, opening its deliciously fragrant pink-and-white fls. early in spring with the
unfolding lvs.; it has proved hardy at the Arnold Arboretum. A closely related species which has been
confused with V. Carlesi is V. bichuiense, Makino. A slenderer, more straggling shrub: lvs. smaller, usually
obtuse and often subcordate; fls. in smaller cymes; anthers inserted near the base; filaments longer than
anthers. Japan. Less handsome than V. Carlesi.
15. Lantana, Linn. WAYFARING TREE. Upright shrub or sometimes small tree, attaining 20 ft.: young
branches scurfy-pubescent: lvs. ovate or oblong-ovate, usually cordate at base, acute or obtuse, sparingly stel-
late-pubescent and wrinkled above, tomentose beneath, denticulate, 2–4 in. long: fls. white, in dense terminal sub-
globose cymes 2–3 in. across, appearing with the lvs.; stamens included, inserted about the middle; filaments

16. cotinifolium, D. Don (V. multratum, C. Koch). Shrub, attaining 6 ft., with spreading branches, tomento-

case when young: lvs. orbicular-ovate to ovate, cordate or rounded at the base, usually obtuse, exscinde-
tenate or almost entire, wrinkled above and nearly gla-
brous at length, tomentose beneath, 2–5 in. long: fls.
white, tinged with pink, in cymes 2–3 in. broad, with
usually 5 rays; corolla rather larger, funnel-shaped cam-
panulate, tube longer than limbs: fr. ovate-oblong, red,
H.W. 3, p. 131. Gn. 61, p. 324.—Hardy shrub, especially for drier situations and limestone soil. Var.
rugosum, Hori. With larger and very wrinkled lvs.
and larger cymes. There are a number of other varie-
ties, including some with variegated lvs.
10. alnifolium, Marsh. (V. lantanoides, Michx.). HOMELINESS.-AMERICAN WAYFARING TREE. Fig. 3921.
Low shrub, sometimes 10 ft. high, with spreading branches, tomentose when young: lvs. orbicular-ovate to ovate, cor-
date or rounded at the base, usually obtuse, exscinde-
tenate or almost entire, wrinkled above and nearly gla-
brous at length, tomentose beneath, 2–5 in. long: fls.
white, tinged with pink, in cymes 2–3 in. broad, with
usually 5 rays; corolla rather larger, funnel-campanulate, tube longer than limbs: fr. ovate-oblong, red,
Not quite hardy N., requiring protection near Boston.
11. alnifolium, Marsh. (V. lantanoides, Michx.). HOMELINESS.-AMERICAN WAYFARING TREE. Fig. 3921.
Low shrub, sometimes 10 ft. high, with spreading branches, tomentose when young: lvs. orbicular or broadly ovate, cor-
date or rounded at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous

22. **wrightii**, Miq. Upright shrub, to 10 ft. high, with the branches almost glabrous: lvs. almost orbicular or broadly obovate to ovate, abruptly acuminate, coarsely dentate, almost glabrous except on the veins beneath, 3-5 in. long; fls. rather large, white, in usually short-stalked, 2-4-in.-broad cymes; corolla glabrous outside; stamens longer than the corolla: fl. globose, red. May, June. Japan. S.T.S. 1:19.-Hardy shrub, similar to the preceding, but of less dense habit, with larger fls.

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above, subrally pubescent beneath, 3-8 in. broad: fls. white: cymes sessile, 3-5 in. broad; marginal fls. enlarged and sterile, long-pedicelled: fr. ovoid-oblong, dark purple. May, June. New Bruns. and Mich. to N. C. G.F. 2:635 (adapted in Fig. 3921).—Handsome shrub, with very large foliage, assuming a deep claret-red in fall. Var. *praeceptor*, Hesse. Said to bloom about 3 weeks earlier than the type. M.D. 1912, p. 370. G.W. 16, p. 495.

20. **fötáium**, Wall. (V. cœanohoides, C. W. Wright). Upright shrub with spreading branches, to 10 ft.: branchlets stellate-pubescent; lvs. obovate to rhombic-or obvate-oblong, acute or acutish, rarely short-acuminate, cuneate at the base, sinuate toothed above the middle, 3-nerved at the base and with 1 or 2 pairs more of lateral veins, glabrous above, pubescent on the veins beneath, 1½-2½ in. long; petiole ½-1⅛ in. long; fls. white, in cymes 2-4 in. across on lateral spreading branchlets: fr. scarlet, ovoid, ½ in. long. June. Himalayas, S. W. China. Var. *rectangulum*, Rehd. (V. rectangulum, Gnubra). Shrub, to 12 ft., with spreading, often pendulous branches: lvs. oblong-obovate to lanceolate, acuminate, remotely dentate or denticulate, usually nearly glabrous, 1½-3 in. long; cymes on slender, lateral branchlets often spreading at right angles. W. China.

21. **dilatátum**, Thunb. Fig. 3924. Upright bushy shrub, attaining 10 ft., with the branches hirsute when young: lvs. roundish or broadly ovate or obovate, usu-
VIBURNUM


VIBURNUM

25. venosum, Brit. (V. moUe, Auth., not Michx. V. Hanceanum, Dipp., not Maxim. V. nepalense, Hort.). Fig. 3925. Shrub, to 5 ft., with grayish brown branches; young branchlets stellate-pubescent; lvs. ovate to orbicular, coarsely and sharply dentate, glabrous or nearly so above, stellate-pubescent beneath, particularly on the veins, 2-5 in. long, with prominent veins beneath; petioles 1/2-1 in. long, pubescent; cyme long-stalked, slightly pubescent, 2 1/2-4 in. across; fr. globose or globos-ovoid, 1/2 in. long, bluish black. June, July; fr. in Sept., Oct. New Bruns. to Minn., south to Ga. G.F. 10:332.—Has proved hardy at the Arnold Arboretum.

26. pubescens, Pursh. Fig. 3926. Bushy shrub, 3-6 ft. high, with slender, upright branches; lvs. oval to ovate, rounded or cordate at base, acute or acuminate, coarsely dentate-serrate, glabrous or nearly so above, stellate-pubescent on the veins, 1 1/2-2 1/2 in. long; cymes short-peduncled, pubescent, 1 1/2-2 in. broad; stamens exceeding the corolla about one-half; fr. oval, almost black, slightly flattened. June, July. Que. to Ga., west to Man. and Ill. G.F. 3:125 (adapted in Fig. 3926). A.F. 12:1101. G.B. 5:311. M.D.G. 1903:404.—Handsome shrub of compact habit. Var. affine, Rehd. (V. affine, Bush). Lvs. nearly glabrous; petioles 1/2-1 in. long, sometimes shorter. Mo.

27. moUe, Michx. (V. Demetrians, Deane & Rob.). Shrub, to 12 ft.; bark separating in thin flakes; lvs. orbicular or broadly ovate, cordate, shortly acuminate, coarsely dentate, pubescent beneath or almost glabrous, 2 1/2-4 in. long; cymes long-peduncled, puberulous, about 2 1/2 in. broad; fr. oblong, almost 1 1/2 in. long, bluish black. May; fr. in Aug. Ky., Mo., Iowa. B.B. (ed. 2) 3:272.—Has proved not quite hardy at the Arnold Arboretum.

30. aucifolium, Raf. Straggling shrub, attaining 5 ft.; lvs. orbicular to oval, coarsely dentate, with 3 short lobes above the middle or often without, glabrous or slightly pubescent beneath when young, 2-3 1/2 in. long; cymes few-fl., small, on lateral, short usually 2-lvd. branches: fr. scarlet, subglobose. June. Lab. to Alaska, south to Vt. and Colo. in the mountains. G.F. 3:5.—It does not usually succeed well in cult.; requires shade and moist porous soil.

VIBURNUM

3463

Gug. 1:9. Gn. 56, p. 83; 76, p. 35. F.E. 15:319; 20:813. G.W. 6, p. 159.—This is a very showy variety, but it lacks the decorative frs. Var. xanthocarpum, Spach. Fr. yellow. There are also variegated forms of the type and of the sterile variety.

32. americanum, Mill. (V. Opulus var. americanum, Ait. V. Trilobum, Marsh. V. opuloides, Muhl. V. edule, Pursh. V. Oxyacum, Pursh.) CRANBERRY BUSH. HIGH CRANBERRY. Fig. 3928. Closely allied to the preceding species, but habit more open and spreading; lvs. with coarsely toothed or nearly entire lobes, pilose on the veins beneath or nearly glabrous, 2-5 in. long; petals with shallow groove and small, usually stalked glands; cymes with shorter pedicels; stamens somewhat shorter. May, June: fr. in Aug., Sept. B.B. (ed.) 2:270 as V. Opulus). New Brit. to Brit. Col., south to N. J. and Ore.—Handsome native shrub, very decorative in fr., which begins to color by the end of July, remains on the branches and keeps its bright scarlet color until the following spring. The berries are eaten by birds.


3927. Snowball.—Viburnum Opulus var. sterile. All the fertile flowers are changed to sterile, showy ones. (X4)

3926. Viburnum pubescens (X4)
VIBURNUM

Vicia (classical Latin name). Vetch. Tare.

Leguminosae. Mostly weedy or insignificant-looking plants, but a few are grown for the bright flowers, others of late for green-manure crops (see Cover-crops), and one (V. faba) is a garden bean.

Herbs, mostly climbing, with pinnate foliage, closely allied to Lathyrus, Pisum, and Lens, but differing in minute floral characters: wings adhering to the keel; style very slender; with beard or hairs all around the upper part or only at the apex; pod flat, 2- to many-seeded, 2-valved, and dehiscing, the seeds either globular or flatisht; stamens diadelphous (9 and 1): fls. mostly blue or violet, sometimes yellowish or white.- About 150 species widely spread in the northern hemisphere and some in S. America. About two dozen species occur in N. America, some of the species intro. The species are mostly cool-season plants of easy culture. The interest in the vetches in this country is mostly for their value as soil-covers and for foliage. V. sativa, V. faba, and V. villosa are the important species at present for agricultural purposes, and V. Cracca, V. Gerardi, and V. julgans are sometimes used as ornamentals. For literature, see Farmers' Bull. Nos. 515 and 529, Bur. Pl. Ind. Cir. No. 15, and U. S. Dept. Agric. Cir. No. 45.

INDEX.

a. Pods 1-1/2 in. broad with spongy septa between the seeds; seeds oblong, Umbellus attached at the end: st. thick, erect, 4-angled: fls. without tendrils.

1. Fabæ. Linn. (V. fabæ vulgaris, Moench. = faba, Bernh.) Broad Bean. WINDSOR BEAN. ENGLISH DWARF BEAN. HORSE BEAN. Figs. 478, 479, Vol. I. Strong erect annual, 2-4 ft., glabrous or nearly so, very leafy: fls. 2-6, the lower ones not opposite on the racemes, the terminal one wanting or represented by a terminalmentil, ovate to elliptic or obtuse and mucronate-pointed: fls. in the axils, dull white and with a large blue-black spot: pods large and thick, from 2 or 3 in. even to 18 in. long, the seeds large and often flat. Probably native to N. Africa and S. W. Asia. R. F. G. 22:238.—Much grown in the Old World, but the hot dry summers prevent its cult, in most parts of the U. S. It is grown successfully in parts of Canada, particularly in the maritime provinces, and also in California as a winter vegetable or green-manure crop. The plant is grown mostly for cattle-feeding in the U. S. But the beans are extensively used in Asia, both full grown and immature, for human food. This bean has been cultivated, from prehistoric times and its nativity is in doubt. The plant is hardy and seeds should be sown early, when the season is cool. The unripe seeds are reported to have caused cases of poisoning, but little is known as to the conditions of the poisonous production.

b. Infl. very short-stalked or sessile: fls. in medium to large, often 1-2 in. in the If.-axis.

c. Stipules very large, mostly toothed: fls. with 1-3 pairs of Sts.: plants annual.

2. narbonensis. Linn. FRANCE OF NARBONNE VETCH. Annual, pubescent, dark green: st. stout, erect or ascending, 4-angled, 2-4 ft. tall: lower fls. with a single pair of flts. without tendrils, upper with 2-3 pairs of flts. and branching tendrils; fls. 1/4-2 in. long, 1/4-1/2 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5)-fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5)-fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broadly linear to rhombic-linear, 2-3/2 in. long, 1/3 in. broad, compressed; seeds flat or mucronate above, 1-2 (rarely 5) -fid.: fls. stalked, 1/2-1/2 in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish; pod broad
Vicia americana (Xvi)

4. pyrenaica, Pourr. Perennial, glabrous or nearly so: sts. 4-12 in. long, prostrate or ascending; angular; lower lvs. with only 1-2 pairs of lfts., the upper with 4-6 pairs of lfts. and unbranched or rarely 2-3-branched tendril; fls. solitary, large; calyx sparingly pubescent; corolla purple-violet; pod broadly linear, glabrous; seed smooth, brown, mottled. S. W. France.

V. americana. (Xvi)

tall: lvs. short-petioled, with 1-3 pairs of lfts., ending in a sharp point, without tendril; lfts. ovate, elliptic to oblong; infl. sessile, mostly 3-7-fld.: fls. ½-3¾ in. long, short-pediciled; calyx-teeth equaling or shorter than the tube; corolla yellowish white to golden; pod linear-oblong; 1-½ in. long; seed nearly spherical, brown, ½ in. diam. Moist lands across the continent and as far south as Ky. B.B. 2:2614.—Has been offered by dealers in native plants.

6. sativa, Linn. COMMON VETCH or TARE. Annual or biennial, not surviving the winter in the N., more or less pubescent, 2-3 ft. high; lfts. 7 pairs or less, elliptic, oblong or oblancolate, mostly truncate and apiculate at the top, the tendril part of the lft. extended: fls. usually 2 in. each axil, about 1 in. long, purple: pods 2-3 in. long when mature. Eu., and naturalized in some parts of the U. S. R. F. G. 22:248. B.B. 2:2621.—Much cult. abroad as a forage plant; in this country grown for similar purposes and also somewhat as a cover-crop for orchards. Best adapted to S. E. U. S. and the Pacific coast as a winter crop for green manure or sown with oats, wheat, rye, or barley for hay. As a spring crop it succeeds only where the summers are fairly cool. Not much injured by a temperature of 10° F. but zero weather results in much winter-killing. The name winter vetch is more commonly applied to winter vetches than those of V. sativa. In some parts of the S. it often makes up a considerable portion of the hay.

7. angustifolia, Linn. Annual, glabrous or pubescent: sts. slender, 1-2 ft. long; lvs. short-petioled or nearly sessile with 4-8 pairs of lfts. and an unbranched or 2-3-branched tendril; lfts. linear, lancolate or oblanceolate, up to 1½ in. long and 3/8 in. wide; fls. purple, ½-¾ in. long; pod glabrous, 1-2 in. long. Eu. R. F. G. 22:250. B.B. 2:2622.—Naturalized and established from Nova Scotia to Fla. The seeds mature earlier than those of V. sativa. In some parts of the S. it often makes up a considerable portion of the hay

V. villosa, the hairy vetch. (Xvi)
mucronate: fls. small, red or nearly scarlet and purple-striped, in a compact raceme or spike. Algeria.—
Adapted only to the Pacific and Gulf states. Usually of poor seed habits, but quite drought-resistant from spring sowings.

**Color of fls. purplish or violet.**


**Limb of banner not over half as long as its claw.**

**Pod glabrous.**

**V. villosa, Roth.** Hairy, Sand of Russian Vetch. Fig. 3930. Annual or biennial (sometimes perennial?), enduring the winters in the N., villous-pubescent: flts. 5-10 pairs, elliptic-oblong, rounded at the tip but usually ending in a very minute point: fls. violet-blue, in long 1-sided axillary about 30-fld. racemes. E. Asia. R.F.G. 22:234.—Now considerably used as a cover-crop. More hardly than V. sativa but the pods shatter more easily and the seeds are smaller. In N. Italy it can be cut early enough to produce a crop of millet the same season.

**Plant with short appressed pubescence: fls. only up to $\frac{3}{4}$ in. long.**

**V. dasycaepa, Ten.** Annual or sometimes perennial, slightly pubescent: st. slender, angled, climbing to prostrate: lvs. nearly sessile: fls. about 10 pairs, oblong-obovate to linear-lanceolate: fls. about 2-12-fld.: fls. about $\frac{3}{4}$ in. long; corolla whitish below, blue-violet above, becoming blue with age; pod $\frac{3}{4}$-1$\frac{1}{4}$ in. long, $\frac{3}{4}$ in. broad; seeds rather large, purplish brown. Eu. R.F.G. 22:235.—As hardy as V. villosa and matures earlier than V. sativa. Produces good seed crops Naturalized in W. Ore.

**Pod pubescent; plant with thick shaggy pubescence: fls. whistling below, purplish above.**

**ATROPERA, Desf.** Pteromcma. Annual, resembling V. villosa in habitat, sometimes with soft whitish pubescence: st. 8-30 in. long, angular, prostrate or climbing: lvs. with 5-8 pairs of flts. with branched tendrils; flts. oblong-linear to almost linear, apex pointed: infl. 2-12-fld.: fls. about $\frac{3}{4}$ in. long; corolla whitish below, purplish above: pod broadly linear to rhombic-linear, 1-1$\frac{1}{2}$ in. long, $\frac{3}{4}$-1$\frac{1}{4}$ in. broad, pubescent; seeds somewhat roundish, somewhat compressed, black. 8. Eu. R.F.G. 22:239. B.R. 871.—Of good seed habits. Best adapted to the Pacific and Gulf coasts and produces excellent yields from spring plantings in semi-arid regions.

**Fls. $\frac{3}{4}$ in. long or less: infl. 2-4-four-flld.: plants annual.**

**ERVILLA, Willd. (Erervm Erotica, Linn.).** Better Vetch. Annual, pubescent: st. erect, angular: lvs. with 8-12 pairs of flts. without tendrils; flts. oblong-linear to linear: infl. 2-4-flld.: corolla rose-colored, veined: pod broadly linear, smooth, yellowish; seed smooth, reddish brown. Eu. R.F.G. 22:261.—Extensively grown in Asiatic Turkey and seed shipped in large quantities to England and other countries for stock feed, especially sheep. Yields about 30 lbs. of seed to the acre. Plants not readily eaten by live stock but it has been found to be an excellent, winter green-manure crop in Calif.

**PL. RICKER.**

**VICTORIA (in honor of Queen Victoria).** *Nympheadora.* **ROYAL WATER-LILY.** The great water-lily of the Amazon, sometimes grown in large aquaria.

This remarkable aquatic genus may be recognized by its huge round floating lvs. often 6 ft. or more in diam., with the margin turned up at right angles to the water surface to a height of 3-8 in., making a basin-like object. Fls. (12-18 in. across) nocturnal, opening on two successive days about 5 P.M. and remaining unopened until the middle of the following evening. The first evening the inner floral fls. remain loosely closed over the stigma, the fl. is creamy white, and exhales a delicious fragrance somewhat like pine-sap; the second evening the floral lvs. spread wide open, and the color changes to pink or red; ovary inferior, densely prickly, and surrounded by a short broad tube, on the sides and summit of which the floral lvs. are situated; sepals 4; petals 50-70, obtuse, oblong-ovate to sublinear, rather thin and delicate in texture; stamens about 20; staminodes 150-200, linear-lanceolate; carpels about 25, forming a ring of thick fleshy bodies between the stamens and the styles; carpels 30-40; stigma forming a broad basin-like depression, 2-2$\frac{1}{2}$ in. wide, in the midst of the fl., with a central conical continuation of the floral axis, the basin filled with fluid on the first evening of opening; carpelary styles broad and fleshy in the lower part, produced upward to a fleshy subulate incurved process about $\frac{3}{4}$ in. long: in fr. all of the floral lvs. have decayed away, leaving the top of the torus at the top of a great prickly berry, half the size of one's head; seeds greenish or brownish black, about the size of a pea.—The genus is represented by 2 well-defined species, inhabiting still waters of S. America, from British Guiana to Argentina.

In its native haunts victoria grows in 4 to 6 feet of water, in great patches in extent, and is perennial. The tuberous rhizome stands erect in the mud, where it is anchored by innumerable spongy roots which spring from the bases of the leaves in groups of ten to thirty or forty. The tuber may be as much as 6 inches in diameter and 2 feet long. It decays below as it grows above. The leaves are arranged in 7 to 18 order, the flowers being extra-axillary. Each leaf after the first seedling leaf has a broadly ovate rounded stipule, these organs serving to protect the apex of the stem. The petioles and peduncles are terete, 1 to 2 inches in diameter, covered with stout fleshy prickles, and traversed internally by four large, and a number of smaller air-canals. The petioles attain a length much greater than the depth of the water, so that the leaves can adjust themselves to changes of the water-level, though Banks states that they may be completely submerged in times of flood. The gigantic leaves are covered beneath with a close network of prickly veins, the larger of which project an inch or more from the leaf-surface, the tissues are full of air-spaces and -canals, thus buoying up the mass of cellular matter. Besides many stomata on the upper surface of the leaf, which open into the air-chambers of the mesophyll, there are countless tiny depressions, in each of which one can see with a hand-lens that the leaf is perforated with a fine hole; these holes were called by Planchon "stomatae." (P.S. 6:240). He considered them to be useful as air-holes to let out gases which, rising from the water or mud, might be caught in the deep meshes of the netted veins on the under side of the leaf. It is also to be noted that, in spite of the cup-like form of the leaves, water from rain or other sources does not pass through the tiny perforations. This would be an indispensable protection against fungi and algae, and for the function of assimilation.

A single leaf, by its buoyancy, may sustain a weight of 150 or 200 pounds. Gurney at Tower Grove Park, St. Louis, covers the leaf with a large round quilted pad, then lays on an equally large frame of thin wooden
VICTORIA

slats, and on this a person can readily stand, as if in a boat. Not the least remarkable feature of these leaves is their rate of growth. Caspary found the maximum growth in length to be about 1 inch an hour when the leaf is just expanding; the surface increases 4 or 5 square feet in twenty-four hours, and a plant will produce in twenty-one to twenty-five weeks 600 or 700 square feet of leaf-surface. A great development of heat has been observed in the opening flowers of Victoria. About 8 p.m., when the anthers are shedding their pollen (in second-day flowers), the stamens may reach and maintain a temperature 10° F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionaries, and certainly of use to savages as food in early times, Victoria was first noticed botanically by Haenke in Bolivia about 1801; but he died in the Philippines without recording his discovery. Bonpland, the companion of Humboldt, also saw it near Corrientes, Argentina, in 1819, and in 1825 sent seeds and a full description to Mirbel at Paris. In 1832 Poeppig found it on the Amazon, and gave the first published account of it in Forrie's "Notizen" in November of that year, under the name of Euryale amazonica. D'Orbigny saw the plant in 1827 at Corrientes, collected specimens, and sent them with drawings to the Museum of Natural History at Paris. In 1833 he saw it again in Bolivia, and several years later published accounts of his find. Robert H. Schomburgk, finding it again in 1836 on the Berbice River in British Guiana, sent home specimens and figures from which Lindley in 1837 (published in 1838) established the genus Victoria and described the species V. regia. This name has settled on the northern species, while the one found at Corrientes was named in 1840, by d'Orbigny, V. Cruziana in honor of General Santa Cruz, of Bolivia.

The struggle to bring the "queen of water-lilies" into captivity began with Schomburgk. He removed living plants from inland lakes and bayous to Georgetown, British Guiana, but they soon died. In 1846 Bridges obtained seed in the Bolivia locality, province of Moscos, and sent them in a jar of wet clay to England. Out of twenty-five seeds obtained at Kew, three germinated and grew vigorously as small seedlings until October, but died in December. In 1848 dry seeds were sent to England from the Essequibo River, along with rhizomes, the latter in Wardian cases; the rhizomes rotted, and the seeds refused to germinate. In 1849 an expedition from Georgetown succeeded in bringing back thirty-five living plants, but these all died. Finally some seeds were sent to Kew from the Demerara River in bottles of fresh water, by two English physicians, Rodie and Luckie. The first sending arrived February 28, 1849, and on November 8 a plant flowered at Chatsworth; the blossom was appropriately presented to Queen Victoria. From this stock Victoria regia was distributed to gardens in Europe, Asia, and America. Van Houtte of Ghent first flowered it on the continent.
the V. Cruziana of d'Orbigny. Its far southern habitat (27° south) explains its hardiness. At Riverton, New Jersey, seeds that have wintered in an open pond produce plants which flower by the end of August. The large starry seeds of this species are used as food in Paraguay under the name of ‘Mats del Agua,’ ‘water-corn.’ The form of Victoria originally introduced from British Guiana had leaves entirely flat until the plant attained considerable size; then a low rim appeared. The leaf was deeply purple-colored beneath. V. Cruziana differs markedly from this as V. regia, Randii approaches the latter; and Malme's recently described V. Cruziana forma mattogrossensis approaches V. regia in several details. Apparently the two species grade into one another in Matto Grosso, where the tributaries of the Amazon and the Parana rivers interlace.

For much interesting information on Victoria, see Hooker, 'Botanical Magazine' 4275-4278; Planche, 'Flora Brasiliensis' 4, part 2, page 143 ff. In 1854 John Fisk Allen published in Boston a four-page work (pages 21 by 27 inches) with colored plates, entitled: "Victoria regia, or the great water-lily of America. With a brief account of its discovery and introduction into cultivation; with illustrations by William Sharp, from specimens grown at Salem, Massachusetts, U. S. A."

**V. regia**, Lindl. Fig. 3931. Lvs. sparingly pubescent beneath, margins of lvs. of diam. above 40 in., turned up 2-4 in. high: fls. becoming dull crimson the second evening; sepals prickly almost or quite to the tips; prickles of the ovary about ½in. (10-11 mm.) long; seed ellipitico-globose, nearly 2½in. long, less in diam. (7-8 mm. long, 5½-6 mm. diam.); raphe indistinct; operculum elliptico-ornibiculare, with the micropyle at its central margin. Britiah Guiana, B.M. 4275 (poor); 4276-78 (incorrect in some details). F.S. 6:595-604. Kerner, Natural History of Plants, pl. 12, 1896. The seed may be planted soon in February, but there is great uncertainty as to how long one must wait for the seedlings to appear, and also as to what percentage of seeds will germinate. As soon as the seedlings appear they should be treated like seedlings of V. regia, except as to temperature, which should be kept as above stated for seedlings and small plants, and as the season advances may be raised to 75° to 80°. The rationality of the cool treatment here advocated is borne out by the fact that early in June quantities of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender seedlings, that is, when the pond is not artificially heated. When it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, early or late, and the advance of summer weather may be determined by the appearance of a few leaves in about ten days. These young plants late appearance in the pond or absence of the young plants late appearance in the pond or absence of leaves will vary with the seasons, and the like, must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pots in the pond specially constructed to start the V. regia, these pots to be heated by hot water or steam and covered with frames and sashes. By this method plants may be set in their summer quarters.

**V. regia**, Lindl. Fig. 3931. Lvs. sparingly pubescent beneath, margins of lvs. of diam. above 40 in., turned up 2-4 in. high: fls. becoming dull crimson the second evening; sepals prickly almost or quite to the tips; prickles of the ovary about ½in. (10-11 mm.) long; seed ellipitico-globose, nearly 2½in. long, less in diam. (7-8 mm. long, 5½-6 mm. diam.); raphe indistinct; operculum elliptico-ornibiculare, with the micropyle at its central margin. Britiah Guiana, B.M. 4275 (poor); 4276-78 (incorrect in some details). F.S. 6:595-604. Kerner, Natural History of Plants, pl. 12, 1896. The seed may be planted soon in February, but there is great uncertainty as to how long one must wait for the seedlings to appear, and also as to what percentage of seeds will germinate. As soon as the seedlings appear they should be treated like seedlings of V. regia, except as to temperature, which should be kept as above stated for seedlings and small plants, and as the season advances may be raised to 75° to 80°. The rationality of the cool treatment here advocated is borne out by the fact that early in June quantities of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender seedlings, that is, when the pond is not artificially heated. When it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, early or late, and the advance of summer weather may be determined by the appearance of a few leaves in about ten days. These young plants late appearance in the pond or absence of the young plants late appearance in the pond or absence of leaves will vary with the seasons, and the like, must all be taken into account.

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Very gratifying results are obtained when the Victoria is grown under glass, as it is thus grown in several places in the United States, notably at Schenley Park, Pittsburgh, and Allegany Park; also at "Greystone," the estate of Samuel Untermyer, Yonkers, New York, also at many notable gardens in Europe. Plants grown under glass usually attain to larger dimensions, as they are protected against climatic changes and the elements, besides enjoying more of a tropical atmosphere. There is more than one disadvantage, however. Setting aside the costly construction, labor, and so on, it is by no means inviting even on a warm day to spend many minutes in such a structure. Compare this with a natural pond and its surroundings and a cool shady seat where these gorgeous plants may be viewed at leisure.

Whether grown indoors or out, these plants are only
annuals, and seedlings are of necessity raised every spring. They form no tubers as do the tender
ympheas, or rootstock as do the hardy ympheas.

Few, if any, insects are troublesome on these plants. The worst is the black-fly or aphid. The use of insecti­
ticides should not be resorted to, as they are most
likely to damage the foliage. The safest remedy is to
introduce a colony or two of the well-known "lady bug.
They and their larvae will soon clear off all the aphides
without any injury to the plant. WM. TRICKER.

VIGNA (Dominic Vigni, Paduan commentator on
Theophrastus in the seventeenth century). Legum­
ferae. Herbs grown mostly for the seeds and fodder;
the cowpea group.

The cultivated species of Vigna are annual bean­
like rambling vines with 3 rhomboid-ovate stalked
fls., the lateral ones unequal-sided, the petioles long:

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<td>V. sesquipedalis</td>
<td>Seeds elongated kidney-form, 8-12 mm. (1/2-1 in.) long, their thickness much less than their breadth; pods pendulous, much elongated, 1-3 ft. long, fleshy and brittle, becoming more or less inflated, flabby and pale in color before ripening, and shriveling about the widely separated seeds when dry. Probably S. Asia.</td>
</tr>
<tr>
<td>V. sesquipedalis</td>
<td>Seeds small, usually oblong or cylindrical and but slightly kidney-shaped, 5-6 mm. (1/16-1/4 in.) long, nearly or quite as thick as broad; pods small, not at all flabby or inflated when green, mostly 3-5 in. long, erect or ascending when green, remaining so when dry or at length becoming spreading or even deflexed. Probably S. Asia.</td>
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sinensis. Endl. Seeds mostly 6-9 mm. (3-1/2 in.) long, varying from subreniform to subglobose; pods 8-12 in. long, early becoming pendulous, not at all flabby or inflated when green. Probably Cent. Afr.

Some species of Vigna are useful for ornament. V. strobilophora, Robs., from Mex. (Fig. 3932), is said by Pringle (G.F. 7:155, from which Fig. 3932 is reduced) to have abundant fls., that rival those of the wisteria in beauty. It is a twining woody vine climbing to tops of trees and shrubs; at. slender and fleshy, pubescent; fls. 3, ovate, acuminate, entire, rounded at base, 2½ in. long; fls. in dense axillary peduncled racemes, blue-purple, standard orbicular, slightly reflexed, with 2 small appendages at base; bracts large, closely imbric­ated. V. vexillata, Bent. (Phaseolus vexillatus, Linn.), widely spread in the tropics and warm parts of Old World, is intro. in S. Calif.: woody perennial with pink fls., the rootstock tuberous, hairy; fls. usually 4-vaned-lanceolate to ovate-lanceolate, 2 in a cluster on summit of peduncle; standard nearly 1 in. across, reflexed: pod 3-4 in. long, nearly cylindrical.

Geo. F. Freeman.

VIGUIÉRA (Dr. A. Vigüier, botanist of Montpellier,
France). Compositae. About 60 or 70 species of herba­
ceous or somewhat shrubby plants, found in the
warmer parts of the world, especially Amer. The fol­
lowing is a native of Low. Calif. and is offered in S.
Calif., but is little known otherwise. It is a tall bushy
VIGUIERA

plant with silvery foliage and small yellow fls. like single sunflowers, but borne in ample corymbs. Rays fertile, or more often sterile, in wild plants sometimes wanting; pappus of 2 chaffy awns: achenes usually pubescent. The plant blooms both winter and summer.

VILLARÉSIA (named for Matthias Villarez, a Spanish botanist). Iac. axillaries. Evergreen tall climbing trees or shrubs, adapted to the warmhouse: lvs. alternate, oblong, entire or spinulose-dentate, thick, leathery, shiny: cymes small, head-like, arranged in axillary or terminal racemose panicles or racemes: fls. white, hermaphrodite or polygamous; calyx 5-parted; petals 5, ribbed inside; stamens 5, disk inconspicuous; ovary 1-celled: drupe ellipsoid.-About 12-15 species, distributed in the islands of the Pacific, Trop. Austral., and Spanish botanist).

GRANDIFLORA, Fisch. Tree, smooth with subangular branches: lvs. sparse, petioled, coriaceous, ovate-lanceolate, narrowed toward the base, apex acuminate, glandless, pubescent; panicles terminal, clustered; fls. sessile, small, white; calyx tubular-campanulate, lobes 5, ovate; petals 5, spreading, lanceolate. Brazil. Gt. 6: 181.

muconotá, Ruiz & Pav. (Ilex gongônea, Mart.). Tree, usually 40 ft. high, rarely 50-60 ft.: lvs. short-petioled, ovate or elliptic-oblong, apex spinulose, leathery, dark green, shining above, paler and dull beneath: fls. 5-merous, in solitary shortly pubescent thyrses, terminal or in the upper axis, yellowish white; sepals wide and many-fld., sometimes iaxy paniculate, sometimes corymbose congested or capitate and involucrate: fls. yellow or white; calyx 5-parted or deeply 5-delt., segments lanceolate; corolla broadly campanulate or rather rotate; stamens 5: caps. 1-celled, subglobose, apex 4-valved.-About 10 species, S. Afr. and Austral.

VINCA (pervinca, old Latin name of periwinkle, used by Pliny). Apocynaceae. Erect or procumbent or trailing herbs or subshrubs, some used for bloom in the flower garden, others for decorative foliage in the greenhouse and in window-boxes and others for permanent ground-cover out-of-doors.

leaffulata, Smith. The name LEAFLESS RUSH-BROOM has been proposed for this. Leafless yellow-flowered shrub, attaining 10-20 ft., formerly cult. in European greenhouses as a small tender shrub: lvs. 3-8 in. long: pod 2-3 lines long. Austral. B.M. 1190. P.M. 14: 123.-Offered in S. Calif.

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F. W. BARCLAY.
rainy weather. It is propagated by division or by cuttings, as seeds very rarely mature. The periwinkle will live in city yards under trees where grass will not thrive; rather is the commonest and perhaps most variable species. Varieties with white, purple, and double flowers are kept in most nurseries, as also a form with variegated foliage. V. major is larger in all its parts than the common periwinkle and not so hardy. It is very tender to frost. A variegated form of it is seen in nearly every veranda-box in the country. V. rosea is a tender plant of erect habit which is used chiefly for summer bedding. It grows about a foot high and has rosy purple or white flowers with or without a reddish eye, and often 2 inches across. The plants bloom continuously from the time they are set out until frost. It can be grown in large masses for public parks with somewhat less expense than geraniums. Mr. Stromback, head gardener of Lincoln Park, Chicago, has recorded his experience with V. rosea in Florist’s Review 1:141 as follows: “The seed is sown in January or February in flats of sandy soil in a temperature of 65° to 70°. When the seedlings show the second leaf, they are transplanted into 1-inch pots, and later shifted to 3-inch pots. The majority are bedded out from the 3-inch pots. The soil of the bed should be a sandy loam if possible, and the plants will not do well in a very heavy soil. In bedding, set the plants about a foot apart. They require more water than a geranium, and when the bed is watered it should be given a good soaking and then left alone for a few days. The plants require no trimming. The amateur will find V. rosea a satisfactory window-plant that can be grown with little trouble from seeds started as late as April, but of course such plants will not bloom as early as the bedding stock propagated in January or February. V. rosea is the largest-flowered species, and it seeds freely. (Wilhelm Miller.)

A. Plants trailing, herbaceous, hardy or nearly so, only the short flowering sts. ascending; fls. mostly blue or white.
B. Foliage evergreen.

a. Minor. Linn. Common Periwinkle. Blue, Ronnina. Fls. Fig. 3933. Hardy evergreen, trailing herb; fls. sts. erect, sometimes nearly a foot high; lvs. ovate or elliptic-lanceolate, not more than 1½ in. long, glabrous, petiole very short with 2 glands at the top; fls. lilac-blue; calyx-lobes narrowly lanceolate, acuminate; corolla-lobes ovate, very obtuse. Sube. G. 2:64.—Common in all country gardens and running wild in cemeteries and shady places. Some of the horticultural varieties are: Var. alba, Hort., which has single white fls. Var. alba variegata, Hort., a form with variegated lvs. and single white fls. Var. argentea variegata, Hort., has the lvs. silvery variegated. Var. strophurpea compacta, Hort., has single dark purple fls. Var. aurea, Hort., has been in the trade, a form with golden yellow florets. Var. aurea variegata, Hort., has golden variegated lvs. Var. cerisea, Hort. (V. cerisea, Hort. V. cerisea minor, Hort.), is a form with bright blue, single fls. There is also a form known as V. cerisea argentea marginata, Hort., which has the lvs. margined with silver white. Var. flore-pleno, Hort., probably the same as var. plena. Var. plena, Hort., has double fls., otherwise like the type. Var. purpurea plena, Hort., has double purple fls. Var. rosea, Hort., has single rosy fls. Var. rosea fl-pl., Hort., is like the last but double-flowered. Var. variegata, Hort., is a variegated-ldv., blue-flowered form offered in the trade. V. elegansina alba, Hort., and also ‘The Bride,’ a form with white fls. which are pink-centered belong to this species.

b. Minor. Linn. Storite sts. reclining; flowering sts. rather erect; lvs. subcorporate-ovate, rather obtuse, ciliate, shining, 2 in. long; fls. blue; calyx-lobes narrowly linear, ciliate; corolla-lobes obvate, very obtuse. Eu.—This species is larger throughout than V. minor. It is much used, especially the variegated forms, for veranda-boxes and hanging-baskets. Var. elegansina, Hort., is a showy form with the lvs. margined and blotched with yellowish white. Common form among the florists and easily prop. by cuttings. Var. reticulata, Hort., is offered in the trade. Var. variegata, Hort., is offered in the trade. G. 27:330.

C. Les. ovoite or ob-long-ovoite; corolla-lobes wedge-shaped; calyx glabrous.

a. Minor. Linn. Madagascar Periwinkle. Fig. 3934. Tender erect everlasting plant, somewhat shrubby or half-prostrate at the base: lvs. oblong, narrowed at base, veiny; petiole glandular at the base: fls. with a very small reddish eye, and often 2 glands at the top; fls. sterile or pubescent, calyx-lobes with pink or red center. As a matter of fact, these are the commonest and perhaps most useful species of Vinca that is realy native to Madagascar, viz., V. lanea, is not in cult. The plant is sometimes called “Cape periwinkle” and “old maid.” The three main types should be known as V. rosea, V. rosea var. alba, V. rosea var. oculara, the latter being a white fl. with pink or red center. As a matter of fact, these appear in American catalogues as V. alba, V. alba pura, V. alba nova, V. oculara, and V. varius, the last being a trade name for seed of mixed varieties. Var. delicata, Hort., is a trade name.

F. Tracy Hubbard.

VINCETOXICUM (compound meaning to conquer or subdue poison, alluding to supposed virtues). Acoeliadaceae. By some combined with Cynanchum (which see), but differing in anthers having only short scarios tips and bearing horizontal rather than suspended pollinia. There are about 75 species, all in Amer., mostly...
in warm or tropical parts: they are twining or trailing woody or perennial herbaceous vines, with opposite or verticillate simple lvs. and small greenish or purplish fls.; corolla campanulate or rotate, deeply 5-lobed and the parts sometimes reflexed; crown small, mostly ring-like or cup-like and thereby differing from the awned crowned-lobes of Gomolobus (Definition of Gomolobus, p. 1356, to be amended); follicles thick, pointed, mucronate or ribbed or both. Several species are native in the U.S. from Pa. and Va. southward, but apparently they are not in cult. The mosquito plant or cruel plant, sometimes named in this genus, is here treated as Cynanchum acuminatofolium.

VIOLAS: Planting, Vol. V. (Index p. 2657.)

VIOLA (classical name). Viola. Violet. Pansy. Usually perennial herbs with attractive spring or early summer bloom, and well adapted for colonizing in grounds and one species for forcing; in the pansy group, many species are handsome winter annuals or biennials; and in the Andes and the Sandwich Islands, and in southern Europe shrubby species occur, but they are scarcely cultivated. See Viola.

Either stemless, bearing lvs. and 1-fld. scape from the crown of the rootstock, or stemmed with manifest internodes between the lvs., from the axis of which arise 1-fld. peduncles: fls. usually of two kinds, those of spring with showy petals (Fig. 3935) and those of summer with petals rudimentary or lacking—fls. never opening but self-pollinated within the closed calyx (cleistogamous). (Fig. 3936.) The showy fls. of spring are 5-merous as to sepals, petals, and stamens, irregular and novel in structure as though contrived to prevent self-pollination; sepals nearly similar, persistent on the fr.; the lower petal of the nodding fl. spurred, the other 4 in 2 unlike pairs, the petals in each pair symmetrically alike; stamens short and included, the anthers more or less coherent in a ring about the style, 2 of them with nectar-bearing appendages projecting backward into the spur: fr. a caps. with several (up to 60) obovate seeds; caps. when ripe splitting into 3 boat-shaped valves with thick rigid keels; as the thin sides of the valve dry and contract the seeds within are more and more pinched, until they fly out, one or two at a time, to a distance often of 9 ft.: later cleistogamous fls. in some of the stemless species not growing in wet ground are borne on short horizontal peduncles concealed under soil and last-mold until the seeds are ripe, when the peduncle lengthens and lifts the caps. into the air, where it scatters the seeds within are more or less alike. (4) The hybrid is unstable in sexual reproduction; that is, the offspring of the self-fertilized hybrid are more or less unlike the parent and unlike each other; the offspring of pure species are not thus unlike.

By experimental cultures extending over twelve years, the writer has ascertained the existence of about eighty spontaneous hybrids among the violets of eastern North America—that is, more hybrids than there are pure species. In Wilhelm Becker's systematic treatise on the violets of Europe (published in 1910), eighty-three hybrids are reported among the one hundred and two species there recognized. Any reader caring for the details of the work on American violets will find a dozen or more papers in Rhodora and in the Bulletin of the Torrey Botanical Club (1904-1913); see also Science, June, 1907, and American Naturalist, April, 1910.

Violets are easily grown if an effort is made to imitate the conditions under which they naturally occur. They usually require abundant moisture and partial shade, and a light covering of fallen leaves or evergreen boughs in winter. The habitats are various: some are woodland species, others from bogs or borders of springs and brooks; still others, especially in the western United States, inhabit dry plains, remaining dormant during the drought of summer. They are propagated readily by division if the plant is fairly large, and in some nine of the American species by runners. Sometimes seeds are used, but not commonly. However, species of the northeastern United States germinate readily in April, if fresh seed is sown in autumn in boxes and exposed to a light covering of fallen leaves or evergreen boughs. Many species, that grow mostly to single stems in the wild, make large clumps under favorable conditions in the garden (Fig. 3942). But few of the native violets are grown to any extent as garden plants. V. pedata, the bird's-foot violet, a most attractive species, is
sometimes cultivated, as is the hardy grower, *V. papilionacea* (Fig. 3936). A partial alias of this, the petals white with a large blue center, is grown in southern gardens as "the confederate violet." It has been published as *V. Procana*, the type coming from Bowling Green, Kentucky; but it is perfectly hardy in the North, and multiplies abundantly. Many hybrids of *V. sororia* and of *V. pedatifida* are also hardy, some with violet flowers, others with white flowers, often fifty or more blooming at once in a large clump.

No attempt is made here to describe all the native species, as they are so numerous and so rarely horticultural subjects. For any desired information regarding them the reader is referred to the most recent editions of Gray's "Manual," of Britton & Brown's "Illustrated Flora," or of Small's "Flora of the South-eastern United States," the treatment of Viola in all three works being by the present writer. However, as a matter of record, a list of those that are or have been offered in the trade is here given, and references made to illustrations found in horticultural magazines. With the recent critical studies of Viola, it is found that two or more species were sometimes comprised under a single name; it is therefore difficult, in some cases, to determine what plant may be in cultivation under one of the older names. It is now considered that the European *V. canina* is not indigenous in America; probably the plant listed under that name is *V. conspersa*.

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A. Species of exotic origin, comprising the florist's violets and the pansy.

b. Plant stemless, the peduncles arising directly from the base or crown.

c. Style truncate at apex.

1. hederacea, Labill. (Erpeton reniforme, Sweet. *E. hederaceum*, E. petiolare, and E. spathulatum, Don). AUSTRALIAN VIOLET. Tufted, and creeping by stolons, glabrous or pubescent: lvs. reniform or orbicular or spatulate, small, entire or toothed, usually not equaling the scapes; fls. small, usually blue, sometimes white, the spur almost none. Austral. G. 35:35.—Offered in S. Calif.

c. Style terminating in a slender hooked beak.

2. odorata, Linn. SWEET VIOLET. Fig. 3937; also Figs. 3947-49. Tufted, somewhat pubescent, producing long prostrate stolons flowering the second year; rootstock short: lvs. cordate-ovate to reniform, obtusely serrate; stipules ovate-lanceolate, acuminate, the fringed border usually not glandular: fls. deep violet, rarely rose or white, fragrant, the spur nearly or quite straight and obtuse. Eu., Aaf., and Asia.—It runs into many forms varying in stature, size of fls. and color. There are double-fl. forms. It is the parent of florists' violets. Fig. 3937, from G.C. III. 21:248, represents var. sulfuera, "reported to be a native of the south of France, and bears dull sulphur-coloured flowers." *V. californica* of gardeners on the Pacific coast is only the sweet violet of Eu. For cult., see *Violet*.

3. cyanes, Cebak. Stemless, stoloniferous: lvs. broadly cordate-ovate, crenate, bright green, glabrous or pubescent, long-acuminate, filbrinate: pedicels 2-4 lines long, about equaling or slightly shorter than the petals after flowering; sepal oblong, obtuse, with short appendages which are rotundate and appressed to the pedicel; corolla medium-sized; petals sky-blue-white below the middle, lower petals emarginate, the others about as long, scarcely emarginate; spur conical, rather straight; ovary short-conoid, very smooth. Eu.


4. alba, Bess. Stolons long, ascending, appearing in spring and sometimes bearing fls. the same season: lvs. nearly triangular, cordate, with deep and broad

sinus, obtuse; stipules lanceolate, long-acuminate, with glandular fringe; fls. fragrant, usually white, but sometimes in various shades of violet and rose. Cent. and S. Eu.

aa. Plants with evident sts., more or less branching, the peduncles arising some distance above the ground or crown.

c. Style slender throughout.

5. silvestris, Reichb. (V. silvestrica, Fries). Sts. reclining and ascending, glabrous or slightly pubescent: lvs. deeply cordate or nearly reniform, short-pointed or obtuse; stipules linear-lanceolate, fringed-toothed, and shining shorter than the petals; sepals lanceolate, acuminate; petals oblong, narrow, not overlapping. Widely distributed in Eu. G.W. 13:73.

6. elatior, Fries. Sts. tall and straight: lvs. lanceolate from a rounded or cordate base, when young with appressed pubescence; the middle stipules as long or

3937. Viola odorata. (X ½)
longer than the petals, the upper much surpassing it: corolla large, pale blue. Cent. Eu. and southeastward.

3938. Viola cornuta. (x 10)

7. calcarata, Linn. (V. valdaria, Huter). Rootstock producing filiform creeping branches: st. simple, 4 in. high: lvs. ovate, or the upper oblong to lanceolate, crenate; stipules nearly or quite pinnately divided; spur as long as the large violet corolla. Alpine region of Cent. Eu. G.W. 12: 709. Gn. 82, p. 97.

8. gracilis, Sibth. & Smith (V. olympica, Bois.). One of the V. calcarata group, and by some authors included in that species: entire plant hairy, internodes more or less elongated, 1 ft. high: lvs. oblong and narrowed to petiole, or broad-ovate to nearly round and abruptly contracted below, somewhat obtuse at apex, the margin crenate; stipules pinnately parted: fls. medium size, the petals violet or yellow; sepals lanceolate; spur exceeding calyx appendages. Macedonia to Asia Minor.

9. Munbyana, Boiss. & Reut. Another of the V. calcarata kind: plant about 1 ft. high, with long internodes, very short-pubescent: lvs. cordate-ovate, obtuse, crenate, glabrous or the margin ciliate, the upper ones somewhat acute; stipules pinnatifid: fls. 1–3, the petals violet or yellow; sepals lanceolate; spur straight, attenuate at the end, about twice longer than the calyx. Algeria.

10. lutea, Huds. Plant persisting by filiform pros­trate branching sts.: stipules digitately much divided, middle division linear and enlarged: sepals oblong­lanceolate, acute, shorter than petals; spur exceeding calyx appendages. Macedonia to Asia Minor.

11. cornuta, Linn. Horned Violet. Bedding Pansy. Fig. 3938. Plant tufted, glabrous or nearly so, producing evident lvs. with long peduncles in the fl.-axis: lvs. subcordate-ovate and usually acuminate, crenately serrate; stipules triangular, large, coarsely dentate: fls. normally violet, the petals ovate-obtuse, standing well apart, the spur slender, acute, shorter than the petals. Libea and the Pyrenees. B.M. 791. G. 32: 417. Gn. 73, p. 385.—Frequently seen in gardens and much prized for its large bright fls. Good for spring bloom. Hardy. There are several colors. Var. filosa, Hort. Gz. 78, p. 449. Var. purpurea, Hort. G. M. 52: 386. Var. Papilio, Hort. (Fig. 3939) has very large fls. violet in color, with small dark eye. Var. admirable, Hort., a garden group of various colors, is probably a hybrid offshoot of this species. V. munbyana is a form of this species.

12. tricolor, Linn. Pansy. Heartsease. Fig. 3940; also Figs. 2748, 2749. Glabrous or nearly so, the sts. becoming long and branched: basal lvs. cordate or round-cordate, those of the st. becoming ovate-oblong or lanceolate, all stalked and crenate-dentate; stipules large, pinnately parted toward the base: fls. large, usually about three colors represented (except in high­bred self varieties), the spur usually twice as long as the appendages of the calyx. Eu. G. Z. 27: 1. R.B. 38: 137.—When strayed from cult., the fls. become small and lose the markings characteristic of the high­bred pan­seys. A small-fl. field form, becoming common, is the common V. arvensis, Murray. A similar but more delicate species, distinguished by petals longer than the calyx, V. Rafinesqui, Greene (V. tricolor var. arvensis, American Auth., not DC.), is indigenous to the U. S. from N. J. southward and westward to Texas and Col. For cult., see Pansy.

AA. Species native in the U. S. and Canada, not do­mesticated but sometimes planted from the wild.

B. Plants stemless.

C. Petals normally violet or purplish.

D. Lvs. more or less dissected.


Gn. 65, p. 383. G. 13: 373; 22: 65.—In the typical form the 2 upper petals are dark violet, the 3 lower pale lilac; the concolorous form is by far the more common. A form with petals nearly white is known as var. filosa.

14. palmata, Linn. Fig. 3941. Rootstock stout, usually oblique rather than erect: first lvs. in spring sometimes less divided but later lvs. palmately 5–11– lobed or -parted, midle segm. largest, all of them variously toothed or eleft: fls. violet-purple, about ½–1 in. across; lateral petals bearded; sepals rather blunt, ovate-lanceolate; produces cleistogamous fls. on prostrate peduncles. Woodlands, Mass. to Minn. and to Fla.

15. pedatifida, Don. Rootstock short and erect: lvs. palmately multifid, primarily 3-parted or -divided, each segm. again 3-eleft or -parted into linear sub­divisions, these further often cut into 2–4 lobes; fls. showy, violet, on scapes surpassing the lvs.; produces cleistogamous fls. with yellowish caps. on erect pedunc. Woodlands, Ohio northwestward and south­westward.

DD. Lvs. lanceolate or oblong-lanceolate.

16. sagittata, Ait. A small species, with erect short rootstock, usually glabrous: mature normal lvs. lanceo­late or oblong-lanceolate, hastately or sagittately toothed
or incised at the base; earlier and later lvs. more deltoid and often only crenate at base; fls. violet-purple; sepal narrow-lanceolate, acute. Banks and fields, Mass. to Minn. and southward.

**DD**. *Les. cordate-ovata* to *cordate-reniform.*

17. *papilionacea,* Pursh (*V. cucullata* of older Manuals). Figs. 3935-6, 3942. Commonest and most variable violet in the N. E. "U. S. A robust plant, with a strong branching horizontal rootstalk, 3-6 in. high; lvs. deltoid-ovate to cordate-ovate, not lobed, bluntish, ovate, the long petiole somewhat pubescent; fls. normally deep violet but white or greenish yellow in the center; outer sepals ovate-lanceolate; petals narrow; spurred petal often narrow and boat-shaped; cleistogamous fls. usually underground but caps. erect. V. Priceana, Pollard, is probably a form of this, with white blue-centered fls. Ky. See remarks on p. 3475.

—Besides albinos there are striped and pied forms now in the trade known as *vari.* *striata,* *picta,* and *variegata,* Hort. All forms are easily colonized in the garden. C.M. 57:313. G. 3:323 (both as *V. cucullata*); GT 1:194.

18. *sororia,* Willd. Much like No. 17, but petioles and lower surface of lvs. villous-pubescent; a sturdy grower, in pubescence, shape of fl., and color of fl. resembling the European *V. odorata,* whence named by Willdenow in 1806 the "sister violet." (Latin *soror,* a sister.) Woods and moist meadows and about buildings, Que. to Minn. and southward.

19. *pratincola,* Greene. A prairie species of the Middle West, from Ind. to Minn. and Col.; like *V. papilionacea,* but less robust, and often united with that species: petals violet-purple but of a lighter shade than in No. 17, the petals broadly ovate.

20. *septentrionalis,* Greene. Scapes and lvs. more or less hisrutulous: lvs. ovate to reniform, cordate at base, somewhat attenuate but blunt at the apex, crenate-toothed and ciliate, the petioles slender: fls. large, of a rich violet-purple (rarely white or white); 3 lowest petals villose at base; sepals lanceolate, acuminate; 3 lower petals beardless or slightly bearded; cleistogamous fls. on shortish erect peduncles. Open moist ground, New. Bruns. to Fla. and La.

**DD**. *Les. ovata,* with either narrowed or rounded base.

21. *seckiriki,* Pursh. A very distinct small species with minute spreading hairs on the upper surface of the lvs.-blades: lvs. thin, ovate to nearly orbicular, deeply cordate with a narrow sinus, crenate: sepals lanceolate or ovate-lanceolate, usually acute; cleistogamous fls.

22. *Sékikiri,* Pursh. A very distinct small species with minute spreading hairs on the upper surface of the lvs.-blades: lvs. thin, ovate to nearly orbicular, deeply cordate with a narrow sinus, crenate: sepals lanceolate or ovate-lanceolate, usually acute; cleistogamous fls.

23. *lanceolata,* Linn. Small glabrous species, with erect habit: lvs. lanceolate or elliptical, obscurely crenulate, gradually narrowed into a margined more or less colored petiole; fls. white, but the 3 lower petals with purplish veins, all usually beardless; sepals lanceolate; cleistogamous fls. erect. Open moist places, Nova Scotia to Minn. and southward.—A distinct and interesting species.

**DD**. *Les. ovata,* with either narrowed or rounded base.

24. *primulifolia,* Linn. Usually glabrous but sometimes pubescent: lvs. oblanceolate, usually rounded at the base or cuneate, obscurely crenate-serrate, the petals often manifestly winged above: fls. white with purplish veins, on peduncles exceeding the lvs.; sepals lanceolate, acuminate; 3 lower petals beardless or slightly bearded; cleistogamous fls. on shortish erect peduncles. Open moist ground, New. Bruns. to Fla. and La.

**DD**. *Les. ovata,* with either narrowed or rounded base.

25. *pallescens,* Brainerd. Small neat species, for the most part glabrous, stoloniferous: lvs. broadly ovate or cordate-orbicular, sometimes only \( \frac{3}{2} \) in. wide, but usually 1½-2 in., crenate-serrate, obtuse: fls. faintly fragrant, white; lateral petals usually with small tuft of hairs, the upper ones broadly ovate. Springy land and along cold brooks, Que. and southward.

**DD**. *Les. ovata,* with either narrowed or rounded base.

26. *blanda,* Wild. Fig. 3943. A northern species extending southward in the mountains to N. Ga., has acuminate lvs. somewhat hairy on the upper surface, and narrow strongly reflexed petals. Probably not in cult.
3476

**VIOLA**

**DDDD. Les. kidney-shaped.**

27. renifolia, Gray. Pubescent to nearly glabrous; rootstock in mature plants mostly stout and scaly; mature lvs. of summer reniform; the 3 lower ones veined or tinged brownish; sepals narrowly-lanceolate; cleistogamous fls. purple, on horizontal peduncles: stolons absent. **Arboretia** swamps and cold woods, Newf. to the Mackenzie River, and southward in the Alleghany and Rocky Mts.

**ccc. Petals yellow.**

28. rotundifolia, Michx. Plant with long and stout scaly root-stocks, and making short stolons; lvs. in midsummer, oval, 2-4 in. wide, thick and prostrate, reniform, fls. bright yellow, with brown lines on the 3 lower petals; lateral petals bearded; cleistogamous fls. on de- 

30. eriocarpa, Schw. (V. scabriuscula, Schw.). Essentially glabrous or sparingly pubescent, the sts. ascending; root-lvs. usually 1-3, long-petioled, ovate to reniform, the base cordate or truncate, the apex usually rounded; st-lvs. all on upper half of st., broad-ovate, subcordate, apex acuminate; fls. yellow, the lateral petals bearded; sepals lanceolate or linear. From the Rocky Mts. eastward to Dak. and Mo.

31. pubescens, Ait. Markedly soft-pubescent; sts. 8-12 in. high, stout, often only one: root-lvs. usually wanting; st-lvs. near the top, short-petioled, broad-ovate to reniform, the base cordate or truncate, crenate-dentate, somewhat short-pointed; stipules large; fls. bright yellow; lateral petals bearded; spur short; sepals narrow-lanceolate. Dry rich woods, Nova Scotia to Man. and far southward.

**DD. Petals white inside with bright yellow base.**

32. rugulosa, Greene (V. Rydbergii, Greene). Plants widely spreading from long underground stolons; first lvs. broad and densely pubescent underneath, long-petioled, cordate-reniform and abruptly acuminate; fls. sometimes tinged with violet. Minn. and westward to Colo. and Brit. Col.

33. canadensis, Lam. Plants without stolons, glabrous or very nearly so; lvs. broad-ovate, cordate, at apex acute or acuminate, serrate, the stipules sharp-lanceolate: fls. solitary from the axis of the st-lvs., white inside with yellow center, the outside more or less tinged with violet, the 3 lower petals with darker stlfs., the lateral petals bearded; sepals subulate. Woods, New Bruns. to Sask. and Rocky Mts., to Ala. and Ariz.

**DD. Petals a uniform white or cream-color.**

34. striata, Ait. Plants cespitose, often 2 ft. high at maturity in summer, the sts. angular and leafy; lvs. nearly or quite glabrous, ovate to orbicular, cordate, mostly acuminate, closely crenate-serrate; stipules large and fimbriate; fls. white or cream-colored, long-stalked; sepals linear-lanceolate and ciliate; spur thick and blunt. Shady places, N. Y. to Minn., Ga. and Mo.

**DDDD. Petals usually violet-blue.**

35. conspersa, Reichh. (V. caulina var. Mühlenbergii, Gray). Plant glabrous, 3-6 in. high, with oblique often much-branched rootstock; lower lvs. cordate-ovicular, obtuse, crenate-serrate, not large (3½-4 in. wide); upper lvs. rather smaller and somewhat acuminate; fls. many, pale violet (running to white), overtopping the foliage; lateral petals bearded; spur 2-4 lines long; sepals acute. Que. to Minn. and Ga., in low or shaded places.

36. rostrata, Pursh. Fig. 3944. Glabrous or nearly so, 4-8 in. high, the sts. often numerous and plant forming a small clump; lvs. orbicular to broad-ovate, cordate, the upper ones acuminete, all serrate; fls. line with lighter spots; petals beardless; spur long (1½-2½ in.) and slender; cleistogamous fls. later on short axillary peduncles. A distinct and attractive species, in open woods and on hillsides, Que. to Mich. and southward.

3944. Viola rostrata. (X½)

3945. Viola Sheltonii. (X½)

**cc. Species western, or found east of the 100th meridian.**

**d. Lvs. not dissected:** petals yellow inside, the 2 upper madder-brown outside.

37. sarmentosa, Douglas. Prostrate plants with thickened rootstocks and numerous long leafy runners; lvs. small, roundish cordate, deep green above but often rusty beneath, closely crenate, shorter than the peduncles; fls. light yellow, the lower petal somewhat purple-veined; spur short and broad. Along the Pacific coast.
38. pedunculata, Torr. & Gray. Sts. ascending, often 2 ft. long, bearing normally in each If.-axil as the st. develops a large (1 in. across) fl. on a peduncle 2-5 in. long: rootstock thick and deep: lvs. round-ovate, the base usually truncate, coarsely crenate; stipules leafy: petals purple-veined inside, the lateral ones bearded. W. Calif., where often cult.; handsome.

39. glabella, Nutt. Sts. erect but usually weak, leafy only above: rootstock horizontal, more or less branching: lvs. cordate-reniform, glabrous or only puberulent, the lower ones on elongated petioles; stipules small; fls. bright yellow and somewhat purple-veined; lateral petals bearded; spur short and sac-like. Moist or shady places; widely distributed in the mountains of the N. W. and along the Pacific coast.

40. lobata, Benth. St. long and mostly naked at the base, the plant either glabrous or only puberulent: rootstock deep: lvs. from the base. Calif. and S. W. Ore.

41. Shétiôni, Torr. Fig. 3945 (adapted from Pacific R. R. Report). Nearly or quite glabrous; lvs. often a lar-reniform to cordate, 3-divided, the divisions 3-parted, lobed and cleft into narrow segms., not exceeding the peduncle: upper petals brownish, the 3 lower pale yellow. N. W. Colo. and N. E. Calif.

42. Beckwithii, Torr. & Gray. Fig. 3946 (adapted from Pacific R. R. Report). Plant pubescent or puberulent: lvs. palmately dect into 5-9 narrow lobes and the central lobe toothed: fls. yellow, the upper petals brownish purple on the outside. Calif. and S. W. Ore.

43. Hâlli, Gray. Plant glabrous; rootstock deep: lvs. 3-divided, the divisions 3-cleft, the segms. narrow; stipules leafy: fls. violet and yellow, the 2 upper petals dark violet and the 3 lower petals yellow or cream-colored; lateral petals bearded at base. N. W. Calif. and W. Ore.

44. trinervata, Howell. Plant glabrous; ultimate segms. of the If. lanceolate or ovate-lanceolate, tapering to an acute callous apex, thick and firm, prominently 3-ribbed; upper petals dark blue, the lower one pale blue to white with a yellow base. Cent. and S. W. Aus.

Ezra B. Shier.
work. Care should be taken not to have the beds too
covered with rustic siding. One walk 14 inches wide
some inconvenience involved in this work that most
In March, and selections
the time of planting varies somewhat in different
the same. The violet requires considerable water, but no very
rigid rules can be laid down as to the amount required. Every
effort should be put forth to keep the plants in
good growing condition without over-saturation of the
do not have the advantages that more favored ones like the
rose and carnation have had. Any good type of well-
cultivated houses is an ordinary even-span type, 12 feet wide.

For all practical purposes the commercial cultivation of the violet is limited to
growing in houses except in the South and
Far West, where for the most part they are
grown in the open or in coldframes.

Care should be taken not to have the beds too
wide, otherwise it will be difficult to reach all parts
of them from the walks. The best growers practice changing
the beds each year. At least 5 inches of fresh soil
should be put in before the young plants are set out.

The time of planting varies somewhat in different
parts of the country. Usually the flowers are not much
in demand after the middle of April, so that in prac-
tically all the violet-growing sections preparations may
be made in March, and selections may be made from these
for the planting, which is performed the latter part
of May.

Comparatively little at-
tention has been given to
proper houses for violet-
culture. Almost any kind
of house is believed to be
suitable, hence the crop has
not had the advantages that more favored ones like the
rose and carnation have had. Any good type of well-
lighted, well-ventilated house will suffice. For those
with a limited amount of capital to invest, one of the most economical and satisfactory
houses is an ordinary even-span type, 12 feet wide.
The height of such houses is about 6 feet, with a roof
5 feet 5 inches wide. Such beds are a
little wider for convenience in reaching the plants from
the walk, but by means of a board to be hooked onto the heating pipes, all plants may be conveniently reached. Coldframes for violet-culture are simple in construction. They are of the usual type, being 6 feet wide, 12 inches high in front, and 16 to 18 inches high at the back. Ordinary 3 by 6 inch may be used. These frames may be made any length in locations where the soil is porous and well drained; the frames may be lower than the surrounding soil. This gives some advantages in winter although it is back-breaking work at any time properly to care for the plants and pick the flowers in such frames.

In sections where the climate is comparatively mild, violets may be planted directly in the open ground and the frames, which may be movable ones, may be set over the plants about the middle of September. Violet houses do not need much heat, merely enough in fact to keep out the frost. The tendency is to overheat and there are probably more good crops spoiled by too much rather than too little heat. Hot water is usually depended on for heating both houses and frames. For the average houses a boiler capacity of 1,200 to 1,500 square feet will be required for every 10,000 plants. With the present cost of materials and labor it is safe to figure the cost of a plain style of house such as already described at about 50 cents a plant. A house 12 feet wide and 100 feet long will hold about 2,000 plants and should cost complete from $850 to $1,000.

Marketing is one of the most important factors connected with commercial violet-growing and is seldom understood in all its details. The grower should be thoroughly familiar with the many needs and requirements of the market and be able to supply these demands, for upon his ability to do this depends largely his success or failure from a financial standpoint. Violets are prized chiefly for their delicate perfume, and as this diminishes in proportion to the length of time they are picked, the best market, other things being equal, is the one which requires the least possible delay between picking the flowers and placing them in the hands of the customer.

The crop may be disposed of at retail or wholesale or through a commission merchant. Each method has its advantages and disadvantages, and in deciding

which one to adopt the grower must be guided by existing conditions. He must in any event have a thorough knowledge of the requirements of the market as regards quality of the flowers, size, shape, and arrangement of the bunch, and should at all times exercise the utmost care in picking, packing, and shipping, so that the flowers may reach the customer in the best and most attractive condition. The kind of bunch varies from year to year, and each large city is likely to have its own style. The various styles are wonderfully exacting in their requirements and great skill is required to bunch the flowers properly.

The cultivated violets are subject to a number of diseases, each of which is characterized by one or more distinct symptoms. The principal diseases are as follows, their destructive-ness being in the order in which they are discussed:

Spot disease (Alternaria violae) (Fig. 3951), also called leaf-spot, leaf-rust, and smallpox, is the most widespread and destructive known in America. It attacks principally the foliage, normally producing definite circular whitish spots, frequently with concentric rings, of a darker shade, very often with a light central portion resembling the bite or sting of an insect. Ceratoceras violae, Phyllosticta violae, and the like, produce spots very similar in outline and appearance to those caused by Alternaria violae, but only under conditions peculiarly favorable to these fungi do they cause any serious loss.

Root-rot (Thielavia basicola) is very troublesome and destructive in some localities, especially to young plants that are transplanted during hot dry weather. It causes the growing or blackening of the parts attacked and the final death of the plant. Wet-rot (Botrytis sp.) attacks leaves, petioles, flower-stalks, and flowers, causing a moist or soft rot. It is sometimes very destructive, especially with large plants growing in a damp stagnant atmosphere, where there is insufficient ventilation and light.

Leaf-fading or yellowing is induced by a variety of conditions, but as yet little that is definite has been ascertained regarding its cause.

It is difficult to exterminate any of the diseases named after they once gain a foothold. However, they can be held in check and often entirely prevented by selecting and propagating exclusively from strong vigorous disease-resistant plants, and by keeping them in the best possible growing condition. Careful attention must be given to watering, cultivation, and ventilation, and the dead and dying leaves and all runners should be destroyed as fast as they appear.

Although violets are attacked by a number of insects and other related enemies, only a few do sufficient injury to warrant discussion here.

Aphides (Aphis sp. and Rhopalosiphum violae) are generally known as the green- and the black aphid or green- and black-fly. They cause the young growing parts to curl and twist, resulting in a stunted deformed plant. They work their way into the young, unopened flower-buds, and, thrusting their bills through the overlapping petals, feed on the juice. Each puncture produces a greenish white blotch on the petal, and the flower becomes dwarfed, distorted, and worthless for market. Aphides can be easily controlled by fumigating with hydrocyanic acid gas, and this is now in general use. To each cubic foot of space in the house or frame use .15 gram of 88 per cent cyanide of potassium for double varieties and .10 gram for single varieties. Handle the cyanide and gas with utmost care, as both
are very poisonous. Divide the total amount of cyanide into as many equal parts as there are jars used, which latter should be one for every 50 to 75 linear feet of a house 12 to 18 feet wide. Put each part into a two-pound manilla paper bag and this into a second bag. Attach each package to a string or wire so arranged as to allow it to be lowered from the outside of the house into its respective jar. Pour into each jar an amount of water about equal to the bulk of cyanide in the bag, add commercial sulfuric acid until steam is evolved, then from the outside lower the bags into the jars beneath. Fumigate double varieties thirty minutes and single varieties twenty minutes, after which open ventilators from outside, leaving them open at least sixty minutes before entering the house. Aphides may also be combated by using tobacco in some one of its many forms, but tobacco is likely to weaken the leaves and make them more liable to the attack of fungi, and on this account is very objectionable.

Red-spider (Tetranychus telarius) lives on the under surface of the leaves, and, when present in sufficient number, causes considerable damage. It is widely distributed on a great variety of plants, and when established in the violet-house is most difficult to combat. It can be held in check, and often the plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of twenty to thirty pounds to the square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

Eel-worms, or nematodes, are sometimes very injurious to the violet. This is a species, attacks the roots producing galls and distortions that check the growth of the plants. These may be controlled by judicious soil selection, the freezing of the soil in winter and the use of good clean grass sod. A very destructive nematode, Aphelenches spicatus, that appeared in this country twelve or fifteen years ago, is rapidly becoming one of the serious enemies of the violet. This nematode attacks the crown-buds, causing the plants to "go blind." Rigid selection of stock is the only remedy. Every "blind" crown plant should be taken out and destroyed. Extreme care should be exercised in introducing new stock. Nearly all imported plants are more or less affected with the pest. The bud nematode does more injury in this country than abroad. This may be due to the fact that while the pest has been imported, its enemies have not been brought in. Some very promising investigations are now being made by N. A. Cobb, of the Bureau of Plant Industry, United States Department of Agriculture, of a race of predaceous nematodes which destroy immense numbers of the harmful kinds.

In some parts of the country the larvae of gall-fly (Diplolepis eriosa), violet sawfly (Empyktus canadensis), greenhouse leaf-tufts (Phyllostreta rubigalis), and several species of cutworms (Agrotis et al.) injure the plants to some extent by feeding on the foliage. Fumigating with hydrocyanic acid gas is the best means of combating them.

Under certain conditions slugs, snails, sowbugs, and the like, do considerable damage, especially to the flowers. They also can be controlled by the hydrocyanic acid gas treatment.

**VITEX (ancient Latin name for this or a similar shrub).** Verbenaceae. Ornamental woody plants chiefly grown for their white, blue, or yellowish flowers produced in terminal spikes or panicles. Deciduous or evergreen shrubs or trees; lvs. opposite, digitate, with 3-7, rarely with 1 ft.; fls. in 1 or many-fld. cymes; calyx campanulate, usually 5-toothed; corolla tubular-funnel shaped, with 5 lobed, oblique and slightly 2-lipped limb; stamens 4, 2 longer and 2 shorter ones: fr. a small drupe, with a 4-angled stone. About 60 species are known, distributed through the subtropical and tropical regions of both hemispheres, few in the temperate regions. Some species, particularly *V. altissima* and *V. leucoxylon*, in S. Asia are important timber trees.
The two species most often cultivated are shrubs or small trees with deciduous digitate leaves and lilac-blue or white flowers in terminal spikes or loose panicles appearing in summer and autumn. The hardiest seems to be *V. Negundo* var. *incisa*, which stands most ordinary winters as far north as Massachusetts. *V. Agraueus* is hardly as far north as New York, in sheltered positions. These species are particularly valuable for their late-appearing flowers. They grow in almost any kind of soil and prefer rather dry sunny situations. Most of the species are inhabitants of tropical and subtropical regions and only a few can be cultivated outdoors in warmer temperate regions. None of these tender kinds seems to be in cultivation in this country; in the Old World they are sometimes cultivated as greenhouse plants. They thrive in a sandy compost of peat and loam. Propagated from seeds sown in spring and by greenwood cuttings under glass; also by layers.

**Agnes-cástus, Linn. CHASTE-TREE. HEMP-TREE.** Shrub or small tree, with a strong aromatic odor, grayish tomentose; lvs. long-stalked; lfts. 3-5, lanceolate, acuminate, serrate or entire, grayish tomentulose beneath, the middle one 3-4 in. long; the fs. in dense, sessile clusters, forming terminal, often panicled spikes 5-7 in. long; corolla usually pale or lilac, grayish outside, 1½ in. long; stamens and style exserted. July-Sept. S. Eu., W. Asia. Mn. 2, p. 44. G.C. III. 51:52. Var. *alba*, Rehd. (V. abiflora, Hort., *Agnes-cástus vulgaris* alba, Carr.). Fls. white.

**Negundo, Linn.** Shrub or small tree with quadrangular branchlets: lfts. usually 3, or occasionally 5, stalked, elliptic-ovate to lanceolate, acuminate, serrate or entire, grayish tomentulose beneath, 1½-4 in. long; fls. blue or lavender, small, scarcely ¼ in. long, stalked, in rather loose clusters forming slender spikes usually crowded into loose terminal panicles 5-8 in. long; stamens and style slightly exserted. China, Indi. Tender. Var. *incisa*, Clarke (V. incuse, Lam. V. laciniata, Hort.). Fig. 3952. Lfts. incised serrate or almost pinnatifid, ½-3 in. long; the more extreme form with deeply pinnatifid lfts. and narrow remote segms. may be distinguished as *V. multifida*, Rehd. (*Agnes-cástus incus var. multifida*, Carr.). July-Aug. N. China, Mongolia. B.M. 364 (as V. Negundo). This variety is much harder than the type; it is less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.

3952. *Vitex Negundo var. incisa*. (X¼)

3953. *Vitis*.—Forms of leaf on the same vine.

**Vitis** (classical Latin name). VINE. GRAPE. *Vitis* or *Ampelidea*. Tendril-climbers (some members of the genus *Cissus* erect) grown as ornamental vines but particularly for the edible fruits or grapes. The genus is variously defined, but if *Cissus* is excluded it is distinguished as follows (Gray): Plants climbing by the prehension and coiling of naked-tipped tendrils; fs. polygamo-dioecious (i.e., some individuals perfect and fertile, others sterile with at most only a rudimentary ovary), 5-merous; corolla calyptrately caducous—the petals in anthesis cast off from the base while cohering by their tips (Fig. 3954); hypogynous disk of 5 nectariferous glands alternate with stamens; style short and thick, or conical; berry pulpy; seeds pyriform, with contracted beak-like base.—A widespread genus of the northern hemisphere, most abundant in temperate countries. In its stricter limitations, the genus includes less than 60 known species, but some authors unite *Cissus* and *Ampelopsis* in it. V. *Negundo* includes some 250 species. The standard monographer (Planchon, DC. Monogr. Phaner. 5), refers 30 or more species to *Vitis* in the main account and in the addendum, and more than 200 to *Cissus*. N. Amer. is particularly rich in *Vitis*, not only in number of species, but in the widespread distribution and the abundance of the plants. From the native species have been developed the outdoor grapes of this country except those of Calif. and the extreme S. W. (which are *Vitis riparia*). For an account of the evolution of these various cultural varieties, see Bailey, Sketch of the Evolution of Our Native Fruits; Hedrick’s Grapes of New York, a notable volume issued by the N. Y. Agric. Exp. Sta.; also Munson, Foundations of American Grape Culture, 1909. For a sketch of *Vitis* and similar plants as ornamental vines, with illustrations, see Veitch, Journ. Roy. Hort. Soc. 28 (1905–4). For cult., and control of insects and diseases, see *Grape*. For recent studies in var. in variation and in pollen sterility, see *Proc. Amer. Breeders’ Assoc., vol. 7* (1912), and Bull. No. 144, Minn. Exp. Sta. (1914).

Many of the species of *Vitis* are excellent ornamental plants, when it is desired to cover arbors, porches, or trees; a number of the recently introduced oriental species (some of them properly referable to *Ampelopsis* and *Parthenocissus*) seem to be particularly interesting for such use. All of them are readily grown from seeds, and most of them from hardwood cuttings. Only a few of the native species are regularly in the trade; but with the possible exception of *V. Treleasei* they have been offered for sale to experimental stations and amateurs by the late T. V. Munson, of Texas, a well-known authority on both the botany and horticulture.
VITIS

3054. Grape flowers, enlarged. 1, shows the bud; 2, shows the petals or "cap" falling; 3, shows the flower in full bloom, the petals having been cast off. In all the flowers the minute calyx is seen, and in 2 and 3 the disk is shown inside the base of the stamens.

North America north of Mexico; it is adapted from the writer's account in Gray's "Synoptical Flora," vol. I, 420-430. These American grapes are very difficult to distinguish in many cases; hence the subjoined descriptions are full, to bring out the contrasting characters. Some of the best recent systematic writing on American Vitis is from French sources, since the American species have come into prominence in France as phylloxera-resistant stocks for the wine grape. See, for example, the works of Millardet, and Viala and Ravaz; also "Ampelographie Universelle," by Viala and Vermorel. Many of the species listed in the trade under Vitis will be found in the genera Ampelopsis, Parthenocissus, and Cissus.

The grape-vines of eastern Asia, although apparently not yielding fruit of value, are interesting as ornamental vines, and some of them are likely to come into prominence for their good foliage and brilliant autumn coloring. They are little known with us as yet. V. Conjonctii and V. amurenensis are hardy in the northern states. Those tender at the Arnold Arboretum and more or less killed back in winter are C. capensis (V. capensis); C. gongylodes (V. murnenensis); C. hypoglauca (V. hypoglauca); C. oblonga (V. oblonga); C. quadrangularis (V. quadrangularis); C. rhombifolia (V. rhombifolia); C. Romanetii (V. rutilans); Cissus striata (V. sempervirens), page 776. The standard English authors incline to keep them distinct. Several of the species properly referred to Cissus are described in the present account (Nos. 1-5), not having found their place regularly under Cissus in Vol. II.

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Vitis capensis (preferably known as Cissus capensis), an evergreen species prized in southern California. (X 1/2)
nearly orbicular to reniform, 3-nerved, obtusely 5-angled, the margin repand-dentate, with ovate stipules; infl. thyrse-like, tomentose, with long peduncles, the fls. woody, with 5 triangular-ovate petals and 5 stamens, the ovary hirsute and style short; fr. globular, red-black and glossy, usually 2-seeded, about 2 in. diam., said to be excellent for sirups, jellies, and for stewing. S. Afr.—Tubers reported as making wholesome fodder for cattle.

3. C. hypoglaucia, Gray (Vitis hypoglaucia, Muell.). Scandent evergreen, the branches angled but not winged; lvs. 3-foliolate, petiolated; lfts. all long-petiolate, serrate, glabrous above, the lateral ones oblique and somewhat cordate, the middle one ovate to rhombic, petioled; lfts. 3-foliolate, petioled; lfts. all long-petiolate, acuminate, stalked, entire or toothed toward the apex: fls. white, with 5 triangular-ovate petals and 5 stamens, the ovary husute and style short: fr. globular, angled, the margin repand-dentate, with ovate stipules: bark without distinct lenticels, on the branchlets smoothish and glabrous; leaves large (4 in. or more diam.) with a distinct stipe-like beak. (Muscadinia; separated as a genus by Small.)

4. C. rhombifolia, Planch. (Vitis rhombifolia, Vahl). Bark without distinct lenticels, on the branchlets smoothish and glabrous; leaves large (4 in. or more diam.) with a distinct stipe-like beak. (Muscadinia; separated as a genus by Small.)

5. C. oblonga, Planch. (Vitis oblonga, Benth.). Erect tree-like evergreen species, the branches with a few tendrils, glabrous or the young shoots minutely tomentose: lvs. simple, broad-oblong to ovate-oblong, obtuse, about 1-2 in. long, entire, obscurely 3-nerved: fr. ovate, small, 2-3-seeded, in short-petioled cymes. Austral.—Allied to C. antarctica.

II. Species of Vitis, or true grapes; plants yielding the grapes of commerce, and some of them grown for arbors and for ornament.

A. Bark bearing prominent lenticels, never shredding; nodes without diaphragma; tendrils simple; fl.-clusters small and not much elongated; seeds ovoid or oblong, without a distinct stipelike beak. (Muscadinia; separated as a genus by Small.)

6. rotundifolia

B. Bark without distinct lenticels, on the old wood separating in long thin strips and fibers; nodes provided with diaphragma; tendrils forked; fl.-clusters mostly large and elongated; seeds pyriform. (Euovis.)

7. Munsoniana

B1. The wine-grape, grown extensively in Calif., as well as in Eu., and also in glass grapevines; skin and pulp mostly firmly adhering to the rpe fr.

8. vinifera

B2. The grapes of more modern domestication or intro., representing the commercial kinds in N. Amer. outside the Calif. region, and exotic species grown for ornament; skin of the mature berry usually separating freely from the pulp.

9. Davidii

C. Sta. stiff-hairy or bristly, or pricky. (Spinottis.)

D. Lvs. becoming glabrous beneath: sta. glabrous and prickly.

D1. Lvs. floccose or loosely pubescent beneath: sta. glandular-bristly and pubescent.

10. Romanetti

C1. Sta. glabrous or pubescent, not aculeate or armed.

D. Vitis species of N. Amer., some of them giving rise to pomological races and the others of botanical interest. (Nos. 21-32)

E. Class of green-leaved grapes, mostly marked at maturity by absence of prominent white, rusty, or blue tomentum or scar or conspicuous bloom on the lvs. beneath (under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even cobwebby): foliage mostly thin: tendrils intermitent, i.e., every third joint bearing no tendrils (or infl.). V. cinerea and V. arizonica are partial exceptions and are much less so than most in the genus. V. Champinii, with a long or at least a prominent point and usually long and large sharp teeth or the edges even jagged.

G. Lvs. broader than long, with truncate-oblique base. (V. Treleasei might be sought here.)

11. rupestris

G1. Lvs. ovate in outline, with a mostly well-marked basal sinus.

12. monticola

H. Diaphragm (in the nodes) thin: young shoots not red: lvs. not deeply lobed.

13. Champinii

II. Lvs. margin not lobed or only obscurely so, the teeth small or else not elongated.

14. Longii

J. Young parts pubescent or floccose.

15. vulpina

K. Tendrils prominent and persistent.

16. Trelasei

KK. Tendrils small and deciduous.

17. rubra

FP. Group of cardofolia-like grapes, with thickish and dull-colored or grayish green lvs. often holding some class dull paleness below at maturity and the shoots and lvs. nearly always more or less pubescent when young, the teeth mostly short, the point mostly red and more conspicuous.

O. Plant strong and climbing, with stout persistent tendrils.

H. Young shoots tere and slender, and glabrous or very slightly becoming so.

18. cordifolia

HI. Young shoots angled, and covered the first year with tomentum or wool.

I. Under surface of lvs. glabrous or essentially so at maturity.

J. Blade of l. lustrosa or glossus when full grown.

19. Berlandieri

JJ. Blade of l. dulli.

20. Baileyana

K. Under surface of lvs. glaucous or pubescent.

21. cinerea

GG. Plant scarcely climbing, the tendrils perishing when failing to find support.

22. arizonica

FPP. Group of orbicular-scallop-led. species of the Pacific coast.

23. californica

EB. Class of colored-leaved grapes, marked by thick or at least firm foliage, the lvs. prominently rusty or white-tomentose or glaucous-blue. V. eipheri, V. arizonica, and possibly V. californica might be sought here; and leaf-patented forms of V. bicolor might be looked for in Eu.
VITIS

V. Lus. only flocculently or coarsely or glabrous below when fully grown (i.e., not covered with thick, dense, felty-hairiness, except sometimes in V. Doniania).

G. Ends of the growing shoots are, under the surface of the leaf, which by gray: the white-tipped.

H. A. Grape of S. Calif., with thick diaphragms and short, pointed lvs.

II. Grape of Okla.-Texas region, with thin diaphragms and prominently pointed lvs.

GG. Ends of shoots (except in V. bicolor), and the unfolding leaves distinctly rusty-colored, and the mature leaves, either rusty or bluish beneath (or sometimes becoming green in V. bicolor): the variscan grapes.

H. Leaves usually prominently floccose or tomentose.

HH. Leaves pubescent or becoming nearly as smooth as glabrous.

I. Under surface of lvs. mostly glaucous-blue.

II. Under surface not glaucous-blue (except in variety of V. bicolour): the variscan grapes.

J. Berries small, 0.5–1 in. long, shaped something like a coffee berry. River banks, swamps, and rich woodlands and thickets, S. Del. to N. Fla. and west to Mo., Kans., Texas, and Mex.


3956. Vitis cinerea. (X4)

7. Munsoniana, Simpson (Muscadinia Munsoniana, Small). MUSTARD GRAPE OF Fla. BIRD, EVERBEARING, OR EVERLASTING GRAPE.

Very slender grower, preferring to run on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously: lvs. smaller, thinner, and more shining, more nearly circular in outline and less prominently pointed, the teeth broader in proportion to the blade and more open or spreading; clusters larger and more thyrse-like: berries a half smaller than in the last and often more numerous, shining black, with a more tender pulp, acid juice, no muskiness and thinner skin; seeds half smaller than in the last. Dry woods and sands, Fla. at Jacksonville, Lake City, and southward, apparently the only grape on the red keys; also in the Bahamas. Difficult to distinguish from V. rotundifolia in herbarian specimens, but distinct in the field. The plant often bears fis. and both green and ripe fr. into Dec.

8. vinifera, Linn. WINE GRAPE. EUROPEAN GRAPE.

Fig. 3956. Young growth smooth or floccose, the plant
not so high-climbing as most American species; tendrils intermittent: lvs. mostly thinish, rounded, with a deep sinus and the basal lobes usually overlapping, tomentose or glabrous beneath, the margins coarsely nicked or jagged; clusters large and long, the berries usually oval or oblong, although wide in some varieties; globular-fruited. Probably native to the Caspian or Caucasus region and W. India. Cult. from the earliest times, and the grape of history; now greatly varied. The hothouse grapes, as Black Hamburg, Barberossa, are of this species; also the vineyard grapes of Calif. Not hardy in the northern states and very subject to phylloxera (root-louse) and mildew. Regel, a Russian botanist, considered the wine grape to be a hybrid of 2 species that he characterized as V. Labruscana and V. vulpina, but this view is not accepted. Var. apiifolia, Loud. (V. laciniata, Linn. V. vinifera var. laciniata, Dipp.), has the lvs. cut into 5-7-9-odd segments; ornamental: known as "parsley vine," and "cicat."

9. Davidi, Fée (Syvadésis Davidi, Romant. Vitis Davidiaina, Dipp. V. armata, Diels & Gilg. V. vinifera var. Davidi, Hort.). Sts. and petioles armed with straight or slightly recurved prickles, glabrous; tendrils interrupted: lvs. long-petioled, large, papery, somewhat glaucous and becoming glabrous; stem vertically broadly ovate, obscurely angled, the base cordate, the apex acuminate and acute, the margin finely and feebly serrulate, the teeth acute or obtuse, the base cordate, the boldly rounded top bearing a short, abrupt point and sometimes 2 lateral teeth enlarged and suggesting a crenate-tint, the sides turned up so as to expose much of the underside, broadly ovate, obscurely angled, the base cor­

10. Romanéthi, Romanet (V. rutilans, Carr.). Petioles and young sts. floccose-pubescent and bearing spreading gland-bearing purplish hairs or bristles; sts. and young shoots bare; fr. bluish: perhaps a hybrid.

11. rupestris, Scheele. SAND, SUGAR, ROCK, BUSY, CURRANT, or MOUNTAIN GRAPE. Shrub 2-6 ft. high, or sometimes slightly climbing, the tendrils few or even none, diaphragm plane and rather thin: lvs. reniform to reniform-ovate (about 5-8 in. wide and two-thirds as long), rather thick, smooth and glabrous on both surfaces at maturity, marked by a characteristic light glaucous tint, the sides turned up so as to expose much of the undersurface, the base only rarely cut into a well-marked sinus, the margins very coarsely angle-toothed, the boldly rounded top bearing a short, abrupt point and sometimes 2 lateral teeth enlarged and suggesting lobes; stamens in fertile fls. recurved laterally or rarely ascending, those in the sterile fls. ascending; cluster small, slender, open and branched; berries small (1/4-1/2 in. diam.), purple-black and somewhat glaucous, pleasant-tasted, ripe in late summer; seeds small and broad. Sand banks, low hills, and mountains, S. Pa. to Tenn., Ind., Mo., Okla., and S. W. Texas. Var. dissicata, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency toward irregular lobing. Mo.

12. monticola, Buckl. (V. texana, Munson. V. texicana, Planch). SWEET MOUNTAIN GRAPE. Fig. 3957. A slender trailing or climbing plant (reaching 20-30 ft. in height, with very long and slender branches, the young growth angular and floccose (sometimes glau­

13. Champaui, Planch. Probably a hybrid of V. rupestris or V. Berlandieri and V. candicans, bearing medium to large reniform or reniform-cordate lvs, which are variously pubescent or cobwebby but become glabrous, the growing tips mostly white-tomentose; berries very large and excellent. S. W. Texas. A.G. 12:579.——-In some places associated with V. candicans, V. Berlandieri, and V. monticola only, and in others with the above and V. rupestris. Often composing dense thickets in the wild.
found about fifty years ago by Engelmann in the Botanic Garden of Berlin under the name of *Vitis* Solonis, without history. Engelmann guesses (Bushberg Cat. ed. 3, 18) the name to be a corruption of "Long's." It is probable that the plant was sent to European gardens as *Vitis* Longii—very likely from Prince's nursery—and the name was misread on the label. The original name, which was duly published by Prince with description, may now be restored.

Var. *microsperma*, Bailey (V. Solonis var. microsperma, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

15. *vulpina*, Linn. (V. riparia, Michx. V. odoratissima, Donn. V. odorata, Hort. V. silvarum, and V. missouriensis, Prince? V. cordifolia var. riparia, Gray). RIVERBANK or FROST GRAPE. Fig. 3958. A vigorous tall-climbing plant, with a bright green cast to the foliage, normally glabrous young shoots, large stipules, and plane very thin diaphragms: lvs. thin, medium to large, cordate-ovate, with a broad but usually an evident sinus, mostly showing a tendency (which is sometimes pronounced) to 3 lobes, generally glabrous and bright green below, but the veins and their angles often pubescent, the margins variously deeply and irregularly toothed and sometimes cut, the teeth and the long point prominently acute: fertile fis. bearing reclining or curved stamens, and the sterile ones long and erect or ascending stamens: clusters medium to large, on short peduncles, branched (often very compound), the fis. sweet-scented: berries small (less than \( \frac{1}{2} \) in. diam.), purple-black with a heavy blue bloom, sour and usually austere, generally ripening late (even after frost); seeds rather small and distinctly pyriform. Nova Scotia and New Bruns. to Man., Kans., and Colo. and south to W. Va., Mo. and Texas. B.M. 2429.

The commonest grape in the northern states west of New England, abundant along streams. Variable in the flavor and maturity of the fr. Forms with petioles and under surfaces of lvs. pubescent sometimes occur. It apparently hybridizes with *V. Labrusca* eastward, the hybrid being known by the tomentose young shoots and unfolding lvs., and the darker foliage, which is marked with rusty tomentum along the veins of the less jagged lvs.

Var. *præcox*, Bailey, is the JUNE GRAPE of Mo., the little sweet frs. ripening in July.

16. *Trelæsei*, Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the lvs.) tendrils deciduous the first year unless finding support, internodes short, the diaphragms twice thicker (about \( \frac{3}{2} \) in.) than in *V. vulpina* and shallow-biconcave: stipules less than one-fourth as large as in *V. vulpina*: lvs. large and green, very broad-ovate or even reniform-ovate (often wider than long), thin, glabrous and shining on both surfaces, the basal sinus very broad and open and making no distinct angle with the petiole, the margin unequally notch-toothed (not jagged as in *V. vulpina*) and indistinctly 3-lobed, the apex much shorter than in *V. vulpina*: fertile fis. with very short, recurved stamens, sterile with ascending stamens: cluster small (2-3 in. long): berries \\( \frac{1}{2} \) in. or less thick, black with a thin bloom, ripening 3 weeks later than *V. vulpina* when grown in the same place, thin-skinned; pulp juicy and sweet; seeds small. Brewster Co., S. W. Texas and New Mex. to Bradshaw Mts., Ariz.—Little known, and possibly a dry-country form of *V. vulpina*. In habit it suggests *V. arizonica* var. *globa*, from which it is distinguished, among other things, by its earlier flowering and larger lvs. with coarser teeth and less pointed apex.

17. *rubra*, Michx. (V. monosperma, Michx.). RED or CAT GRAPE. Fig. 3959. A slender but strong-growing vine, with small long-jointed angled red glabrous herb-like shoots and red petioles: lvs. small to medium, ovate-acuminate, dark green and glossy, sometimes indistinctly pubescent on the nerves below, the sinus obtuse, the blade either nearly continuous in outline or (commonly) prominently lobed or even parted, coarsely notched: stamens in the sterile fis. long and erect: clusters loose and long-peduncled, branched, the fis. opening very late: berries small and late (\( \frac{3}{4}-\frac{3}{8} \) in. diam.),
acute, sinus more open; petioles shorter and often smaller, the larger ones shortly but distinctly prolonged and often muticous, the teeth comparatively small and notch-like and not prominently pubescent at maturity only on the veins, the point only on the surface of the IVB.

3-lobed or 3-angled, the basal sinus rather deep and ending in a short mucro. Kerr Co., S. Texas, 1,600-2,000 ft.

Var. fécilis, Engelm., has fétidly aromatic berries, and grows in the Mississippi Valley.

Var. sempervirens, Munson. A glossy-leaved form holding its foliage very late; lvs. sometimessuggesting forms of V. rubra, deltoid with a truncate base: clusters small, the fr. ripening later than in the type. S. Fla.

Var. Helleri, Bailey (V. Helleri, Small). Lvs. more circular (i.e., lacking the long point), and the teeth round-obtuse and ending in a short mucro. Kerr Co., S. Texas, 1,600-2,000 ft.

19. Berlandieri, Planch. MOUNTAIN, SPANISH, FALL, or WINTER GRAPE. Fig. 3960. A stocky moderately climbing vine, with mostly short internodes and rather thick diaphragms; lvs. medium large, broadly cordate-ovate or cordate-orbicular (freely as broad as long), glabrous and glossy above, covered at first with gray pubescence below but becoming glabrous and even glossy except on the veins, the sinus mostly inverted-U-shaped in outline but often acute at the point of insertion of the petiole, the margin distinctly angled above or shortly 3-lobed and marked by rather large, open, notch-like acute teeth of varying size, the apex mostly pronounced and triangular-pointed: stomens long and ascending in the sterile fls., laterally recurved in the fertile ones: clusters compact and compound, mostly strongly shouldered, bearing numerous medium to small (½ in. or less diam.), purple and slightly glaucous very late berries which are juicy and pleasant-tasting; seed (frequently only 1) medium to small. Limestone soils along streams and hills, S. W. Texas and Mex.—Well marked by the gray-veined under surface of the lvs.

20. Baileyana, Munson. POSSUM GRAPE. Less vigorous climber than V. cordifolia, rather slender, with short internodes and very many short side shoots; lvs. frequently smaller, the larger ones shortly but distinctly 3-lobed (lobes mostly pointed and much spreading), bright green but not shining above, gray below and pubescent at maturity only on the veins, the point only slightly prolonged and often muticous, the teeth comparatively small and notch-like and not prominently acute, sinus more open; petioles shorter and often pubescent; floral organs very small, the stamens reflexed in the fertile fls.: pedicels short, making the bunch very compact: berries about the size of V. cordifolia, black and nearly or quite bloomless, late; seed small and notched on top. Mountain valleys, 800-3,000 ft. altitude, S. W. Va. and adjacent W. Va. and W. N. C., Tenn., and N. Ga.; also at common levels in the uplands of W. Cent. Ga.—The eastern counterpart of V. Berlandieri.

21. cinerea, Engelm. SWEET WINTER GRAPE. Fig. 3961. Climbing high, with medium to long internodes and thick and strong diaphragms; lvs. large, broadly cordate-ovate to triangular-cordate-ovate (generally longer than broad), the sinus mostly wide and obtuse, the margin small-notched (teeth much smaller than in V. Berlandieri) or sometimes almost entire, mostly distinctly and dextracordately 3-angled or shortly 3-lobed toward the apex, the triangular apex large and prominent, the upper surface coarsely pubescent and the lower dark green (not glossy), the under surface remaining ash-gray or dun-gray, pubescent: stomens in sterile fls. long, slender, and ascending, in the fertile ones short and laterally recurved: cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all glaucous, ripening very late, and after frost becoming sweet and pleasant; seeds small to medium. Along streams, mostly in limy soils, Cent. Ill. to Kans. and Texas; also N. Fla., also in Mex.—Readily distinguished from V. austriaca by the triangular-topped sharply 3-lobed ash-gray lvs. and the gray tomentum of the young growth.

Var. floridana, Munson (V. austriaca, Small). Growing tips rusty-tomentose, as are sometimes the veins on...
the under sides of the lvs.: cluster longer-peuncled and more compound. Manatee Co., Fla.; and apparently also in Ark.; possibly a compound with *V. sativula*, but the lvs. have the characteristic shape of *V. cinerea*. Not to be confounded with any form of *V. cariba*, because of the lobed triangular-topped lvs. and much larger teeth.

Var. canescens, Bailey. A form with rounded or heart-like lvs., the upper half of the l. lacking the triangular and 3-lobed shape of the type. St. Louis, Mo., and S. Ill. to Texas.

22. arizonica, Engelm.  (*V. arizonensis*, Parry). CAÑON GRAPE. Plant weak, much branched, with short internodes and thick diaphragms, branchlets angled: lvs. mostly small, cordate-ovate and with a prominent triangular-pointed apex, the sinus broad or the base of the blade even truncate, the teeth many and small and pointed or mucronate, the margin either continuous or very indistinctly 3-lobed (or sometimes prominently lobed on young growths), the lvs. and shoots white-woolly when young, but becoming nearly glabrous with age: stamens ascending in sterile fls. and recurved in the fertile ones: bunches small and compound, not greatly; if at all, exceeding the lvs., bearing 20-40 small black berries of pleasant taste; seeds 2-3, medium size. Along river banks, W. Texas to New Mex. and Ariz., mostly south of the 35th parallel, to S. E. Calif. and N. Mex.

Var. glabra, Munson. Plant glabrous, with glossy and mostly thinner and larger lvs. In mountain gulches, with the species and ranging northward into S. Utah. Distinguished from *V. monticola* by its triangular-pointed and small-toothed lvs. Perhaps a form of *V. Treleausii*.

23. californica, Benth. Fig. 3962. A vigorous species, tall-climbing on trees but making bushy clumps when not finding support, the nodes large and diaphragms rather thin: lvs. mostly round-reniform (the broader ones the shape of a horse's hoof-print), rather thin, either glabrous and glossy or (more commonly) cottony-canescent until half grown and usually remaining plainly pubescent below, the sinus ranging from very narrow and deep to broad and open, the margins varying (on the same vine) from finely blunt-toothed to coarsely scallop-toothed (the latter a characteristic feature), the upper portion of the blade either perfectly continuous or rounded or sometimes indistinctly 3-lobed and terminating in a very short apex: bunches medium, mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor; seed large (2½-in. long), prominently pyriform. Along streams in Cent. and N. Calif. and S. Ore.—Lvs. becoming handsomely colored and mottled in autumn. Very susceptible to mildew.

24. Girdiana, Munson. VALLEY GRAPE. SOUTHERN CALIFORNIA GRAPE. Strong climbing vine, with thick diaphragms: lvs. medium to large and rather thin, broadly cordate-ovate, with a rather deep and narrow sinus and nearly continuous or obscurely 3-lobed outline (sometimes markedly 3-lobed on young shoots), the teeth many and small and acute, the apex short-triangular or almost none, the under surface remaining closely ashy-tomentose: clusters large and very compound, each one dividing into 3 or 4 nearly equal sections, which are in turn shouldered and thyrse-like: berries small, black and slightly glaucous, the skin thin but tough, pulp finally becoming sweet; seeds medium in size, pyriform. S. Calif., south of the 36th parallel. —Diffs from *V. californica* in the more pubescent shoots and foliage, smaller and sharp teeth, decom-pound clusters, smaller less glaucous berries, and smaller seeds, Shoots of *V. californica* often bear lvs. with small and muti-cous teeth, and such specimens without the fl.-clusters are diff-icult to distinguish from this species. Some of the forms which have been referred to *V. Girdiana* are apparently hybrids with the wine grape, *V. vinifera*; the plant is imperfectly under-stood and its merits as a species are yet to be determined. It bears the name of H. H. Gird, of Calif.

25. Doaniiana, Munson. Plant vigorous, climbing high or remaining bushy if failing to find support, with short internodes and rather thin diaphragms: lvs. bluish green in cast, mostly large, thick, and firm, cordate-ovate or round-ovate in outline, bearing a prominent triangular apex, the sinus either deep or shallow, the margins with very large, angular, notch-like teeth and more or less prominent lobes, the under surface usually remaining densely pubescent and the upper surface more or less floccose: cluster medium to small,
The plant would pass as a hybrid of  V. culpina and  V. cande-
cans, except that these species do not often occur in its range. It bears the name of Judge J. Doan, of Wil-
barger Co., Texas. It gives promise as a parent of pomological grapes. The Arnold Arboretum reports it as
"a fast-growing plant and appears to be perfectly at home in New England. The leaves are large, thick and firm, and rather pale bluish green in color. The fruit, which grows in small clusters, is blue covered with a pale bloom and of fair quality."

26.  carib rea, DC. Fig. 3963. Climbing, with floccu-
cent-woolly (or rarely almost glabrous) and strPointF
shoots; tendrils rarely continuous; lvs. ovate-ovate or even oval and mostly acuminate-pointed, some-
times obscurely angled above (but never lobed except now and then on young shoots), becoming glabrous above but generally remaining rufous-tomentose below, the margins set with very small, mucro-tipped sinuate teeth; cluster long and long-peduncled, generally large and very compound; berry small and globose, purple; lvs. large, round-cordate-ovate in outline, glabrous and dull above and very heavily glaucous-blue below, but losing the bloom and becoming dull green very late in the season, those on the young growth deep blue-
lobed and on the older growths shallowly 3-lobed, the
basal sinus running from deep to shallow, the margins mostly shallow-toothed or sinuate-toothed (at least not so prominently notch-toothed as in  V. aestivalis); cluster mostly long and nearly simple (sometimes forked), generally with a long or prominent peduncle; the purple and densely glaucous berries of medium size (½in. or less diam.), sour but pleasant-tasted when ripe (just before frost); seeds rather small. Abundant
northward along streams and on banks, sometimes taking the place of  V. aestivalis. Ranges from New England and Ill. to the mountains of W. N. C. and to W. Tenn.

—Well distinguished from  V. aestivalis (at least in its
northern forms) by the absence of rufous tomentum,
the blue-glaucous small-toothed lvs. and long petioles
and tendrils. It has been misunderstood because it
loses its glaucous character in autumn; an excellent
species as a covering for arbors and trellises.

28.  aestivalis, Michx. (V. Nortoni, Prince. V.
Labrusca var. aestivalis, Regel. V. bracteata and V.
arméensis, Le Conte). SUmmer, BUNCH, or PIGEON
GRAPE. Strong tall-climbing vine, with mostly long inter-
nodes and thick diaphragms, the young growths
rusty or red-brown pubescence which clings
to the under side retaining a covering of copious
astringent to juicy and sweet; seeds 2–4, medium size (½in. or less long). S. N. Y. to
Cent. Fla. and westward to the Missouri and Misso-
rouri rivers.—A marked type readily
distinguished from other species by the red-
dish fuzz of the under side of the lvs.

Var. Bourquiniana, Bailey (V. Bourquiniana, Munson). A domestic offshoot, represented in such cult.
varieties as Herbermont and Le Noir, differing from  V.
aparvula in its mostly thinner lvs. which (like the young
shoots) are only slightly red-brown below, the pubes-
cence mostly crenate or dun-colored or the under sur-
f ace sometimes blue-green; berries large and juicy,
black or amber-colored.—A mixed type, much out
S. It is probably exotic, but may have been modified
by hybridization. Probably to be associated botanically with *V. vinifera*.

29. *Linsecomii*, Buckl. (*V. diversifolia*, Prince. *V. xantii* var. *Linsecomii*, Munson). Post-Oak, Pines, or Turkey Grape. More stocky than *V. xantii*, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below: berries large (1½-3½ in. diam.), black and glaucous, mostly palatable; seeds mostly much larger than in *V. xantii* (often ½ in. long). High post-oak (*Quercus stellata*) lands, S. W. Mo. to Texas and La.—Munson distinguishes it from *V. xantii* by larger berries and seeds, larger lvs. which are bluish in the var. glauca, greater endurance of drought. A promising species for the pomologist. It bears the name of Dr. Gideon Linsecom, and is oftenwritten *V. Linsecomii*, but if such original spellings as Wisteria, Zanthorizia, Deditis, Stewartia and many others are to be retained, consistency requires that we hold to Buckley’s original spelling, *V. Linsecomii*.

Var. glauca, Munson (*V. xantii* var. glauca, Bailey). Lvs. and mature wood glaucous-blue on the body beneath, but the veins rusty: berries and seeds larger. S. W. Mo. to N. Texas.—Much like *V. bicolor*, but lvs. thicker and more pubescent below, and tips of shoots rusty-tomentose: berries larger and the clusters strongly shouldered.

30. *candicans*, Engelm. (*V. mustangensis*, Buckl.), Mustang Grape. Plant strong and high-climbing, with densely woolly young growth (which is generally rust-tipped), and very thick diaphragms: lvs. in large in size and more or less poplar-like, ranging from reniform to cordate-ovate or triangular-ovate, dull above but very densely white-tomentose below and on the petioles, the basal sinus very broad and open or usually none whatever (the base of the leaf nearly truncate), deeply 3–10 lobed (with enlarging rounded sinuses) on the strong shoots and more or less indifferently lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the fertile lfs. long and strong, those in the fertile lfs. very short and laterally reflexed: clusters mostly branched, bearing 12–20 large (½ in. or less diam.) purple or light-colored or even whitish berries, which have a thick skin and a very disagreeable fiery flavor; seeds large, pyriform. W. Ark., Okla., N. Texas, mostly on limestone soils.

Var. coriacea, Bailey (*V. coriacea*, Shuttlew.). Leather-Leaf or Callosa Grape. Fig. 3965.

Differ from the species chiefly in bearing much smaller (about ½ in. diam.) thinner-skinned and more edible grapes with mostly smaller seeds, and perhaps a less tendency to very deep lobing in the lvs. on young shoots and possibly rather more marked rustiness on the young growths. Fls. chiefly southward, in which range various Texan plants reappear.—The more agreeable quality of the fr. is perhaps the result of a more equable and moist climate.

31. *Simpsonii*, Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin berries, and large-toothed ones on the main shoots; rusty white tomentum below and very prominently brown-tomentose young growths—the character of the lvs. and tomentum varying widely, the foliage somewhat becoming almost blue-green below. Fls.—This is perhaps a hybrid of *V. xantii* and *V. candicans* var. *coriacea*. Some forms of it are very like *V. Labrusca*, and might be mistaken for that species. Its botanical position is yet to be determined.

32. *Labrusca*, Linn. (*V. Blandyi, Prince*). Fox Grape, Skunk Grape. Fig. 1705, Vol. III. A strong vine, climbing high on thickets and trees: young shoots tawny or fuscous, with much scurfy down: lvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly oblong or triangular, heart-shaped to the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded and dentate at the bottom) or sometimes nearly continuous in outline and almost deltoid-ovate, with the petiole usually shorter than the blade and very open (tending to narrow and half or more the length of the petiole), the margins shallowly scallop-toothed with mucro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny white, dun-colored or red-brown tomentum: stamens long and erect in the sterile lfs. and (in wild forms) short and recurved in the fertile ones: raceme short (berries usually less than 2 in wild types), generally simple or very nearly so, in anthesis about the length of the peduncle: berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. Cent. New England and southward in the Allegheny region and highlands to W. Cent. Ga. Not known to occur west of E. N. Y. in the N., but occurs in S. Ind. and Tex.—The parent of the greater part of American cult. grapes (probably largely through hybridization). It is often confounded with *V. xantii* in the S., from which it is distinguished by the habitually continuous tendrils, the more felt-like lvs. which are not floccose, and especially by the small-toothed lvs., very short clusters, and large berries and seeds.

33. *Pissazkii*, Maxim. (*Ampelopsis Davidiana*, Mott.). A species with variable foliage: dioecious; young branches, petioles, and under surface of lvs. rufous-pubescent: lvs. membranaceous, terebrate; lfts. petiolulate, the central one rhomboid and more or less divided into segments, the lateral ones obliquely ovate, the central one rhomboid and more or less divided into segments, the lateral ones obliquely ovate, the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded and dentate at the bottom) or sometimes nearly continuous in outline and almost deltoid-ovate, with the petiole usually shorter than the blade and very open (tending to narrow and half or more the length of the petiole), the margins shallowly scallop-toothed with mucro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny white, dun-colored or red-brown tomentum: stamens long and erect in the sterile lfs. and (in wild forms) short and recurved in the fertile ones: raceme short (berries usually less than 20 in wild types), generally simple or very nearly so, in anthesis about the length of the peduncle: berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. Cent. New England and southward in the Allegheny region and highlands to W. Cent. Ga. Not known to occur west of E. N. Y. in the N., but occurs in S. Ind. and Tex.—The parent of the greater part of American cult. grapes (probably largely through hybridization). It is often confounded with *V. xantii* in the S., from which it is distinguished by the habitually continuous tendrils, the more felt-like lvs. which are not floccose, and especially by the small-toothed lvs., very short clusters, and large berries and seeds.

35. flexuosa, Thumb. Sts. slender and usually flexuous, glabrous at maturity, the new ones more or less rufous-tomentose: lvs. petiolate, cordate-ovate or truncate-ovate, entire or angular-3-lobed, short-cuspidate, unequally dentate, at maturity glabrous above and more or less hairy or floccose beneath (at least on the veins): fl-clusters peduncled and branching: fr. very small, 2-3-seeded. China, Korea, Japan. Var. parvifolia, Gagnep. (V. parejolola, Roxbg. V. flexuosa var. Wilsonii, Veitch), is a small, indv. form, cult. for the color of the lvs., which are purple beneath and bronzy with metallic luster above. China.

36. amurensis, Rupr. (V. vulpina var. amurensis, Regel). A hardy species, well known to botanists but little planted although found in growing colonies: sts. obliquely angled and striate, the young shoots loosely floccose or webby, later glabrous or nearly so: lvs. green above and beneath, nearly or quite glabrous, cordate-ovate, some of them more or less 3-5-lobed: fl-cluster shorter than lvs. or about equaling them: fr. very small (½-⅔ in. long), 2-3-seeded, purplish black. China, Japan. B.M. 8558. —It is the E. Asian representative of V. labrusca. The plant sometimes cult. under this name is probably V. pentagona. A form of V. Coignetiae passes as V. Thunbergii in England.

37. Thunbergii, Sieb. & Zucc. (V. Sieboldii, Hort.). A variable species resembling V. labrusca: sts. angled, those and other parts rufous-tomentose: lvs. glabrous above, tomentose or pubescent on the nerves beneath, cordate, 3-5-lobed or deeply cut, unequally mucronate-dentate: fl-cluster shorter than lvs. or about equaling them: fr. very small (⅔-⅔ in. long), 2-3-seeded, purplish black. China, Japan. B.M. 8558. —It is the E. Asian representative of V. labrusca. The plant sometimes cult. under this name is probably V. pentagona. A form of V. Coignetiae passes as V. Thunbergii in England.

38. pentagona, Dick & Gilg. Climbing the tundra regions of the small, 2-3 seeded. China, Korea, Japan. outside the southern parts: sts. and lvs. less or more pubescent or tomentose: lvs. 3-6 in. or more long (sometimes very large), sometimes nearly glabrous but usually soft-pubescent or tomentose beneath, membraneaceous, cordate-ovate, short-acuminated, not lobed: fls. small and green, in a paniculate cyme, the petals rarely separating at the top: fr. purple, size of large pea, 4-seeded. Himalaya to China.

heterophylla var.—V. Poinsettiana, Balf. Climbing, the tendril spiral, red-tasty; lvs. persistent, coriaceous, long-stalked, digitate with usually 5 elliptical coarsely dentate lfts. which are glabrous above and bright green; fls. in axillary short-peduncled cymes, hermaphrodite; sepals 4, oval, shorter than the 4 oval-lanceolate separate petals; carpels woolly, with a short 4-lobed style, the 2 carpels bouralate. Tonkin. R. H. 1902. pp. 56, 57. R. B. 28-3. Genus doubtful.—V. somereni, Hort. "observed in a nice villa garden" robust, etc. brown-felted; lvs. large and leathery, deeply cut into fine lobes, brown-tomentose, deep olive-green at maturity.

L. H. B.

VITTAGDMIA (Dr. C. Vittadini, an Austrian who wrote on fungi, 1826-1842). Compositae. Herbs with a thick caudex, or branching subshrubs.

Leaves alternate, entire or variously cut; heads rather small, with a yellow disk and white or blue rays, terminal, solitary or in loose leafy corymbs: involucre of several rows; rays pistillate, numerous, crowded, in more than one row: achenes narrow, compressed or flat, with or without ribs on the faces; pappus of numerous, often unequal capillary bristles.—About 14 species, natives of Austral, New Zealand, S. Amer., and Hawaiian Isls. The genus is closely related to Erigeron, differing in habit and in the appendages of the style-branches, those of Erigeron being short, while those of Vittadinia areawl-shaped. For V. triloba, Hort., not DC., see Erigeron mucronatus.

australis, A. Rich. (V. triloba, DC., not Hort.). Herbaceous plant of uncertain duration, 1 ft. high or less, tomentose lvs. obovate or spatulate to linear-lanceolate, entire or coarsely 3-toothed or lobed; heads solitary: rays narrow: said to be revolute (which may apply only to dried specimens). G.W. 11, p. 129. Austral, Tasmania.—There are botanical varieties.

V. tricolor, Hort. is apparently V. australis, A. Rich.

WILHELM MILLER.

VITTAHIA (Lat. a fillet or head-band or in vita, a line). Polyphideae. A genus of about 40 species of tropical ferns mostly with narrow cord-like lvs. growing pendent from trees: sporangia borne in 2 lines along the margins. V. lineata, Swartz, Old Man’s Beard, is a tropical American species which is found as far north as Cent. Fla., where it grows on the cabbage palmetto. Rare in cult. and interesting only as an oddity.

V. filifolia, Féc. Fig. 3967. A small species, 10-12 in., which is representative in appearance and habit of most of the species; sometimes found in choice collections. Trop. Amer.

L. M. UNDERWOOD.

VOANDZÉA (from a native name). Leguminosae. One species, V. subterranea, Thouars, cult. widely by the natives of Cent. Afr. for its underground peanut-like seeds. It is a prostate herb with a creeping pubescent rhizome from which arise slender-stalked compound lvs. Illts. 3, oblong or lanceolate, 3 in. or less long, with minute obtuse stipels: fls. yellow, ½ or ⅓ in. long, papilionaceous, 1-3 on flexuous peduncles; calyx very small; standard obovate; wings equaling standard, oblangelate; keel boat-shaped; nut or seed diapholous; fr. a tuber-like roundish pod, about ½ in. or more long, with 1 or 2 small seeds; the peduncle elongates after flowering and the ovary is buried in the earth, where the fr. ripens; seeds globose-ellipsoidal, about ½-⅓ in. long, yellow-mottled. Until very recently the plant has been unknown in a wild state, but it has now been found natively in Nigeria and German Adamaua (see Kew Bull. 1912, p. 213; and in this article the plant is distinguished from Kerstinella geniculata, page 1737. another underground legume widely cult. in Trop. Afr.). Voandzea appears not to have been intro. in this country.

L. H. B.

VOCHSIA (Vochy is the name of one of the species in Guiana). Vochysiaceæ. Glabrous or tomentose usually resinous trees, frequently tall shrubs, occasionally grown in the warmhouse: lvs. decussately opposite or verticillate, usually leathery; stipules small, subulate: fls. rather large, yellow, odorous, in elongated composite racemes or panicles; pedicels 2-bracted; sepalas 5, connate at base, lateral and anterior very short, posterior largest, usually spurred; petals 1-3, linear or spatulate, anterior commonly larger than the others; stamen 1, fertile; ovary ovary 3-celled; capsule, leathery or woody, 3-celled, loculically 3-valved.—About 60 species, natives of Brazil, Guiana, E. Peru, and Colombia. The spelling Vochysia is later.

V. ferruginea, Mart. (V. tomentosa, DC.). Tree, 25 ft. or more high: lvs. ovate-oblong, long-acuminated, acute at base, glabrous above, ferrugineous-tomentose beneath: fls. in terminal racemes, which are loose and slightly noding. Guiana.—V. guianensis, Aubl. Tree, 12 ft. or more high: lvs. obvate-oblong, shortly acuminate, glabrous on both surfaces: fls. in simple racemes, which are erect, terminal and close-fld.; sp. spreading. Guiana.

VOLKAMÉRIA: Clerodendron.

VOLUTARÉLLA (diminutive of Volutaria). Syn., Amberboa. Compositæ. Erect or divaricately diffuse valious or glabrous annual herbs, sparingly grown in Calif.: lvs. alternate, crenate-dentate or remotely pinnatifid: heads heterogamous, outer fls. 1-row, neuter, disk-fls. fertile; involucre ovoid or globose; bracts in many rows, imbricate; corolla purplish, violet, or blue, regular tube slender and very short, limb cylindrical, deeply 3-lobed; achenes obvoid or oblong, prominently 10-15-ribbed. About 7 species, Medit. region, W. Asia, and India. This genus is treated as a part of Centaurea by Hoffmann in Engler and Prantl, Pflanzenfamilien IV, pt. 5. V. murielae, Benthi. & Hook. f. (Amberboa murielae, DC.). St. erect, 1-2 ft. high: basal lvs. lanceolate, attenuate to the petiole; cauline sessile, middle ones auricled, upper and lowest not auricled, linear- or obovate-lanceolate: fls. purple. Spain and Morocco. According to the Brussels Congress, Amberboa is placed in the list of "nomina conservanda," and if this ruling is followed, the species above mentioned will retake the name A. murielae, DC.

VOUAPA (native name in Guiana). Leguminosae. Unarmed trees, rarely cult.: lvs. abruptly or somewhat, old-pinnately-compound; llfs. sometimes 1 or few-paired, sometimes many-paired; stipules leafy or auricled, uppermost clawed; 2-4, lower small, scale-like or none;
VOUAPA

perfect stamens 3; ovary stipitate, 3- to many-ovuled; pod obliquely orbiculate, ovate-oblong or tubate, plano-compressed, leathery, 2-valved. About 45 species, Trop. Amer. and Trop. Afr. This is the oldest generic name, but the name Macrolobium is retained by the list of "nominis conservanda" accepted at Vienna. Macrolobium bifolium, Pers. (M. Vouapa, J. P. Gmel. Vouapa bifólia, Aubl.). Tree, about 10 ft. high; lvs. sessile, ovate, acuminate, oblique: fls. violet; calyx lobes spreading; stamens nearly equalling the corolla. Guiana.

VRIÉSIA (named for Dr. W. de Vriese, of Amsterdam). Bromeliáceae. Often spelled Vriesia, but not so spelled by Lindley, who founded the genus. Tropical American stiff-leaved plants, with mostly distichous spikes bearing large and showy bracts. According to Mez (DC. Monogr. Phaner. 9), 84 species are to be referred to this genus. They are very like tillandsias, with which they are united by Bentham & Hooker and others. The chief technical difference is the presence in Vriesia of 2 ligules or a single cleft or erarginate ligule on the inside of the base of petals. Culturally, vriesias are like tillandsias. They run to forms with marbled and banded lvs. Several species have been intro. in recent years, and many garden hybrids have been produced. Few kinds are offered in the American trade, and only these kinds are described here. For other kinds, see the monographs of Baker and Mez; also the accounts from time to time in horticultural publications. For cult., see Tillandsia.

A. Stamens longer than the petals.
   b. Infl. branched.


bb. Inf. simple.
   c. Bracts of infl. strongly imbricate.

speciosa, Hook. (Tillandsia splendens, Hort. T. plicata, Hort. T. zebrina, Hort., in part). Fig. 3968.

Strong-growing plant, with broad, strong, arching-ascending lvs. 1 ft. or more long, which are bright green and marked with dark brown transverse bands: spike with densely imbricated bright red acuminate bracts, the scape spotted: fls. exerted, yellowish white. Guiana. B.M. 4382. F.S. 2:107; B. p. 102. R.H. 1846: 41. F.W. 1874:33 (as V. brachystachys).—One of the best and most showy species. A robust form is var. major, Hort. See supplementary list below for additional note on T. zebrina.

AA. Stamens shorter than the petals.
   b. Lvs. not barred, mottled, or tessellated.

heliconoides, Lindl. (V. bellula, Hort. Tillandsia heliconoides, HBK.). Dwarf and tufted, with many rosetate recurving or arching lanceolate lvs. (about 12 in. long) which are bright green above and purple-tinged beneath: scape overtopping the foliage, simple and erect, with wide-spreading distichous boat-shaped bracts that are light red at the base and greenish at the tip, showy: fls. white. Colombia. I.H. 30:490. G.C. II. 21:140.

bb. Lvs. tessellated (marked in small checkered pattern) or minutely variegated.


fenestralis, Lind. & André (Tillandsia fenestrailis, Hook. f.). Robust, densely tufted, the lvs. stout (1-2 ft.
VRIESIA


bbb. Lvs. marked with strong transverse bands.

hieroglyphica, Morr. (Tillandsia hieroglyphica, Bull.). Fig. 3970. Lvs. many, rosulate, stout, recurved, short-acute, very strongly and irregularly marked and banded with dark green above and brown-purple beneath: infl. paniculate, the bracts broadly elliptic-ovate, the fls. yellowish. Brazil. I.H. 31:514; 42, p. 318. R.H. 1891:400. Gm. 37, p. 244 (adapted in Fig. 3970).—A very striking and showy plant. Sometimes known as a Massangea.

V. Blakii, Hort. (Tillandsia Blakii, Hort.). Infl. crimson, pinnately plicate, 4-6 ft. tall; floral bracts ovate; fls. in 2 rows, 4 in long; petals yellow, linear, about 4 in. long. S. Amer. B.M. 8192. G.C. III. 45-558.—V. filipes, Hort., has been catalogued in this country. It is a garden hybrid (V. incurvata × V. Duvalii). It has short green lvs. and an exerted simple spike with distinct bright red imbricated bracts. I.H. 35:67.—V. glaucophylla, Hook., in Tillandsia fasciculata.—V. Leopoldiana.—V. splendidissima.—V. Malpighii, Gm. 54:1539.—V. mucronata.—Grammonia.—V. regina, A.D. Lvs. very long-acute: infl. large; bracts elliptic-ovate, rounded at apex; fls. dirty yellow. Brazil.—V. Rez. Hybrid. R.H. 1907:570.

VUYLSTEKEARA

—V. zebrina, Hort., is sometimes V. splendidissima and sometimes Cryptanthus sonatus.
L. H. B.

VULNERARIA: Anthyllis.

VUYLSTEKEARA, a multigeneric orchid hybrid embracing Cochlioda, Miltonia, and Odontoglossum. It bears the name of Charles Vuylsteke, of Ghent, Belgium, and the name is conformable with Adamara, Linneana, Lowiana, Wilsoniana. Only two species or species-forms (very recent) are recorded, the first of which has been in doubt as to parentage. These are V. insignis, Hort., recorded (G.C. III. 56:14) as a hybrid of Milliotioda Bleuana and Odontioda Charlesworthii, bearing cream-white fls. with brownish spots; and V. Hyama, Hort., a hybrid between Odontonia Laeversia and Cochlioda Noezlana, with fls. 2 in. across with a cinnabar tint suffusing the greater part of the surface of the sepals and petals after the color of C. Noezlana, but with the form of fl. approaching O. Laeversia especially in the center of the labellum, which is white tinged rose-color, and the base having a crest of yellow ridges on a red ground in front of which is a large shining brownish yellow raised blotch similar to that in Milliotio Warcewiczii.
WAHLBORGIA (named after Georg Wahlberg, 1780-1851, Swedish botanist). Including Edræanthes (Hedranthus). Campanulaceae. Annual or perennial herbs, base of the stems sometimes woody, used as greenhouse and border plants, mostly the latter.

Leaves alternate, rarely opposite: ind. usually irregularly centriugal: peduncles terminal, lateral or axillary, solitary or rarely paniculate: fls. usually blue and nodding; calyx-tube adnate, hemispherical, turbinate or obconical-oblong, limb 5-parted, very rarely 3-4-merous; corolla-campanulate, funnel-shaped, tubular or rather rotate, 5-lobed, very rarely 3-4-lobed; ovary inferior or semi-inferior, 2-5-celled: caps. erect, loculicidally 5-valved.—About 110 species, Eu., Medit. region, S. Af., and Trop. Amer. This treatment includes Edraianthus, which is often kept as a distinct genus. The species are used mostly as rock-garden plants, and receive the treatment given campanulas.

A. Plants with clustered tubers.

b. Lvs. alternate or opposite and narrow, scattered along the sts.: plants usually annual.

c. Blades nearly rounded.

d. Pedicels of flowers about 1 in. long, calyx a little shorter, oblong, obtuse, calyx-lobes more or less equal, 5-7-angled, nearly rotund, about 1/2 in. diam.: fls. few, terminal, pale blue-lilac; calyx glabrous, tube hemispherical, lobes linear-subulate; corolla-lobes ovate, acute. Eu.

c. Blades linear to lanceolate or narrowly ovate.

g. Scapiflorus, L. (G. saxicola, A. DC.). Sts. simple or branched, 6-12 in. high, erect or somewhat decumbent: lvs. alternate or subopposite, linear-lanceolate, sinuate-dentate, about 1/2 in. long; peduncles terminal or axillary: fls. blue; calyx rather glabrous, tube ovoid, lobes acuminate; corolla-lobes ovate, acute. Trop. and south temperate regions of the Old World. G. C. III. 52:215.


aa. Plants without clustered tubers.

n. Lvs. basal clustered, narrow: plants perennial. (Section Edraiantha.)

c. Fls. solitary on the peduncles.


cc. Fls. several to numerous on the peduncles.


3971. Wahlenbergia serpyllifolia. (X1/2)

W. gentianoides, Hort., is offered in the trade as a rock-plant growing a foot high, with erect wiry sts. and bright blue fls.—W. grandiflora, Schrad., is Plateyrootis grandiflorum.

F. TRACY HUBBARD.

WÀTZIA (F. A. C. Waitz, born 1768, at Schauenburg, Germany, state physician to the Dutch at Samarrang, Java; wrote on Javanese plants). Compositae. Includes one of the rare "everlasting flowers," a half-hardy annual which bears flat-topped clusters of yellow flower-heads, with a golden disk.

Mostly annuals: lvs. alternate, linear or nearly so: fls.-heads in terminal corymbs or rarely in oblong leafy racemes; involucral bracts: the bracts over-lapping in many rows, all colored and petal-like: receptacle flat, without scales: anthers provided with tails of very small size: achenes somewhat compressed, glabrous or papillate, terminating in a slender beak; pappus of capillary bristles usually cohering at the base, simple, barbelate or plumose.—Seven species from Australia. The genus is distinguished from Helipterum and Helichrysum by the beaked achenes.
It seems to have replaced *W. aurea*, Steetz, the favorite of a former generation, being larger-flowered, more robust, and rather easier of culture.

*Wilhelm Miller.*

**WAKE ROBIN:** In England, *Arum maculatum*; in America, *Trillium*.

**3972. Yellow or barren strawberry.—**Waldsteinia fragarioides. (X½)

**WALDSTEINIA** (named after Franz Adam, Count of Waldstein-Wartenburg, born 1759 at Vienna; wrote with Kitaibel an illustrated work on rare plants of Hungary; died 1823). Rosaceæ. Creeping herbs with the habit of Fragaria, perennial and hardy, used in the border as an edging and on rockeries.

Leaves mainly radical, 3-5-lobed or -divided; fls. small, yellow, borne on bracted scapes; calyx-tube inversely conical, limb 5-cleft, with 5 often minute and deciduous bractlets; petals 5; stamens many, inserted into the throat of the calyx: achenes 2-6, minutely hairy.—About 5 species, Cent. and E. Eu., N. Asia, and Temp. E. N. Amer. Of simple cult.

The yellow or barren strawberry, *W. fragarioides*, is a little plant that looks much like a slender strawberry but it has yellow flowers and bears no edible fruit. It is a hardy North American tufted perennial herb, about 4 inches high, with glossy leaves composed of three wedge-shaped leaflets, and five-petaled flowers less than ½ inch across. It comes with the first rush of spring, and continues to bloom until summer. There is little satisfaction in growing only a few plants of this wild flower. The plant is appropriate to the rockery, where every effect should be made to induce it to form a large mat. Masses of the yellow strawberry have been used with good effect for edging shrubbery borders, and the plant is listed in the trade.

**WALKS, PATHS, AND DRIVEWAYS.** That gardens and grounds may be reached at all times in any weather, walks are introduced to afford dry comfortable routes. They should be laid out to conform to and emphasize the garden design. However, too much gravel or a too complicated system will mar the purpose and scale of the garden and detract from its charm. It is necessary, therefore, that the paths be kept in proportion by adopting various widths according to the amount of travel expected and the importance of certain lines in the design. Principal lines or “axes” of the design may be emphasized by widths of 6 to 14 feet; secondary by 4 to 8 feet; minor, 2½ to 4 feet. It may be added that straight paths should be wider proportionately than curving ones. Paths may also be maintained in scale by use of different materials, using stone or brick for the principal ones; gravel, tanbark, or stepping-stones for secondary; grass for the least important. The color of path material also influences the garden appearance, and the simpler the garden character the less pronounced should be its path-colors. Turf is the least and cement the most conspicuous of materials.

Grass paths should be designed for unusual wear, and a depth of at least a foot of well under-drained soil provided. Many simple gardens have turf paths only, but these are at a disadvantage in wet weather or dew. If the wear is more than grass will stand, or the garden lines need more emphasis, stepping-stones may be introduced in the grasses. (Fig. 3973.)

Stepping-stone paths are simplest made of native rock of irregular shapes (Fig. 3974); more refined if of native rock, hammer-dressed; and still more refined if of regular blocks, slate, flag, or cement, (12 by 12 inches square, or (12 by 24 inches) of regular (Fig. 3974). The stones should be set 20 inches apart,
WALKS

WALKS

3974. A, Stepping-stones in the grass—the simplest dry path in the natural style. B, The same, conventionalized for the formal style.

design as to demand greater width, the character should change, and gravel or crushed stone be used.

For macadam paths (Fig. 3975) excavate 8 inches at the sides, 6 inches in center, and lay 5 inches of stone or "spawls" on edge across the path. Over this spread 2 inches of crushed stone the size of a hen's egg (1/2-inch stone) and a sprinkling of clayish soil, and roll firm, a hand roller being used. An inch of crushed limestone or hard shale should then be spread and rolled until a firm hard surface results. The walk should be raised 1 inch at the center for each 2 feet of width. These hard walks must be contained by borders of grass sod, boxwood, stone, brick, or cement curb. The curb should stand only 1 inch above the walk-surface; it should be 2 1/4 inches wide for a 4-foot path and 2 1/2 inch wider for each added foot width of the walk up to 4 inches, which is sufficient for a highway.

Gravel paths appear well up to any width, but as they are widened their color increases in design importance. Many garden designers use red gravel only; others prefer blue trappe rock; few use washed beach gravel or other white surface material because of its glare.

This fault is a grievous one with respect to cement as a walk material; it also seems too artificial and not gardenesque.

Many garden designers use red gravel only; others prefer blue trappe rock; few use washed beach gravel or other white surface material because of its glare. This fault is a grievous one with respect to cement as a walk material; it also seems too artificial and not gardenesque.

Brick in various colors and textures is an old and valuable path material which meets the requirements of color, texture, interest, drainage, and neatness, as well as anything yet devised. The pattern of laying should not be complicated to the degree of attracting attention which should be bestowed on the garden itself. In front of seats or steps, about a pool or a garden dial, it may be embellished by special design or by tile introduced into the pattern. Usually the patterns are three, or adaptation of those shown in Fig. 3976. A tile effect can be secured by using extra-wide joints, but glazed tile will be found too slippery for out-of-door use. Brick walks should be laid over a foundation of 16 inches of cinders or broken stone, for drainage and to prevent-heaving by frost. To lay "dry," an inch of sand is spread upon this foundation, the bricks laid and afterward swept over with sand until joints are filled. If a cemented job is desired, spread 3 inches of concrete upon the "frostproof" foundation; lay the brick upon a layer of cement mortar spread above the concrete, and pour the brick joints afterward with cement (one part), sand (one part); scour the bricks with muriatic acid, one part to ten of water.

Much may be said in favor of stone paths. It is a material full of interest and generally harmonizes well in garden or lawn. The stones, as a rule, should be larger if the walk or terrace is wide or long. They may be laid regularly or irregularly (Fig. 3977); smooth or rough of surface; cemented joints over foundations as for bricks; or laid with grass joints. These last are very gardenesque, particularly if the joints are filled with low-growing plants, like Sedum acre, Armeria vulgaris, certain saxifragas, and Veronica rupestris. Such a walk is not easy to keep free of either snow or heavy dew, so that it must not be laid where service demands dryness.

In the English or natural landscape style, lawns and informal gardens are made up of grass, shrubs, trees, and vistas. Paths are introduced for the sole purpose of giving easy access to various points or objects of interest and are not relevant, as in formal gardens, to the design. On the other hand, it is easy to intercept and spoil a vista, subdivide charming greensward, or mar a graceful slope by introducing a walk. Considerable study is required to lay out paths which will be direct, serving the practical needs of the place without interfering with esthetic considerations. Usually it is best accomplished by keeping paths somewhat toward boundaries, and consisting of graceful long curves in harmony with the general rounded outlines of foliage, foregrounds, and slopes in hillsides, rather than by more conventional straight lines, directed through centers. These paths must not seem circuitous or precipitous, however, and the interest must be satisfying to the traveler by presenting special vistas, close examination of interesting plantings, providing good restful benches, passing through arches or otherwise made interesting and seemingly short. Paths of this character must not be laid out in an unrelated system nor built simply to break up lawns and afford aimless strrolls. It should not often be necessary for the traveler to return the way he came along a path, at least any distance, and even in small
grounds a full circuit should be devised, or else no path-scheme laid out at all. When crossing a vista, as is often necessary to secure directness or continuity, the path may be graded lower to obscure its course (Fig. 3978), or it may be of an inconspicuous material such as a blue slate, brown stones, or dark stepping-stones with grass joints (Fig. 3973).

The materials of such lawn-paths may be simply of turf when passage is through woods or meadows. This latter charming device is secured by moving a strip through the longer meadow grass and daisies. Macadam or gravel is usually the method of construction.

For crowded parks, the width should be 8 to 12 feet or more. The construction may be heavier by 2 inches, and special care given to drainage. Oiled macadam, valuable for roads, is not suitable for paths unless top-surfaced with fine screenings to prevent tracking the oil.

Asphalt paths are sometimes used and are best if the residuum used in the flux of the surface coat be reduced to the minimum in order to leave as hard a pavement as possible. Concrete is being more generally used because of its wearing properties. It should be colored with red ochre, and the usual whiteness of cement surface. These walks may be constructed in the usual way (3 inches concrete, 1 inch cement float), except that the surface should be rough finished—neither troweled nor rolled. Wing walks at each side of the cement may often be provided to good advantage. They are 2 to 4 feet wide, made of 4 inches of gravel (or crushed stone) laid upon 6 inches of cinders or broken stone.

Drainage should be provided for all paths. Brick, asphalt, or cement walks should be crowned in the center or on the high side. Three-fourths of an inch is sufficient for an 8-foot cement walk. At each side, or at the upper side at least, of paths on a slope, drainage should be provided by sod gutters. This will carry the surface water to park inlets which discharge into sewer lines.

**3977. Forms of stone paths of a gardenesque appearance.**

A, grass or flower joints; B, cement joints; C, cobbles and stones in cement.

**3978. Walk crossing a lawn in slight depression for concealment.**

Driveways.

If walks and drives were not necessary to a human use of the informal type of landscape, they would never be put into it. Drives should be regarded as secondary, not primary elements of beauty in this style of gardening and they should remain unobtrusive by direction, width, and material. But as the landscape becomes more formal, drives become increasingly important and prominent in the design. It is simpler to plan the driveway in the formal balanced lawn of a house with terrace and gardens in a straight line swung on evident axes than to observe the indefinite lines, the less apparent unity and balance of informal gardening and incorporate therein a wide roadway. A straight formal drive should not be intruded through an informal lawn, or an irregularly curved and planted road through a formal place.

As elements of beauty, roads are tolerable only as they serve their purpose thoroughly well. This purpose may be a service-way to the kitchen, when directness is the first consideration; or to the front door, when good views of the house and lawn may warrant more indirectness; or a pleasure-drive, where directness is lost sight of, and good views, interest of scenery, and gradient become all-important. Success in laying out driveways depends on skill in applying the principles of landscape design, with a true regard for grades and excellence of construction. More engineering skill will not attain good private or park drives, for part of the function of such roads is to harmonize as far as possible with the other elements of the created or natural landscape.

Practical reasons urge a principal entrance toward the most-used corner of the property. As far as possible, the natural inclination for "short cuts" should always be recognized. Neither straight lines nor tiresome turnings are esthetically pleasing; grades must be considered and fine existing natural features, trees, rocks, and the like usually avoided. The driveways should command interesting views ahead and to the side and attract attention to handsome plantings in the curves. The curves should always be directed toward and not away from the objective point, and circuitousness for sake of adding mere length to the approach should be avoided.

To be comfortable as well as practicable, the gradient should be low, of about 6 per cent (6 feet of rise in 100 of length), at turns never over 7 per cent, although 10 or 12 may be required elsewhere to accomplish the ascent. Transition from one slope to another must be carefully arranged so as to avoid sharp jolts (Fig. 3979); this is accomplished by filling the hollows or cutting off the crests where the grades reverse. There should always be a flat place in front of doors and at entrances. Road-curves should be long, at least equal to 60 feet radii. It is an advantage to plot the curves at least roughly upon the ground first and transfer them to paper rather than vice versa, as their true artistic and practical effect may be perceived better. Long stakes should be used to aid the sight or a coil of rope laid upon the ground, and moved about until the desired line is attained, then the rope staked.
By tying colored twine around the stakes and moving it up and down while sighting, the new grades may also often be visualized. In cleared ground this method is very sure. It is better than the engineer's method of regular curves connected by straight tangents.

Precaution should be exercised at curves and intersections to secure safety as well as appearance and convenience. The fast-moving almost noiseless modern vehicles emphasize this precaution; therefore the view ahead at sharp turns should always be unbroken by banks or dense, tall plantings (Fig. 3980). Drives should branch on the outside (A) not inside (B) of curves (Fig. 3981). Danger lurks in narrow branchings and may be avoided by widening the intersecting triangle (Fig. 3982). Small triangles at right-angle intersections are not to be advised. When used at all they should be large and clear of tall planting which obscures the view. Triangles with less than 50-foot sides may better be omitted altogether (Fig. 3983).

At the turn-in from the public road especial care must be exercised to avoid danger. The acute angle (A) is bad (Fig. 3984), and the corner entrance (B) is not much better, or is absolutely fool-hardy when arranged as C. The best turn-in is shown at D. When possible, enter from an outward bend of the public road (Fig. 3985) or at the head of the street (Fig. 3986), and always at nearly right angles to the public road (Fig. 3988), making a gradual bend, if desired, to an angle within the property. Avoid if possible the street entrance at the foot of a steep hill as it is the point of greatest speed. Formerly entrances were heavily emphasized by gate-piers, lodges, and tree-plantings; now they are recessed and the planting is less high.

The road-surface should be smooth, dry, elastic, clean, and of good color. All this is to be obtained by various constructions. The gravel roadway is always pleasing as to color and wear, but the present-day macadam, although somewhat lacking as to color, better withstands modern traffic. Brick, concrete, and asphalt are too noisy and seem too hot and formal for private roads in the country, although for short distances in the city they may be used properly.

The construction of any roadway is begun by grading the level for the bottom of the road. This is called the sub-grade and is made higher in the center than at the sides by 1/2 inch or more to each foot width. The sub-grade should be rolled before the stone is laid. For private drives generally a light Telford consisting of native stone, about 6 inches wide and 1 to 3 inches thick, is laid by hand upon edge crosswise of the road. Over this a sprinkling of clay soil is thrown and covered 2 inches deep with crushed stone of the 1/4-inch grade; this in turn is covered by an inch of crushed limestone screenings. Each course as laid is sprinkled and rolled with a six- to ten-ton steam roller. This is a water-bound macadam. (Fig. 3987 A.) Since it does not withstand automobile traffic without dust, various oil-binding treatments of the surface are on the market. Bitulithic macadam is an excellent method of binding the top courses together, with hot pitch applied under pressure. There is no tracking of oil when this method is practised and the color and texture are satisfactory. Local conditions so influence materials and methods that it is necessary to investigate before applying any general specification in detail.

A cheaper road (Fig. 3987 B) may be built of spawls, or other broken stone, spread evenly, rolled, and surfaced with the other two courses of crushed stone, each thoroughly rolled wet. Where gravel of a cementitious quality is obtainable, or a hard shale, it may be substituted for crushed limestone surfacing.
The earth road has its country uses. Its success depends on dryness, and this is brought about by wide ditching at the side, a rather high crown in the center, and puddling the surface by repeated dragging while in a wet condition. The turf road (Fig. 3987 C) in country estates, for occasional travel, is made by laying roundish stone without "chinging in" the interstices. Cover with soil 1 inch thick over top of stone and seed with grass.

Whatever material the road is made of, it should be of convenient although not of unnecessary width, 9 feet for a single suburban lot being sufficient, 13 to 16 feet, including gutters, for more pretentious places, 14 feet for the little-traveled by-roads in parks, and 22 to 30 feet for the principal drives, and 60 to 80 for boulevard widths. The roads should also partake of the decoration suited to the large feeling of the place. Such accessories as gutters and inlets, signs and light-posts, entrance-piers and gates, should be rustic or more refined, carved or conspicuous in proportion as the surroundings have been conventionalized. Roads must harmonize and obey the demands of unity in design. The use of roadside shrubbery and arrangement of taller-growing trees is the means whereby the designer may tie together an artificial road to the landscape.

ARTHUR W. COWELL.

WALLFLOWER. The vernacular name of Cheiranthus Cheiri, which see. A favorite spring bloom in Great Britain, and sometimes secured as early as Christmas; in this country it is little known, probably because of climatic reasons.

3987. Types of road construction: A, macadam; B, broken stone; C, turf; 1, cob gutter; 2, gutter; 3, stone curb; 4, cinders; 5, screenings; 6, 1½-inch crushed stone; 7, Tedford; 8, screenings over gravel; 9, spawls.

WALNUT

The wallflower is a perennial, blooming profusely the second year, but needing to be renewed frequently. The compact forms grow only 1 foot or 18 inches high, but some kinds are taller than this. There are single-flowered and double-flowered kinds, and colors in yellow, orange, blood-red, maroon-red, yellow-brown, light brown, ruby-purple, pink. The yellows are most commonly seen in English gardens, and make a most attractive show about cottages in early spring. The double kinds are propagated by cuttings taken in spring, and they make good blooming plants the following spring if not allowed to become stunted; double wallflowers are also grown from carefully selected seeds. The seeds of wallflowers may be sown in spring and plants are kept in vigorous condition until protected for the winter; they are transplanted when young into permanent beds. If seeds are started in late winter, bloom may be had in the following holidays, in a climate mild enough to carry them.

WALLICHA (Nathaniel Wallich, 1788-1854, Danish botanist; wrote on plants of India). Palmae. Stove palms, one of which, the first described below, is cultivated outdoors in southern Florida and southern California and in Europe under glass, and the second, while not advertised in America, is probably in a few northern greenhouses.

Low palms, esoposite, with short branching caudices, or in 1 species tall: lvs. densely fasciculate, terminal, distichous, scaly, unequally pinnatisect; segms. solitary or the lowest in groups, cuneate at the base, oblong-oblanceolate, cross-dentate, the terminal one cuneate; midnerve distinct; nerves fibrillose; margins recurved at the base; petiole slender, laterally compressed; sheath short, split, with the margins deeply crenate; spadices short-terminated, the staminate drooping or recurved, ovoid, much branched, densely fdl., the pistillate looser, erect; spaths very numerous, slender-conicossaious, the lower ones the narrower, tubular, the upper ones cylindrical, entire, imbricated: fls. symmetrical, the pistillate much smaller than the staminate, yellow: fr. ovoid-oblong, red or purple.—Three species, Himalayas. Wallichia is allied to Didymosperma, Arenga, and Caryota, differing in having 6 stamens instead of an indefinite number. Caryota is the only one of this group with ruminate albumen. Didymosperma has a cup-shaped 3-holod calyx, and in Arenga the calyx has 3 distinct sepals.

disticha, T. Anders. Fig. 3988. Caudex 10-15 ft. high, about 5-6 in. diam.; vs. graceful, 6-10 ft. long, alternate, erect; Hts. 1-2 ft. long, 2½ in. wide, fascicled, linear, narrowed to the base, denticulate at the apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy; lvs. disposed in a one-third spiral: spadix 3-8 ft., the staminate usually twice as long as the pistillate; fls. in many spiral series, green. Himalaya.

caryotoides, Roxbg. (Harina caryotoides, Buch.-Ham. Didymosperma caryotoides, Hort.). St. very short or none, often sheathed with the persistent H.-base: lvs. oblong or linear-oblong, pinnatifidly excisate and acutely toothed, white beneath: spadix about 18 in. long, the fls. purple or yellow, according to sex. F. 1874, p. 161. R.H. 1870, p. 368.

V. densiflora, Mart., a palm like W. caryotoides and differing only in technical ovary characters, is offered in Flora of Unknown in Amer. J.F. p. 233, 234.—W. peraphrodes, Mart. See Didymosperma.

JARED G. SMITH.
N. TAYLOR.

WALNUT (formerly sometimes written walnut, but the name has no connection with wall, being rather of Anglo-Saxon derivation signifying "foreign nut," as the product came from the continent). A name applied to Juglans regia and its fruit, to us known mostly as
English walnut because the supply yearly reached America through England; also, by extension, to other species of the genus Juglans. The name is sometimes, but provisionally, given to hickory-nuts.

The walnuts may be thrown into three horticultural groups: (1) The Persian or English domesticated species, *Juglans regia* (Fig. 3988), the walnut of commerce and of extensive cultivation in California and other parts of the United States. (2) The North American walnuts, of several species but chiefly known in the black walnut, *J. nigra* (Fig. 3990). (3) The East Asian walnuts, represented by *J. sieboldiana* and allies, promising but yet little grown in this country. To the genus also belongs the butternut, *J. cinerea* (Fig. 2901), sometimes called white walnut. There is much promise of important cultural races in the species of Juglans, but the markets yet know practically only the nuts of *J. regia*. See Juglans, Vol. III.

L. H. B.

**Walnut in California.**

The extent of the present Persian or English walnut (*J. regia*) industry of California amounts to between 45,000 and 50,000 acres, or about 1,250,000 trees. An average crop for the past few years is about 12,000 tons, valued at $4,500,000. The crop for the year 1915 equaled 14,300 tons, valued at approximately $4,250,000 to the growers. The investment in the walnut industry of California represents about $15,000,000.

English walnuts may have first been planted in California by the Mission Fathers. However, it was not until after the coming of the first Americans that the walnut attained any commercial importance. The present walnut industry is of comparatively recent origin and owes its establishment to the early efforts of Joseph Sexton, of Santa Barbara, and the late Felix Gillet, of Nevada City. The Santa Barbara Soft Shell seedlings and the several grafted varieties of this type are usually planted immediately after harvest, the French varieties, such as the Mayette, Franquette, and the like, owe their popularity to the tireless work of the late Gillet in promoting the production of this type of walnut.

Commercial walnut-growing is largely centralized in the following counties mentioned in their order of importance: Orange, Los Angeles, Ventura, Santa Barbara, San Joaquin, and Contra Costa.

This industry is almost everywhere a specialized crop. It is seldom seen as one of two or more general farm crops, but, on the contrary, nuts are the one and only crop produced by many of the orchardists engaged in this industry. Success with this crop depends on the climate and climatic conditions and the availability of irrigation water. A deep rich alluvial loam containing plenty of humus is desirable. Groves planted on the light sandy loams or soils underlain with a fluctuating water-table or a hardpan within 4 or 5 feet of surface are usually short-lived and unsatisfactory in the end. Although good drainage is imperative to a depth of at least 6 or 8 feet, irrigation water is necessary throughout most of the walnut areas of California for the black walnut.

The walnut industry has been most successful throughout in the coast regions. In general, the high humidity and frequent fogs, together with a relatively small daily range in temperature, seem favorable to this crop. Walnuts grown inland are subject to sun-scald injury on both the nuts and the trees. The inland regions are subject to a very low humidity, an extreme maximum temperature and a wide daily range. Some of the more recently introduced varieties seem to endure the inland conditions better than the Santa Barbara Soft Shell seedlings. It seems very likely that the inland valleys may yet be devoted to this crop with the proper choice of varieties.

Clean culture, with the use of a winter cover-crop, is the most prevalent type of soil-management practiced by the progressive growers. Such cover-crops as melilotus clover, vetch, and rye are often seen. These crops are usually planted immediately after harvest, the latter part of September or October, and should be nearly waist-high at the time they are plowed under, in the latter part of March or April.

Irrigation water is applied by the furrow system in most cases, although occasionally a grove is watered by the basin method, where the land is level or where possibly a sod is grown in the grove throughout the year. From one to five or six applications of water are made in a season, depending on the moisture-holding capacity of the soil and local climatic conditions. Each irrigation should penetrate from 6 to 8 feet from the surface of the ground in order to reach the entire root-system. If the trees are irrigated a week or two before harvest, the shucks will open and remain on the trees. Dropping the clean nuts to the ground. In case the trees are drought-stricken at harvest, the shucks are likely to become sunburned, stick to the nuts, and thus cause an increase in harvesting expense.
The larger number of growers do very little systematic pruning of the walnut except to remove the lower limbs which interfere with cultivation. Occasionally, however, a grove is to be seen in which the branches are annually thinned out. Such trees usually bear more nuts on the main limbs near their centers than the unpruned ones.

In general, the first two men-others combined: Placentia, Eureka, Franquette, industry. At the present time the following five varieties are being propagated to a greater extent than all discarded even thus early in the development of the luwe been introduced and many of these have been this time, a comparatively large number of varieties today, with fewer adaptations to this crop.

The older plantations are composed entirely of seedlings, most of which are of the Santa Barbara Soft Shell type and trace directly or indirectly to the original trees grown by Sexton at Santa Barbara. It is only within a most of which are of the Santa Barbara Soft Shell type and in fact young groves, before they reach a bearing age, are sometimes handled with clean cultivation. The interplanting of young walnut groves with lima beans or other broad vegetable crops, small-fruits, alfalfa, and occasionally apricots and peaches, is a common practice. Certain intercrops, as beans, if properly handled, will commence making returns immediately, without detriment to the future walnut grove. Vegetable crops are preferable to tree crops for interplanting. Peaches and especially apricots have an apparent dwarfing effect on the young walnut trees. Their use may be profitable, however, in the end in spite of the injury caused.

The older plantations were set too close together. Although 40 to 50 feet apart seemed ample room for development, it is very evident now that a distance of 60 feet is none too much for the larger-growing varieties on the rich loam soils which are best adapted to this crop. It is a matter of common observation to see the outside trees in a grove produce considerably more than the trees in the center. This leads one to believe that perhaps some of the older plantations might produce more walnuts today with fewer trees to the acre.

The older groves are composed entirely of seedlings, most of which are of the Santa Barbara Soft Shell type and trace directly or indirectly to the original trees grown by Sexton at Santa Barbara. It is only within a comparatively recent time, during the last ten to fifteen years, that the walnut has been propagated by budding and grafting in commercial quantities. During this time, a comparatively large number of varieties have been introduced and many of these have been discarded even thus early in the development of the industry. At the present time the following five varieties are being propagated to a greater extent than all other sorts combined: Placentia, Eureka, Franquette, El Monte, and Prolific. In general, the first two mentioned varieties compose nearly 70 per cent of the trees propagated at the present time in southern California nurseries.

The several black walnuts are used as rootstocks. The northern California species (J. Hindsii) is held in the greatest favor at present. This is a strong vigorous tree which will withstand adverse soil conditions much better than the Persian walnut itself. Very few eastern black walnuts (J. nigra) are used for propagation, as they are usually thought to be less vigorous than California species. The southern California black walnut (J. californica) is little used at present, although it was once popular (Fig. 3992). This species starts growth so much earlier in the spring than the Persian walnut that it suckers profusely when used as a rootstock. It is not so rapid-growing as the J. Hindsii. Some of the nurserymen are using the Royal hybrid as rootstock. The Royal hybrid is the name commonly given to a cross between J. nigra and either of the California species. Some observers think the Royal hybrid root more resistant to excessive soil-moisture and general adverse soil conditions than any other rootstock. The Paradox hybrid, which is a cross between J. regia and any of the black species, is an exceedingly vigorous rapid-growing tree. This hybrid can be obtained by planting black walnuts which were produced in the neighborhood of J. regia trees. Such nuts will produce from 50 to 90 per cent hybrid progeny. Although this hybrid makes an excellent root and produces exceptionally large and vigorous tree, it is rather impractical for general use as it cannot be obtained in wholesale quantities.

The nursery propagation of walnuts is usually by crown-grafting in place. The black walnut root is grown one year in the nursery and grafted the second spring just before the leaves start to come out. A short whip-graft is used, tied in place by soft cotton twine or raffia. After tying, the graft and top of the cion are covered thoroughly with hot wax. Some additional protection is usually given to prevent the cion drying out excessively. This is done by covering with a paper bag or by hilling the soil over the union until growth starts. The young trees are staked in the nursery, as they are very supple, due to their rapid growth. The one-year-old trees are preferred by most planters and should be 6 to 10 feet high at this age. As the trees are set in the orchard, they are usually cut back to about 5 feet. Some growers in the inland sections, however, prefer to cut the trees back to 18 inches and then train one sprout from the trunk of the tree. This sprout is pinched back when it reaches a height of 5 feet. The method necessitates staking the trees. At the end of one season's growth such severely headed-back trees may be as large as though they were left 5 feet high in the beginning. The trees cut back to 18 inches grow much more vigorously than trees only moderately pruned.

The harvesting of walnuts is done largely by Mexican families who camp in the groves through the picking season. A portion of the nuts fall naturally to the
ground and the remainder are shaken off by means of hooks attached to long poles. The picker receives from 80 cents to $1 for 100 pounds for gathering the nuts and placing them in barley sacks. The nuts ripen through a period of a month or six weeks; therefore two or three pickings are made, followed by a cleaning of scattered nuts.

The nuts are washed, dried (Fig. 3993), culled, and sacked. There are then delivered to a central packing-house to be bleached. This is accomplished by spraying with electrolyzed salt-brine, or dipping in a solution of chloride of lime and sal soda, to which sulfuric acid is added. Ether process removes all discoloration from the shells and gives them a bright light tan color, attractive in appearance. There are many ways of handling the nuts after bleaching to hasten their drying. Some packing-houses pass the nuts through a warm air-current in long drums, thence they are elevated to the bins, where they arrive nearly as dry enough to suck. Other houses dry the nuts for about twenty-four hours in wire or lath bins. By putting each grower's nuts into several bins as they come from the bleacher, and then drawing from several bins at the time the nuts are sacked, a thoroughly mixed uniform product is packed in each bag. Each bag contains 100 pounds of nuts.

The grading of California walnuts has developed rapidly within the last decade, as compared with sales in the past of seedling nuts ungraded and unbleached, as plain walnuts; the grading has gradually reached a stage where part of the nuts are sold under their variety name and another larger portion is disposed of after being bleached and strictly graded according to size, shape, color of the meat, and quality of same.

The California Walnut-Growers' Association has recently introduced a one- and two-pound carton that has standardized the product handled in this package as strictly as breakfast foods and canned goods are graded and packed.

Although the walnut industry has not an established reputation for profitability which is comparable with citrus fruits of California, it has nevertheless maintained its position as a stable, conservative, permanent crop within this state. The income to the acre for this product will vary, widely according to variety, soil, and climatic conditions as well as the personal element of management. Such incomes will fluctuate from $100 to $300 an acre. Whereas the average yield of walnuts for the state is between 800 and 1,000 pounds, the better groves will average from 1,500 to 2,000 pounds to the acre annually.

The future development of this industry seems to be drifting gradually inland, giving way in Orange and Los Angeles counties to citrus culture. The inland valleys were formerly thought to be poorly adapted to walnut-production because of the darkening of the meats by the intense hot sunshine; however, there are several sections which give promise for development along these lines with the proper choice of varieties adapted to these particular environments.

The walnut industry enjoys one of the most notable features of any fruit industry of the country, inasmuch as its product may be successfully stored awaiting disposal for a period of at least twelve months if necessary. This has given the industry a very stable character and has freed this product from the speculative manipulations which are frequently found in connection with the perishable fruit products. It is interesting to note that the importations of walnuts into the United States have gradually increased during the last ten years and within this same period the total production and the prices to the growers of California have also gradually increased. This may be taken as only one of many indications that the walnut is being looked on more and more as a necessary food by the people of this country.

From present indications, this industry is less liable to the dangers of over-production than almost any other agricultural or horticultural crop within the borders of the state.

The chief insect and fungus troubles of the walnut are the walnut aphis, and also the walnut blight or bacteriosis (Pseudomonas juglandis). The aphis may be controlled by means of tobacco sprays; this is rarely done, however, as the damage is only occasional. There is no means of control known at present for the blight or bacteriosis (Fig. 3995). The wide variation among seedling trees in their susceptibility to the disease gives promise of eventual relief through the selection of blight-resistant varieties. Minor losses are due to red-spider, codlin-moth, and melasmula.

Bibliography.

culturists, there are at least four substantial reasons for doing so: (1) the species might well be planted at one-half or one-quarter the usual orchard distances apart, with the idea of allowing them to become forest trees, if for any reason the nuts should not justify their retention for orchard purposes. It is very doubtful whether any other species of walnut could be recommended for such use, as with the possible exception of the two forms of hybrids common in California, Paradox and Royal, no other species of walnut is now being seriously considered for forest planting and, except in rare instances, neither of these species would be developed into useful trees at practically no further expense. If one-quarter of the American farmers were to plant even two walnut trees about their premises, it is difficult to estimate what would be the aggregate increased value to such farms by the end of a
quarter-century, but certainly it would be very appreciable.

Among the species of walnuts not usually under cultivation, but which give promise of commercial possibilities, some are discussed in the following:

The American black walnut, Juglans nigra.

As a producer of marketable nuts, this species now gives greater promise than does any other secondary species of Juglans. Its natural range extends from middle New England to north Florida, in the east, and from Minnesota to Texas on the west. Although best suited to deep fertile loams, moist yet well drained, it readily adapts itself to conditions less favorable. It attains its best development in the basin drained by the Ohio River but is common at practically all altitudes in the eastern states up to about 1,400 feet where it is superseded by the butternut. The tree is a symmetrical and fairly rapid grower; usually moderately productive and very useful both in the landscape and as a forest tree. The nuts usually are thick-shelled, and it is seldom that the kernels can be separated from the cracked shell in perfect halves. A few varieties, the kernels of which crack out more or less perfectly, are now listed by the nurseries. The two best known are the Thomas, introduced from Pennsylvania in the early eighties, and the Stabler from Maryland in 1915.

The butternut, white or long walnut, J. cinerea.

In many respects, this species is similar to the preceding. Its northern range is somewhat more extensive than is that of the black walnut and its southern and western limits are less by about 300 miles. The tree is short-lived, not as symmetrical in form, nor as capable of adapting itself to unfavorable conditions, and the timber is of inferior value to that of black walnut. The nuts have thicker and rougher shells and are more difficult to crack but the kernels are more readily separated from the broken shells in perfect halves than are those of the former species. By many, the kernels of the butternut are much preferred to those of any other nut.

The Japanese walnut, J. Sieboldiana.

This species and its variety cordiformis, described in Vol. III, page 1723, as there explained do not breed true to type and revert to each other or to intermediate forms, but typically are broadly rounded at the base, conical, and smaller than are those of J. nigra. When struck with a hammer, they tend to open at the suture, thereby breaking both half-kernels into quarters. Frequently, nuts of the cordiformis type open automatically at the apex, and with the aid of a knife-blade, the half-shells may be separated entirely and the whole kernel removed without breaking. In color, texture, and flavor of kernel, the Japanese walnuts are very similar to those of the butternut, J. cinerea.

Miscellaneous species of Juglans.

A species from northeastern China (J. mandshurica), the nuts of which are intermediate in form between those of J. cinerea and J. Sieboldiana, was introduced into the United States some years ago but is not yet sufficiently well tested to make possible a definite report. It should be hardy and therefore of value in the northern states. Aside from those already included, there are a number of species of Juglans which are more or less common in parts of the United States, but all are of minor importance, so far as nut production is concerned, and apparently of use only in sections where the better species are unadapted and as stocks for superior varieties. Among such are included J. Californica, J. Hindsi, J. major, and J. rupestris. For full accounts of these species, see Vol. III, pages 1721 to 1724.

Juglans hybrids.

The various walnut species so freely interpollinate, when grown in close proximity to each other, that when pure strains are desired it is not safe to plant the nuts where there is danger of such pollination having taken place. The familiar Paradox and Royal of California, crosses of J. regia with any species of black, and of any California black with the eastern black, respectively, are typical examples of such natural hybridity. In the East, there are numerous crosses of J. regia with other species, viz., J. intermedia (J. regia x J. nigra); J. quadrangulata (J. regia x J. cinerea); and one between J. regia and J. Sieboldiana, which apparently has not yet been described. Frequently, individual trees of these forms are sturdy growers and make valuable stocks for other species, as already noted, but usually they are practically nonproductive and of little value to the orchardist.

C. A. Reed.

WANDERING JEW: Zebrina pendula and Tradescantia fluminensis. The common purple-leaved wandering jew of greenhouses, with pink flowers that open in sunshine, is Zebrina pendula, often confused with Tradescantia.
WARDIAN CASE. A nearly air-tight case with glass sides and top, used for transporting growing plants on long sea voyages, invented about 1836 by N. B. Ward, who wrote a book of ninety-five pages "On the Growth of Plants in Closely Glazed Cases," published at London in 1842. It provides the best and safest method of transporting potted and living plants across the ocean, as it insures the necessary light, protects the plants from salt spray and foul gases, and requires a minimum of care, as the plants need no watering. Such cases maintain nearly uniform conditions of temperature, moisture, and atmosphere. Similar cases are used in greenhouses for growing filmy ferns, dwarf foliage plants, and other small specimens that require a very moist and close atmosphere and invariable conditions.

WARPÜRIA (named after G. Warpur, who collected the genus). Acanthaceae. Low perennial greenhouse herb, branching from the base: lvs. opposite, approximate, entire or nearly so: fls. minute, white, in dense many-fld. cymes, head-like, long-peduncled, collected in the axis; calyx hyaline, 5-parted, segms. narrow, posterior 3 distinct nearly to their base, anterior 2 con-
CXVIII. Washingtonia filifera var. robusta.
WASHINGTONIA

Banning, Riverside County, California. This is the largest group of indigenous fan palms in the United States, and the only grove of important size on the Pacific side of the United States. The grove contains thousands of trees, some of them nearly 100 feet high. There are many young ones of all sizes and the other trees are still vigorous. Most of the canons of the desert basins of San Jacinto, according to Parish, contain these palms; and a few grow in the canyon of the White Water River, which is the western limit of the species. The southern limit is probably Carrizo Creek, San Diego County, and the northern at Corn Springs in San Bernardino County. Except in trees protected in cultivation, old specimens are rarely seen bearing the great shaggy mass of dead hanging leaves, for they are burned off by Indians or take fire by accident; even in cultivated trees, the mane is usually cut away to give the plants a neater appearance but much of the characteristic beauty of the palm is then lost. Parish writes that "the functional life of a leaf is about one year. How long the dead leaves would remain attached to the trunk if undisturbed cannot be stated; probably for a very long period."

The Washingtonias are much planted in California, thriving even in the climate about San Francisco Bay. In southern California they attain great size and comprise a characteristic feature of the landscape. They grow readily from seeds, but the trunks rise slowly. Two species are commonly planted, W. filifera var. robusta, with leaves bearing many filaments or threads on the edge and in the sinuses, and W. gracilis which is practically devoid of filaments.

A. Petiole prolonged into the blade with an acuminate point. acuminata
b. Blade of if. abundantly supplied with threads or filaments. filifera
bb. Blade nearly or quite destitute of filaments or threads. gracilis

filifera, Wendl. (Brachea filamentosa, Hort. B. filifera, Hort. Pritchardia filamentosa, Wendl. P. filifera, Hort.). Margins of the petioles armed up to the middle or somewhat beyond with stout hooked spines, but naked above: st. cylindrical, 20-40 ft., enlarged at the base, covered with persistent petiole-bases: blades 3-5 ft. long, 1-2½ ft. wide at the summit, glabrous, plano-convex; ligule large, glabrous, lacerate; blade circular, tomentose on the margins of the many segms., 3-5 ft. long, erect until old, 2 in. wide at base, % in. at apex, somewhat glaucous, very filiferous; peduncle declined, exceeding the lvs.: frs. nearly sessile; seed broad-ovate, about ½ in. long, somewhat rugose or wrinkled on the raphal face. Probably native in northern Low. Calif.—From the W. filifera group this tree is distinguished by its slender trunk, smaller and less deeply divided shorter-stalked lvs., which bear no filaments or threads except now and then in the sinuses of some of the folds.

Var. robusta, Parish (W. robusta, Wendl. W. filifera, Hort., not Wendl. Neovashingtonia filamentosa, Sudw.). Fig. 3997. The palm usually cult. in this country as W. filifera, whereas the one cult. as W. robusta is really W. gracilis: margins of petiole armed throughout: trunk stout, enlarged at base, 60-90 ft. tall: petioles stout and erect until old, 3-5 ft. long, the upper surface concave; ligule paper-like, acuminate and torn; if.-blade 3-5 ft. across, with 60-70 folds, cleft two-thirds to the base, the margins with abundant threads; panicle declined, exceeding the lvs., the involucre dense, but in fr. becoming diffuse or open: fls. with heavy odor: seed excavated on raphal face. Probably for a very long period.

Sonora, Wats. (Neovashingtonia Sonora, Rose) Top of petiole obtuse where it joins the blade, the latter abundantly supplied with filaments: st. 25 ft. high, 1 ft. diam.: lvs. 3-4 ft. diam., somewhat glaucous, very filiferous; peduncle 3 ft. long, very slender, 2 in. wide at base, % in. at apex, floccose-hairy along the margins and with stout curved spines: frs. % in. long, edible. Guaymas and Low. Calif., Mex.—Yet imperfectly known in cult. L. H. B.†

WATERING

The watering of plants usually exhibits the skill, or the lack of it, of the gardener. It is a practice that cannot be well explained in print, although a few general statements may be made.

An abundant and convenient supply of pure fresh water should always be a first consideration in locating a garden or greenhouse. Having this, the next matter is knowing how to use it. For here, good gardeners say, lies nine-tenths of the elements of success. Certain it is, especially in the indoor cultivation of plants, that more depends on knowing when to give or withhold water than on any other single matter. The art of watering is untouchable; it requires experience, judgment, skill. Some knowledge of the commoner facts of vegetable physiology, physics, and soil physics will be helpful, but even then experience will be necessary.

In American gardens watering is usually performed with a hose from a stored water-supply. Two common types of watering-cans are shown in Fig. 3908.

A fairly safe guide to watering is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough soaking. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, a useful test is to thump the jar. If it rings the soil is dry; if the sound produced is dull the soil is sufficiently moist. Such rules, however, are only for the novice. They presuppose activity of growth, and even into account only one consideration aside from this, and that is the condition of the soil as regards moisture. The experienced gardener reads his practice in his plants and the conditions under which they are being kept. The following suggestions are based on the most important considerations.

Actively growing plants may be watered very freely, as a rule, whereas in a dormant or semi-dormant state the same plants will require only occasional waterings. Soft-stemmed or rapid-growing plants ("soft-wood" and "herb-like" plants), and those with large leaves, need, as a rule, an abundance of water when growing actively. Hard-wood or slower-growing plants, with smaller leaves, must be watered with greater care. Soft-wooded plants, with some exceptions, may at times even flag somewhat for want of water, and recover without permanent injury when a fresh supply is given. Hard-wooded plants, as camellias, azaleas, and heaths, on the other hand, suffer permanent injury from becoming too dry. It is safest to allow no plant in active growth to flag.

The amount of foliage affects the plants' capacity for using water. Plants which have been cut back, or which from disease, insects, or other causes, have lost most of their foliage, must be kept drier until they have regained their foliage. Unhealthy plants are benefited, as a rule, by being kept rather dry until they begin to show signs of renewed vigor.

Small cuttings, or any plants freshly potted or newly transplanted, are not in condition to use much water until the root-hairs have attached themselves to the soil-particles and growth has begun. A thorough watering at the time of potting or repotting the plants, especially if they are subsequently shaded for a few days, is usually sufficient until they have become established.

The character and bulk of soil should be kept in mind. Porous and warm soils dry out much sooner, while heavier clay soils are in danger of becoming water-logged and sour unless watered with care. When there is a large mass of soil in proportion to root-development, as in the case of greenhouse beds newly set with young plants, care must be used in watering until the soil is occupied with roots.

Serious trouble often begins in the greenhouse from a heavy watering at the beginning of a period of dark muggy weather. Not only does such watering do damage to the soil and roots, but the excessive humidity of the air about the plants and its weakening effect on their tissues invite the attacks of various mildews, fungi, and insect pests.

The time of day is important. In the greenhouse in winter free ventilation is usually impossible. At night there is a tendency toward a damp atmosphere. Careful florists, therefore, water in the early part of the day at this season, so that the house will have become somewhat dried out by nightfall. It is seldom advisable to let plants under glass go into the night with wet foliage. It gives the fungi a chance. Especially hazardous is it to water cutting benches or boxes of young seedlings late in the day in the winter season. The various damping-off fungi find under such treatment the condition suitable for their development. Excessive humidity on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is large and renders the air of the house drier. During summer, when there is free ventilation, the watering may advantageously be done late in the day. Midday watering at a season when the sunshine is very bright is often followed by scalding of the foliage unless the plants are well shaded. Ferns, Rex begonias, Chinese primroses and richardias are among plants easily injured in this way.

Consider the temperature at which the plants are kept, the position of the heating-pipes, the amount of light, and the freedom of ventilation permissible in watering plants in glasshouses. It is better, as a rule, to have the watering conform to these conditions; but frequently the practice must be reversed.

The temperature of the water exerts a marked effect on the growth, flowering, and fruiting of plants. It is now held that, in general, the water should be of a temperature close to that of the air in the house where the plants are growing, or about 10° F. below.

Watering may be indirect. Shading the glass of greenhouses in summer with some suitable material is much practised by florists for the purpose of sheltering plants from too great intensity of light, and for the purpose of reducing evaporation and transpiration. Certain kinds of plants, as palms, and some kinds of ferns, require this; also newly potted plants. Syringing of walks, by reducing the temperature and increasing the humidity of the air, also tends to reduce transpiration and save watering. Watchfulness and attention to ventilation are necessary, however, to avoid excess.
sive humidity, which tends toward a soft watery growth and extreme sensitiveness and susceptibility to disease. Watering is best practised in the early morning or early evening, when the air is cool and the leaves can absorb the moisture from the spray without wilting. The amount of water required will depend on the size, shape, and direction of spread of the plant. Excessive watering should be avoided, especially in hot weather, as this can lead to the formation of soft, watery growths and increase susceptibility to disease.

Watsonias are particularly sensitive to overwatering, and their roots can become waterlogged and damaged. It is recommended to water the plants in the early morning or evening when the air is cool and the leaves can absorb the moisture from the spray without wilting. The amount of water required will depend on the size, shape, and direction of spread of the plant. Excessive watering should be avoided, especially in hot weather, as this can lead to the formation of soft, watery growths and increase susceptibility to disease.

It is important to avoid watering at night, as this can cause the plant to become waterlogged and damaged. It is also important to avoid watering during the heat of the day, as this can cause the plant to become wilted and damaged. The best time to water Watsonias is in the early morning or evening when the air is cool and the leaves can absorb the moisture from the spray without wilting. The amount of water required will depend on the size, shape, and direction of spread of the plant. Excessive watering should be avoided, especially in hot weather, as this can lead to the formation of soft, watery growths and increase susceptibility to disease.

Another important aspect of watering Watsonias is to avoid overwatering. This can cause the roots to become waterlogged and damaged, and can lead to the formation of soft, watery growths and increase susceptibility to disease. It is recommended to water the plants in the early morning or evening when the air is cool and the leaves can absorb the moisture from the spray without wilting. The amount of water required will depend on the size, shape, and direction of spread of the plant. Excessive watering should be avoided, especially in hot weather, as this can lead to the formation of soft, watery growths and increase susceptibility to disease.

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WATSONIA

WEEDS

WEDELLA (Georg Wolfgang Wedel, professor at Jena, Germany, 1645–1721). Compositae. Scabrous-pubescent or hirsute, annual or perennial herbs or subshrubs, suitable for growing in the greenhouse: lvs. opposite, usually decussate, rarely 3-cleft or entire; head heterogamous; ray-fls. male, disk-fls. fertile or the innermost sterile; involucral ovoid, campanulate or somewhat hemispherical, in 2 rows; corolla yellow, male ligulate, spreading, apex entire or 2-3-toothed, female regular, tubular, 4-5-toothed and chiloid; achenes glabrous or pilose, smooth or tuberculate, cuneate-oolong or obovate.—About 70 species, natives of the warmer regions of the world.

oblonga, Hutchins. Glabrous-hairy herb, up to 3 ft. high: lvs. strongly cuneate. Hemispherical heads, male acute, 3–3 1/2 x 1–3 in.; peduncles 1 1/2–2 in. long: flower heads yellowish–white, 1 1/2–2 in. diam.; outer bracts leaflike, inner somewhat scarious; ray-fls. about 12, 3-toothed. British E. Afr.

To this genus, Passalis is referred by recent authors. P. glauca, Ortg., is from Chile, probably not in cult. The plant cult. under this name in England, and once or twice in this country, is probably the plant shown in P.M. 8:125, which is thought to be a Helianthus. It is not hardy and there seems to be little reason for cultivating it here where there are so many other sunflowers. P. glauca is an herbaceous perennial, with opposite linear-lanceolate lvs., the upper ones entire and lower ones irregularly dentate; heads terminal and solitary, yellow-rayed.

WEEDS. A weed is a plant that is not wanted. There are, therefore, no species of weeds, for a plant that is a weed in one place may not be in another. There are, of course, species that are habitual weeds; but in their wild state, where they do not intrude on cultivated areas, they can scarcely be called weeds. The common weeds are sometimes valuable, in which case potato plants would be weeds if they grew among them.

It would have been a sorry thing for agriculture if there had been no weeds. They have made us stir the soil, and stirring the soil is the foundation of good farming. Even after we have learned that crops are benefited by the stirring of the land, we are likely to forget the lesson or be too neglectful of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are among the chief.

The one way to destroy weeds is to practise good farming. Judicious tillage should always keep weeds down in cultivated lands. In idle lands weeds are likely to become a serious nuisance. In sod lands they are also likely to take the place of grass when for any reason the grass begins to fail. The remedy for weeds in grass lands, therefore, is to secure more grass. In order to do so, it may be necessary to plow the land and reseed. In some cases, however, it is only necessary to give the land a light surface tillage, to add clean and quickly available fertilizers, and to sow more grass seed. This is the fundamental remedy for weeds on lawns. When the land for any reason is fallow—when it is waiting for a crop—surface tillage with harrows or cultivators will serve to keep down the weeds and to make the land clean for the coming crop. Often lands that are perfectly clean in spring and early summer become foul in the fall after the crops are removed. Cleaning the land late in the season, therefore, may be one of the most efficient remedies for riddling the place of weeds. Coarse and rough stable manure, which is not well rotted, may also be a coveryer of weed seed. The seeds of weeds are sometimes carried in the seed with

WATTLE: Acacia.


W.-work: Celsia sp. soundae.

EE. Fls. rose-red or white.

F. Lvs. 1/2–3/4 in. wide: spikes about 12-fld.

Meriana, Mill. This seems to be the dominant species of the genus and hence the most variable and the one most interesting to the plant-breders. In its widest sense it includes W. tridifolia, but for horticultural purposes it will be convenient to consider a distinct species. W. Meriana is best restricted to the commonest type at the Cape, which is a rose-fl. species 3–1 ft. high, the st. usually branched, lvs. lanceolate, spikes 12–20-fld. This is the plant figured in B.M. 1194 as Antholyza Meriana. Gn. 17:390 is more typical in color. The white-fl. form, which is rarer in nature, is treated under W. tridifolia.

Baker says that there are scarlet-fl. forms of this species, but he gives them no name, and it is probable that all such should be referred to W. angustia.

F. Lvs. wider: spikes denser, 20-fld. or more.

tridifolia, Ker-Gawl. (W. Meriana var. tridifolia, Baker). This is treated by Baker as a variety of W. Meriana characterized by broader lvs. than the type: fls. closer and more numerous, white or pinkish. For horticultural purposes it will be convenient to treat it as a distinct species and restrict the name to the pink or rose-colored type.


dd. Spikes dense, 30–50-fld.

densiflora, Baker. This very distinct and handsome rose-colored species more nearly resembles a gladiolus than any other by reason of the density and regularity of its pyramidal inf.: sts. unbranched, 2–3 ft. high: spikes 4–6-fld.: corolla-tube elongated, wider at the base, nearly 1–2 in. wide, and the spikes 12–20-fld. This is the widest sense it includes W. Meriana var. ardernei. This showy scarlet-fl. species differs from W. Meriana in its st. being shorter and unbranched, the spikes fewer-fld., and the styles a trifle longer: lvs. 1–2 ft. high: spikes 3–4-fld.: corolla-tube elongated, longer than the limb, the lobes spreading, obovate, acute or rounded: involucre ovoid, campanulate or subhemispherical, many-bracted. B.M. 1194 (W. Meriana variety). J.H. III. 33:61.

dd. Tube 1 1/2–2 in. long.

humilis, Mill. This species has rose-red fls. apparently the same size and color as W. densiflora but only 4–6 in a spike and the st. only a foot or so high: corolla-lobes oblanceolate, acute. B.M. 631.—A variegated form figured in B.M.1193 as W. roseo-alba has a spike of 5 flesh-colored fls. with broad bands and splashes of scarlet.

a. Upper part of tube short and broadly funnel-shaped.


WILHELM MILLER.

E. TRACY HUBBARD.†

WATTEL: Acacia.
WEEDS

which the land is sown, particularly in grass and grain
seeds.

It does not follow that weeds are always an evil, even
when they are abundant. In autumn a good covering
of weeds may serve as an efficient cover-crop for the
orchard. They are likely to entice some extra care the
next year in order to prevent them from gaining a
monopoly, but his extra care benefits the orchard at the
same time. It is, of course, far better to sow the cover-
crop oneself, for then the orchardist secures what he
wants of the proper quantity and at the right
season; but a winter cover of weeds is usually better
than bare earth.

From the above remarks it will be seen that weeds are
scarcely to be regarded as fundamental difficulties
in farming, but rather as incidents. In the most
intensive and careful farming the weeds bother the
least. There should be a careful oversight of all waste
areas, as road sides and vacant lots. The greatest
difficulty arises on commons and waste land, not on
farms.

Weeds are often troublesome in walks, particularly in
those made of gravel. If the walk were excavated 2
feet deep and filled with stones, rubber, or coal-ashes,
weeds cannot secure a foothold. It is particularly
important that gutters be not laid directly on the soil,
either in the city or in the sewage channel. There are
various preparations that can be applied to walks to kill
the weeds, although, of course, they also kill the grass
drigings if carelessly applied. Strong brine, applied hot, is
one of the best (one pound of salt to one gallon of water).
They are also very good to use in the preparation of arsenic, vitriol, lime, and sulfur, known as herbicides. For identification of
weeds and means of control, see Georgia's "Manual of

L. H. B.

WEIGELA, WEIGELIA: Diervilla.

WELDENIA (for Ludwig von Welden, an Austrian
army officer, wrote on natural history; 1780-1833).
Commelinaceae. Tube-rooted herb, suitable for the
greenhouse: lvs. numerous, grouped at the top of the st.,
forming a sort of involucre about the figure; cymes very
densely fasciated, sessile among the lvs.; calyx sessile,
15-25 mm. or less long, membranous, long and laxly
tubular, often atrophe-like, split, apex shortly 3-cleft;
corolla-tube slender, much longer than the calyx, lobes
broad, spreading, subequal; stamens 6; ovary ovoid.

One species. W. candida, Schult.

WELLINGTONIA: Sequoia.

WELWITSCHIA (Dr. Friedrich Welwitsch, 1806-
1872, botanical traveler, who brought this remarkable
plant to notice). Gnetaceae. One of the most singular of
plants, sometimes seen in the dried state in museums
and rarely grown in botanic gardens.

The plant consists essentially of 2 persistent woody
lvs. lying near or on the ground, the ends becoming
much frayed (at one time supposed to be persistent cotyledon), and from the center or crown the cone-
like fructification arises. It may be described as follows: A low woody plant, sometimes grown as an
oddity; st. or trunk thick, cone- or top-shaped, usu-
ally somewhat raised above ground, more or less 2-
lobed, said to be sometimes 14 ft. in circum.: lvs. 2,
lasting the life of the plant, linear at first, later spatter-
ing into many sections: inf. axillary, paniculate,
dichotomously branched, the branches ending in 4-
angled ament-like spikes which are colored: fls. diac-
icious; male fls. with 4 perianth-segms. in the shape of a
cross, stamens 6, joined at the base; perianth of female fls. tubular, inclosing completely
the fertile seed.—One species, arid places Trop. and
S. W. Afr.

The oldest actual name for this strange plant is
Tumboa, which was mentioned incidentally in the
Gardeners' Chronicle, 1801, page 75, in a running
account of a meeting of the Linnean Society; and the
name T. Bainesii, Hook. f., was similarly mentioned
on page 1008 in an account of a meeting of the Royal
Horticultural Society. In the same journal in 1802 the
name T. strabilifera was also mentioned. Neither the
genus nor the species was botanically defined. In
Gardeners' Chronicle for 1802, the name Welwitschia
was proposed, and under that name the plant was
carefully drawn and the plant regularly described in
Trans. Linn. Soc., 1803, and in the same year in B.M.
5368, 5369. Under this name the plant has passed; but
in Engler & Prantl, Pflanzenfamilien Nachtr. (1897),
attention is called to the older Tumboa as the proper
name, and this name is taken up in Cat. Welwitsch
Afr., pl. II, pt. 1 (1899). All the preceding literature
is under Welwitschia and all the horticultural refer-
ces; and inasmuch as the name in nomenclature is,
should be, stability rather than priority, the principle
of long-accepted usage should be invoked in this case
and the name Welwitschia retained, particularly as
the name Tumboa was not formally founded and as the
revival of it contributes nothing to clearness or
definition. (It is retained by the Brussels Congress.)

In respect to the cultivation of Welwitschia, W.
Watson, Curator of the Royal Botanic Gardens, Kew,
England, writes in 1916: "We have a plant here
which was raised from a seed in 1880. It lives, but
growth is very slow, so slow that a full-sized plant,
such as we have in our Museum, might at this rate be
reckoned a thousand years old. We grow it in a
tropical house devoted to succulents, where it gets all
the sunlight, the usual amount of water, except for
about three months in winter, when it gets very little,
and it is potted in sandy loam. There may be a set of
conditions that would suit the plant better, though
experiments with other plants raised here since did not
reveal anything better."

mirabilis, Hook. f. Lvs. 6 ft. or more long, the split
ends reclinign on the ground, flat and long-narrow,
attached at the base to the crown of the wrinkled brown
and hard trunk: plant said to persist a century. G.C.

L. H. B.

WESTRINGIA (J. P. Westring, Swedish physician
and author; died 1833). Labiatae. Shrubs, suitable for
greenhouse cult., although apparently not now in com-
mom cult.: lvs. in whorls of 3, 4, or rarely more, entire,

3511
WESTRINGIA

fls. axillary or rarely in terminal leafy heads; calyx campanulate, 5-toothed; corolla-tube short and dilated at the throat, limb 2-lipped, upper lip flat, broadly 2-lobed, lower spreading, 3-lobed; stamens, 2 upper perfect, 2 lower sterile; nutlets reticulate-rugose.—About 12 species, natives of extra-Trop. Austral.

WHIPPLEA (in honor of Lieut. A. W. Whipple, commander of the surveying expedition to the Pacific Ocean in 1853–1854). Saxifragaceae. Two low shrubs in W. N. Amer. with small opposite nearly sessile lvs., 3-nerved and entire or sparingly dentate, appressed-hairy on both sides, and with small white fls. in terminal cymes: fls. 5- or rarely 6-merous; receptacle turbinate, adnate to the base of the ovary; sepals lanceolate; petals small, oblong-elliptic, 5-lobed, lobes imbricate; stamens 5, or rarely 6-merous; ovary half inferior, with small white or brick-colored, solitary in the axis of opposing bracts, arranged in a terminal raceme; calyx 6-lobed, segments membranaceous, colored, oblong or lanceolate; corollas tube swollen almost from the base or slender-cylindrical and abruptly inflexed above widening to a campanulate throat, 5-lobed, lobes ovate or oblong-lanceolate; stamens 4, in pairs.—About 17 species, Trap. Afr. This material which has been offered in Amer. as W. lateritia is really Jacobinia cornnea (see Vol. III, p. 1714): the true W. lateritia, Hook., is rarely cult. and is a tender evergreen shrub about 3 ft. high; lvs. ovate or oblong-ovate, wavy; fls. red; corolla bell- or funnel-shaped. W. Trop. Afr. B.M.4153, F.S. 1:36.

WIGANDIA (named after Johannes Wigand, Pomeranian bishop; wrote on plants; 1523–1587). Hydrophyllaceae. Tall hispid perennial herbs or subshrubs, used for subtropical bedding, or may be grown in the greenhouse.

Leaves alternate, large, rugose, doubly dentate, cymes terminal, large, dichotomous: fls. sessile, 1-sided along the branch; calyx-segments linear; corolla-tube shortly and broadly campanulate, sealed inside; limb broad, spreading, 5-lobed, lobes imbricate; stamens 5; ovary rather perfectly 2-celled: caps. 2-valved.—About 3 or 4 species, widely dispersed in the mountains of Trop. Amer. Monographed by A. Brand in Engler's Pflanzenreich hft. 59 (IV. 251). The species of Wigandia are very much confused in current reference books, as well as in the trade. The following account is based on André's revision of the genus in R.H. 1861: 371, with an important change in the name of one species. In respect to W. urens, André follows the previous revision by Choisy in DC. Prod. 10:184. The combination Wigandia urens was first used by Kunth, who applied it to a Mexican plant. Before this, however, another plant of the same family but a native of Peru had been called Hydrocleys urens. When Choisy came to monograph the whole family he transferred Hydrocleys urens to the genus Wigandia and called it Wigandia urens, Choisy. He therefore had to rename the Mexican plant. This he did as W. modesta, Kunth.

Wigandias are chiefly valued as foliage plants for subtropical bedding, because of their very showy character. Their leaves are covered with stinging hairs, similar to nettles. Many large specimens may be seen in California, but the plants are considered to be rather coarse and straggling. They are generally raised from seed every year, the seed being started indoors as early as January. The plants attain a height of 8 to 10 feet in a single season. They are unsatisfactory greenhouse plants, as they do not grow vigorously indoors. The roots may be kept over winter in a frostless place and stock may be secured in spring by cuttings. In general, the plants are not much used in North America.
caracasana, HBK, Fig. 3999. Erect robust subshrub, 1-2 ft. high, softly golden or silvery-pubescent; lvs. rather long-petioled, ovate, obtuse, base subcordate, 18 x 10 in., coarsely, doubly and irregularly crenate, white-tomentose beneath; inf. golden silvery-pubescent, terminal, elongate, strict (a thymoid cincinnus); corolla violet, tube white; caps. equaling or a little longer than the calyx. S. Mex. to Venezuela and Colombia. B.M. 4575 (adapted in Fig. 3999). B.R. 1866; F.S. 8:755. Ga. 4, p. 502; 8, p. 198. R.H. 1859, p. 635, J.F. 2:132. Var. macrophylla, Brand (W. macrophylla, Choisy & Schultes.), is a larger-sized form which also grows rather taller than the type and has the infl. white-silvery-pubescent. R.H. 1861:371.—It is the Mexican form of the species and the one mostly in cult.

Kanthii, Choisy (W. arenus, HBK, not Choisy). Very hirsute subshrub, not golden pubescent, about 6-15 ft. high; lvs. doubly sharp-serrate, not white-tomentose; infl. not at all thyrsoid but paniculate, very hirsip, rarely pubescent or dirty tomentose; corolla violet, tube white: caps. slightly longer than the calyx, very densely hirsute. Mex. to Honduras.

Arenus, Choisy, not HBK. (W. peruviana, W. Mill. Hydrolea arenus, Ruiz & Pav.) Stout erect subshrub up to 12 ft. high, very densely dirty white-hirsute; lvs. short-petioled, 8-12 x 6-7 in., broadly ovate, dentate or truncate, apex obtuse; fls. arranged in a broad terminal raceme (cincinnus); sepals lanceolate-acute, hirsute; corolla violet, parted to the middle, lobes elliptical, densely silky outside: caps. oblong, twice shorter than the calyx. Peru. R.H. 1867, p. 470.

W. imperialis is listed as a very ornamental plant, but it is not treated by Brand.—W. Podleri, Carr., is not treated in Brand's monograph and is apparently a horticultural form, perhaps of W. caracasana. Carriere merely said it was a silvery plant instead of somber and plumy like W. caracasana. It is frequently listed in the trade and is said to have blue-black or wine-colored fls.

F. TRACY HUBBARD.

WIKSTRÉMIA (named after J. E. Wikstrom, professor of botany at Stockholm, 1789-1856). Thymelaeaceae. Shrub or trees, occasionally grown in the warmhouse or greenhouse; lvs. opposite or rarely alternate; fls. in short terminal or axillary racemes, spires or heads; perianth tubular, limb spreading, 4-lobed, without scales in the throat; stamens 8; ovary villose, 1-celled: fr. a berry-like drupe.—About 40 species, Trop. Asia, Austral., and the islands of the Pacific.


Poséigera, Brit. & Rose (Echinocereus tuberosus, Rümpl. Cereus tuberosus, Posel.). Roots black, several, borne near the surface: stems 2 ft. or less high, with about 8 ribs, the lower and older part naked, spiny above, the spines almost hiding the ribs; spines appressed, yellowish or golden-pubescent, radially and ascending, black-tipped: fls. purple, 2 in. long: seeds pitted or rugose, 1/4 in. long.—This species, although often cult., does not do well under glass when grown on its roots, but when grafted on various species of Selenicerus, it does extremely well.

J. N. ROSE.

WILD FLOWERS: Their appeal and conservation. In many countries some kind of wild flower grows first place in the love and sentiment of the inhabitants. The rose, the thistle, the shamrock, the iris, the edelweiss and alpine rose, the chrysanthemum, the poppy and the lotus have all contributed their share to the literature and art of the Old World. Typically of the states have adopted some native American plant for the state flower, including the arbutus, bitter-root, black-eyed Susan, columbine, gentian, goldenrod, laurel, lupine, magnolia, mistletoe, mountain-flower, Oregon grape, pukea flower, golden poppy, pine cone, rhododendron, rose, Sago lily, sunflower, syringa, and violet. Of these the goldenrod and violet lead in popularity, with the arbutus, magnolia, and rhododendron next in public favor. Nine states have chosen either cultivated plants of economic value or introduced weeds like the daisy. Thus far, no national flower has been adopted, principally because no wild flower grows or could be grown in all the states and territories, owing to the diversity of climate and flora. An attempt has been made recently to adopt the mountain laurel, but as this is a plant which grows only in the Appalachian regions of the eastern states it has not met with unanimous approval.

That a widespread interest in native plants exists there can be no question. Local and popular floras abound, poems and songs appear frequently, yet the people as a whole are still barbarians when it is a question of real love and protection. Arrows pulled up from the roots and sent through the mails in frail and broken pasteboard boxes, having been nearly or quite exterminated where formerly it was abundant. Orchids and lilies are gathered by the basketful to adorn college commencements and church services. Ropes of laurel and ground-pine are used at balls and Christmas festivities, and the holly which used to be abundant is rapidly becoming scarce, and hard to find. All these supplies come from wild sources and few of them will pay to cultivate. Moderation and protection are recommended for all of them. Some few of our wild flowers take kindly to cultivation, and are grown for their beauty: laurel, rhododendron, azaleas, dogwood, and magnolias perhaps lead in popularity, but some of the smaller herbaceous plants such as bloodroot, hepatica, columbine, lilies, jack-in-the-pulpit, forget-me-nots, and many of the native ferns may be readily grown if given suitable conditions of soil, moisture, and shade. Most wild flowers prefer an acid soil with plenty of leaf-mold to the ordinary garden soil, and should be planted in some place by themselves where natural conditions can be maintained. A hopeful sign of advancing appreciation is that the best landscape architects and park superintendents are recommending the planting and preservation of native plants and in many of the national parks and public reservations the native flora is protected from depredation. With the increase of motors has come an interest in good roads and roadside planting, but some of the railroads in Colorado still run "flower excursions" where a lot of vandals are taken to some beautiful spot and come home loaded with wild flowers which they promptly throw away. It is sad to think of selfish and thoughtless destructiveness which should be combated by all true lovers of native plants, and various organizations have been formed to try to accomplish it. Arbor Day might fitly be called Conservation Day and used to impress on school children the importance of this work.

The following associations are interested and will supply information to those wishing to cooperate: Conservation Department, General Federation of Women's Clubs; Conservation Society of National Educators; American Association of Forestry; State Associations of Forestry; Garden Clubs of America, Philadelphia; Lincoln Highway Commission; Society for the Protec-
tion of Native Plants, Boston; Stokes Fund for the Preservation of Native Plants, New York Botanical Garden; American Association of Park Superintendents, Portland, Oregon; Wild Flower Preservation Society of America, Brooklyn Botanic Garden.

List of state and provincial flowers.

- **Alabama**: Goldenrod.
- **Alaska**: Forget-me-not.
- **Arkansas**: Apple blossom.
- **California**: Golden poppy.
- **Canada**: Sugar maple.
- **Colorado**: Blue columbine.
- **Connecticut**: Mountain laurel.
- **Delaware**: Peach.
- **Florida**: Orange blossoms.
- **Georgia**: Cherokee rose.
- **Idaho**: Syringa.
- **Illinois**: Native violet.
- **Indiana**: Carnation (pink).
- **Iowa**: Goldenrod.
- **Kansas**: Sunflower.
- **Kentucky**: Goldenrod.
- **Louisiana**: Magnolia.
- **Maine**: Pine cone and tassel.
- **Maryland**: Black-eyed Susan.
- **Massachusetts**: Arbutus, Mayflower.
- **Minnesota**: Moccasin flower.
- **Mississippi**: Magnolia.
- **Missouri**: Goldenrod.
- **Montana**: Bitter-root (Lewisia).
- **Nebraska**: Goldenrod.
- **New Jersey**: Violet.
- **New York**: Rose.
- **North Carolina**: Daisy.
- **North Dakota**: Wild rose.
- **Nova Scotia**: Arbutus.
- **Ohio**: Red carnation.
- **Oklahoma**: Mistletoe.
- **Oregon**: Oregon grape (Mahonia).
- **Pennsylvania**: Laurel.
- **Rhode Island**: Violet.
- **South Dakota**: Pasque flower (Anemone).
- **Tennessee**: Daisy.
- **Texas**: Blue bonnet, lupines.
- **Utah**: Sage lily (Calochortus).
- **Vermont**: Red clover.
- **Washington**: Rhododendron.
- **West Virginia**: Rhododendron.
- **Wisconsin**: Violet.
- **Wyoming**: Gentian.
- **Hawaii**: Lehua (Metrosideros).

**ELIZABETH G. BRITTON.**

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**WINDBREAK**

In horticultural usage, windbreaks are plantations of trees or other plants designed to check the force of the wind or to deflect it to other directions. Windbreaks are often of the greatest use, and at other times they are detrimental. In regions of very strong prevailing winds, they may be necessary to prevent injury to the plants. This is true along seashores. In the dry interior regions, windbreaks are often useful, also, to check the force of parching winds that would take the moisture from the land. In other cases, they are employed for the purpose of sheltering the homestead, to make it more comfortable for human occupancy: such breaks are usually known as shelter-belts. See Hedges.

Whether windbreaks shall be used for orchard plantations depends wholly on circumstances. In regions of very strong prevailing winds, as near large bodies of water or on the plains, such breaks are usually necessary on the windward side of the orchard. However, if the prevailing winds are habitually warmer than the local temperature, the winds should not be stopped or wholly reflected, but they should be allowed to pass through the windbreak with diminished power in order that, while their force may be checked, they may still prevent too low temperature. In regions that are very liable to late spring and early fall frosts, a tight break is usually a disadvantage, since it tends to confine the air—to make it still—and thereby to increase the danger of light frosts. If windbreaks are employed in such cases, it is best to have them somewhat open so that atmospheric drainage may not be checked. In most regions, the greatest value of the windbreak for orchard plan-
if their velocity is not too great; care must be taken to allow of adequate atmospheric drainage.

Windbreaks for orchards require much land, and crops near them are likely to suffer for lack of food and moisture, and also from shade. In small places, therefore, it may be impossible to establish large breaks. It is well to plant the windbreak at some distance from the first row of orchard trees, if possible. It is usually planted for shelter-belts, because they thrive under most conditions, grow rapidly, and are hardy.

L. H. B.

WINDOWFLOWER: *Anemone*.

WINDOW-GARDENING. The growing of plants in windows and similar openings, particularly when conducted as a regular and systematic undertaking.

Although not strictly a part of the planting of the property, window- and veranda-boxes give color and tone to the place as well as provide pleasant and satisfaction for the inmates of the residence. For those who live in crowded localities or are unable to care for a garden, these outside boxes offer an opportunity for a display of flowers, not only in the summer months, but, in the case of window-boxes and by the substitution of other kinds of plants, through the winter months as well. The illustrations (Figs. 4001-4003) show good forms of window-boxes. The first two are drawn from illustrations in Gardening, May 15, 1916. See House Plants, Vol. III.

These boxes may be purchased and may be highly ornate, having pattern tiling or made of finely finished wood and suspended by fancy brackets; but such boxes are not necessary. A stout pine box of the required length, from 10 to 12 inches wide and at least 6 inches deep, if painted a suitable color serves quite as well as the others, for the side and ends of the box should be soon covered by the drooping vines. Provision for drainage should be made by boring holes in the bottom of the box, these holes being covered with pieces of broken pots, coal-cinders or gravel-stones. This allows for the drainage of water while holding the earth from escaping. The soil for these window-boxes should be rich in plant-food, as the roots will be restricted. The most desirable soil is one that does not pack hard when watered, or contract much when dry, but remains porous and springy.

The soil may be made by mixing two parts of garden loam, one part of leaf-mold or wood earth, and one part of sand. To this mixture should be added well-decayed manure, preferably cow-mature, at the rate of one peck to two bushels of soil.

Many kinds of plants may be used in window- and porch-boxes, but in planting one should choose the subjects most suitable for the particular exposure. If the boxes are to be placed in full sunlight, it will be necessary to choose vigorous-growing sun-loving plants. For

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4001. A hotel window-box.

4002. Window-box in a club building.
a shady corner or a northern exposure, more delicate plants may be used. For the former, such plants as geranium, coleus, achyranthes (iresine), Paris daisy, double petunias, may be used; or, if a more pretentious display is desired, crotona, colored-leaved dracenas, acalypha, aspidistra, or small palms may be employed. Low-growing plants for the front of the box may consist of the dwarf white-leaved geranium Madame Sal­leroi, the golden feverfew, lobelia, sweet alysium, and the white-leaved cineraria. For the drooping vines, nothing excels the variegated-leaved vines, nasturtiums, tradescantia, and German ivy. If the position is shady, vigorous-growing ferns, such as the nephrolepis, a few of the pteris, and perhaps the hardiest of the adiantums are effective. The narrow-leaved dracena (Cordyline indivisa), grevillea, and Rex begonias are all good plants for shady places.

After the plants have filled the box with roots, it will be necessary to work into the soil more plant-food, either a light coating of bone-meal or a thicker layer of well-rotted manure; still better would be a watering about once each week with dilute liquid manure.

One of the objections to veranda-boxes, especially those that are fastened permanently in place, is that in winter they are usually bare of foliage and therefore unsightly. This disadvantage may be overcome and a seasonable appearance given by the use of small conifers, broad-leaved evergreens, dwarf box, mahonia, Eony­mus radicans and pachysandra or Vinca minor are all available. To lighten the somber effect of the solid green, small shrubs bearing bright-colored fruits may be introduced, such as dwarfed plants of barberry, either Berberis vulgaris bearing long clusters of dark red fruits or B. Thunbergii with bright scarlet berries borne along the gracefully bending branches. Privets, either Ligustrum vulgare or L. Regelianum, are good for berries, both bearing clusters of blue-black fruits con­trasting well with the green of the conifers or the reds of the barberry; these fruits are held through the winter without change in color. Hardy strains of English ivy either

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Wisteria sinensis in a striking setting.
Those who wish to give a young wisteria an extra-good start may sink a bottomless tub in the ground and fill it with good soil. When a wisteria is to be trained to a tree, choose an old tree, if possible, which is past the height of its vigor; but good results are to be expected only when sunlight and opportunity are ample, and these can rarely be secured under a living tree-head.

The Japanese wisteria (W. floribunda) is one of the best and commonest of hardy climbers. It has pale green pinnate foliage and bears profusely of dense drooping clusters of purplish pea-shaped flowers. The clusters are about a foot long. This is the commonest and best form. The variations furnish the connoisseur with variety in habit, color, and season of bloom, but they are not as prolific, and doubling adds nothing to the beauty of the flowers. Moreover, the double flowers decay quickly in wet weather.

The wisterias bloom in May and usually give a smaller crop of flowers in August or September. The spring crop is borne on spurs, while the autumn crop is borne on terminal shoots of the season. There are several ideas about training a wisteria. A good way is to let it alone. This produces rugged twisted and gnarled form. The vines should be pruned back every year in early spring to a height of 6 or 8 feet and pruned in for some years, the stem will stiffen until it is able to stand alone, and the top will spread out into a broad head.

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INDEX.

KEY TO THE SPECIES.

A. Standard of the fl. with distinct calices or appendages at base (Wisteria proper).
B. Fls. 7–9 pairs ........................................ 1. floribunda
B. Fls. usually less than 7 pairs.
C. Lei. smooth or nearly so on both surfaces of calix
D. Racemes long, 6–12 in. or more. 2. sinensis
E. Fls. large (more than 1 in. across at full expansion).
F. Fls. small (less than 1 in. across): American ........................................ 3. macrostachys
G. Racemes short, 4–6 in. or less: American ........................................ 4. frutescens
H. Racemes long, 6–12 in. or more: American ........................................ 5. venusta
I. Standard lacking auricles at base (transition to Millettia) ........................................ 6. japonica

1. floribunda, DC. (Glycine floribunda, Wild. Wisteria brachybotrys, Sieb. & Zucc. Krauthia brachybotrys, Greene). JAPANESE WISTERIA. Young lvs. densely covered with straight appressed hairs, but foliage soon glabrous; lfts. 7–9 pairs, ovate-elliptic, rather abruptly acuminate, acute, rounded at base; fls. violet or violet-blue, rather small, in moderately long racemes (or sometimes in short racemes, particularly later in the season, whence the name brachybotrys); standard oblong-oblanceolate, subcordate at base and auriculate, with a short stipe-like claw; calyx hairy, the upper teeth very short and broad. Common on

diagram: Wisteria covering for a porch.
sinensis, Makino). CHINESE WISTERIA. Fig. 4005. Lvs. smooth or nearly so at maturity, the petiole swollen at base; lfts. about 5 pairs, ovate-acuminate or ovate-lanceolate, short-stalked, 2–3 in. long, the margins ciliate but entire; racemes pendulous, 6–12 in. long, terminating the branches; calyx villous; corolla large, blue-violet, not fragrant, showy. Low altitudes in China, and much cultivated there. Apparently little grown in this country and not so hardy as W. floribunda. B. M. 2083 (from which Fig. 4005 is adapted). B. R. 650. L.B.C. 8:773. P. M. 7:127. Var. alba (forma alba, Lindl. var. alba, Kuntze) has white fls. I.H. 5:166.

3. macrostachys, Nutt. (Kraunkia macrostachys, Small). Slender vine 20–25 ft. high or long: lfts. usually about 9, ovate to elliptic-lanceolate, about 2 in. long, acuminate at base or acute, cordate or rounded at base, racemes 8–10 in. long, drooping, loosely flded, the pedicels and calyx glandular-hairy; fls. light blue or purplish, the standard about ¼ in. across and not prominently auricled; calyx-teeth half or more the length of the tube. Swamps, Ill., southward. Probably rarely if at all cult.

4. frutescens, Poir. (Glycine frutescens, Linn. Kraunkia frutescens, Greene. Bradilia frutescens, Brit. W. speciosa, Nutt.). Tall stout climber, the trunk attaining several inches in diam.: not glandular, smoothish or somewhat downy at maturity; lfts. 4–6–7 pairs, ovate to ovate-lanceolate, acuminate but obtuse, glabrous above: racemes 4–6 in. long, densely flded; fls. lilac-purple; auricles of the standard rather prominent; calyx-teeth very short. Low grounds, Va. to Fla. and Texas. Sometimes planted. Var. alba, Hort., with white fls., has been listed. Var. magnifica, Herneq (W. magnifica, Hort.), supposed to belong here, has racemes 50–60-fld. and 6–8 in. long; fls. 1 in. across, lilac with a yellow spot, earlier than the type. F.S. 11:1151.

5. venusta, Rehd. & Wils. (W. brachypoda var. alba, Mill.). SILKY WISTERIA. Tall, reaching 30 ft. or more, the young growth pubescent: lfts. usually 5 pairs (from 4–6 pairs), velvety both sides, oblong-lanceolate or elliptic to ovate-oblong, short-acuminate, at the base subcordate or rounded or truncate, entire; racemes pendulous, 6 in. or less long including the short peduncle, broad, the rachis densely appressed-villous; fls. very large, white, on nearly horizontal spreading pedicels; standard suborbicular, truncate at the apex and acuminate at base, clawed; upper calyx-teeth subulate; pod compressed, densely velvety. China, province Chi-hi.—

More or less planted in Eu. and U. S., but only recently distinguished. Var. plena (forma plena), Rehd. & Wilson. With double white fls., occasionally offered by Japanese dealers; the only double-flld. white wisteria known.

6. japonica, Sieb. & Zucc. (Miliédicta japonica, Gray. Phaseolos japonicus, Kunze). Kraunkia japonica, (Taub.). Glabrous throughout: lfts. 4–6 pairs, petiolate, narrow-ovate or ovate-lanceolate, acuminate but obtuse at point, entire, light green: fls. small, white, in long drooping simple racemes to 8 in. long; calyx cylindrical urn-shaped or cup-shaped, pubescent; standard obovate, lacking the callouses at base; ovary and style glabrous; pod linear-oblong, mucronate at apex, woody, not large. Japan, Korea. Little known in this country, and not hardy in the northern parts. By some authors this species is kept in the genus Milletia, where it was placed by Asa Gray; and under that name it is described in Vol. IV, page 2051.

L. H. B.†

WITCH-HAZEL. Hamamelis.

WITHANIA. See note under Salpichroa.

WITLOOF (Dutch, “white-leaf”) is a salad vegetable comprised of the compact blanched leaf-head produced by certain forms of chicory. The large thick roots of chicory produce leaves when forced in absence of light, and these leaves may be further blanched by forcing them through sand or other covering. See Covi.

The vegetable known as barbe-de-capucin, often shortened to barbe, is very similar to witloof, being produced by forcing either wild or improved roots of chicory and having a looser more leafy head. Witloof is usually forced from a special variety, grown for this purpose. As seen in the market in its best form, it is a firm oblong-pointed head about 6 inches long of white crisp undeveloped leaves. (Fig. 4006.) This vegetable is imported into this country in large quantities, being much prized as a delicate salad with a slightly bitter and characteristic flavor. It is frequently known as French endive.

There seems to be no reason why witloof can not be produced in this country. The New York Agricultural Experiment Station (Geneva) has recently published the results of tests (J. W. Wellington, Bulletin No. 418, from which the following directions are adapted: The seed (sold by many American seedsmen) from which to grow the forcing roots may be sown any time in May in open ground, in rows 18 inches apart and the plants later thinned to 6 inches apart in the row. Ordinary garden culture only is needed, but the plants should make a steady luxuriant growth, resembling large smooth-leaved dandelions. The roots should be lifted just before the ground is liable to freeze, the leaves trimmed to within 2 inches of the crown, and the roots stored. When needed for forcing in winter, the roots should be placed in boxes or boxes where moderate heat can be applied, first cutting them off at the bottom to a uniform length of 8 or 9 inches. For holding the roots any soil or sand will do, since the growth of the heads is from the food stored in the roots and does not depend at all on the soil fertility. The roots may be set quite close together, but not touching, upright in the soil, and
covered to the crowns. Various materials may be used for holding and bleaching the heads during their growth; 8 inches of clear sand is a good medium. This may be placed on the bedding material, as long as the roots are set. One or more free applications of water should be made. From 50° to 60° F. in a desirable temperature, the latter probably preferable since growth is slower at the lower temperature. Higher temperature than 60° for any considerable period causes the leaves to shoot up rapidly and decreases the proportion of solid heads. At these temperatures the leaves begin to show through the 8 inches of sand in about two weeks, when the heads are ready for harvesting.

In the Geneva tests four grades of sizes of roots were used, ranging from 0.25 inches, medium, 0.9 inch, and small, 0.6 inch. Of these the large and medium roots gave more than 70 per cent of marketable heads, while the extra roots produced too many divided and loose heads, or heads too large to serve satisfactorily as individual portions at table. The small roots produced many small heads, too slender for market purposes. The heads should be 4 to 6 inches long, and weigh two to three ounces to suit the market best. In Europe they are packed in baskets holding ten kilograms; but a three-pound Climax basket serves satisfactorily as individual portions at table. The heads are ready for harvest at these temperatures.

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WITTLÖOF (named after Nicholas Witsen, Dutch patron of botany in first half of 18th century). Iridaceae. An ornamental greenhouse shrub with erect ensiform lvs. which are equitant, subsessile fls. with a very definite tube; petals free, linear, acuminate, without scales; fr. a dry berry. About 5 species, Cent. and S. Amer. This genus has sometimes been referred to Asphodelaceae; see Bilbergia for cult. W. lingulata, Mez. Lvs. about 10 in a rosette, firm, strap-shaped, rounded, shortly cuspitate, about 2 ft. long, 2½ in. wide, spines short, broad-based, about 3 lines apart; scape floccose when young; sepals lanceolate; pani­* ple pinnately branched; fls. numerous, sessile; sepal white, ovate, bearing an awn nearly 1 line long; petals yellow, ovate from an oblong base; ovary glabrous, rather cylindrical. W. Indicus. B.M. 8066.


WOODBETONY (after Joseph Woods, an English botanist, 1776–1864). Polypodiaceae. A genus of mainly rock-loving ferns characterized by their inferior indusium, which is attached beneath the sorus, inclosing it at first but soon splitting into star-like lobes, and later hidden beneath the sorus. – Some 15 species are known, of which 7 grow wild in this country. The following native species are sometimes cult. in borders. Treatment given other hardy ferns will suit them well. Both grow best among rocks.

A. Lvs. of two sorts, the veins everywhere forming areoles areolata, Moore (W. angustifolia, Smith). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinna; apophylls with narrowly linear pinna 3–4 in. long. Mich. to Fla., mostly near the coast. – Often and probably better separated under a distinct genus, Lorinseria, on account of its characteristic trichomes, which have been offered. They are of interest only as rarities in large collections. R. C. BENEDICT.

WOODWARDIA (Thomas J. Woodward, an English botanist). Cystopteris. A group of rather coarse-foliated ferns of diverse habit and structure, but all bearing the sor in rows arranged parallel to the midrib like links of sausages. See Fern.

A. Lvs. of two sorts, the veins everywhere forming areoles areolata, Moore (W. angustifolia, Smith). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinna; apophylls with narrowly linear pinna 3–4 in. long. Mich. to Fla., mostly near the coast. – Often and probably better separated under a distinct genus, Lorinseria, on account of its different lvs. and habit of growth. AA. Lvs. uniform.

B. Veins forming one or more series of areoles.

radicans, Smith. Lvs. rising from a short erect st., 2–3 ft. long, gracefully curved; pinnae 8–15 in. long, 2–4 in. wide, pinnatifid nearly to the midrib. The true W. radicans from Eu. bears scaly buds toward the apex of the fl. and roots to form new plants. The Californian and Mexican species, which has often been referred to

4008. Fruiting lobe of Woodwardia virginica.
ents. According to Blythe, the green color of this liquor is due not to wormwood but to the chlorophyll of anise, parsley, or nettles. The plant may be grown without trouble in light dry rather poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out, the few specimens necessary to furnish a family supply should be placed not closer than 15 inches each way the first year. If alternate plants be removed with a good ball of earth early in the following spring and planted 30 inches apart, they will be sufficiently close together and the transplanted ones should suffer from no check. Ripened cuttings taken in March or October may be used for propagation. Clean cultivation and slight annual dressings of manure are the only other requisites. In the middle western states there are several localities where wormwood is grown for export.

Wormwood is used very extensively in the manufacture of certain medicines. The oil is produced largely in southern Michigan, and Wisconsin supplies a large acreage.

M. G. KAINS.

WYETHIA: *Ixia elephas*, Regel, is *Ixia columellaris*.

**WULFENIA** (named for F. X. Wulfen, 1778-1825).

*Scrophulariaceae.* Hardy perennial glabrous or slightly pubescent herbs, suitable for the border or rock-garden.

Leaves nearly radical, petiolate, crenate; peduncles scape-like, simple: fls. racemose at the top of the scape or spike, solitary at the axil of the bracts, nodding, blue; calyx 5-parted, segments narrow; corolla-tube exserted, cylindrical, limb 4-lobed, erect-spread; stamina 2: caps. acute, septicidally and loculicidally dehiscent, 4-valved.—About 8 species. Eu. and Asia.

**Amherstiana, Benth.** Lvs. obviate-oblong or obovate-spatulate, 2½ in. long; coarsely crenate or lobulate, narrowed at base and subplanitiate; petals ½-1½ in. long: scape 5-10 in. long, slender; racemes long, many-fl.: corolla ½ in. long. Himalayas. G.W. 9, p. 375.

**carinithaca, Jacq.** About 9 in. high; lvs. oblong or oval-oblong, doubly crenate, slightly lobed, narrowed at base, radical few, 3-8 in. long: scape 1-2 ft. long; raceeme dense, spike-like, at length elongated; corollata ½ in. long, limb shorter, upper segments bifid, lower somewhat crenate. Mountains of Carinthia. *W. cordata*, Greene, = *Synthyras reniformis*.

F. TRACY HUBBARD.

**WYETHIA** (named for N. J. Wyeth, North American botanical collector). *Compasita.* Hardy perennial herbs, probably adapted to the wild-garden or border. Caudex stout: sts. usually simple, 1-headed: lvs. radical or alternate, entire; heads large, heteroagamous; ray-lvs. pistillate, in 1 row, disk-lvs. perfect and fertile; involucre hemispherical; 2-5 rows of bracts; corolla yellow, rays ligulate, spreading, entire or minutely 2-toothed.—About 7 species, N. Amer. *W. mólis*, Gray. Plant floccose-woolly when young, more or less glabrous when old, 1-3 ft. high, bearing solitary or few heads: lvs. oblong or ovate, base rounded, truncate or cuneate; rays 10-15, over 1 in. long; achenes minutely pubescent at summit. Nev. and Calif. B.M. 7772.
XANTHISMA (Greek, dyed yellow, referring to the color of the flowers). Compositae. Summer-blooming yellow-flowered composites.

Annuals or biennials, with alternate, usually entire, narrow lvs.: fls. all fertile, exclusively radiate; achenes top-shaped, 4-5-ribbed or angled; pappus persistent, composed of 10 or 12 rigid bristles which are minutely scabrous above, gradually chaffy-dilated toward the base, and longer than the disk-corolla, as many more one-half shorter, and usually 5 still smaller and shorter external ones.—Two species, of easy cult. texanum, DC. (Centaurium Drummondii, Torr. & Gray). Fig. 4011. Nearly glabrous biennial or annual, 1-4 ft. high: lvs. narrowly oblong to lanceolate; st.-Ivs. entire or with a few teeth toward the apex: fls. attaining a diam. of 2 in. even in the wild, very showy, composed of a small disk and about 20 rather slender rays. On prairies, Texas.—Suitable for dry open places. In cult. treated like a hardy annual, the seed being sown in the open border early in spring. The second species, X. Berlandieri, Small (X. texanum var. Berlandieri, Gray), also of the prairies in Texas, is probably not cult. N. TAYLOR.†

XANTHOCRAS (Greek, xanthos, yellow, and keris, horn, alluding to the yellow corn-like processes of the disk). Sapindaceae. Ornamental shrub planted for its showy racemes of white flowers and also for the handsome pinnate foliage.

Deciduous: lvs. alternate, odd-pinnate, with narrow serrate lfts.: fls. polygamous, the upper ones of the terminal raceme pistillate, the lower ones staminate, those of the lateral 6-8; ovary superior, 3-located, with a rather short, thick style: fr. a caps., with thick walls dehiscent into 3 valves, each locule with several globose, dark brown seeds.—One species from N. China, allied to Ungnadia and Koelreuteria. A very handsome shrub or sometimes a small tree with rather finely pinnate dark green and glossy foliage which is not attacked by insects and retains its bright color until frost sets in, and with showy white flowers appearing in upright profusely produced racemes with the leaves on last year's branches. The large greenish fruits are similar to those of the buckeye. It is hardy as far north as Massachusetts and is well suited for solitary planting on the lawn. Xanthoceras is also sometimes used for hedges. It is not very particular as to soil. A porous loamy soil and a sunny position seem to suit it best. Propagation is by seeds, stratified and sown in spring, and by root-cuttings, which succeed best with moderate bottom-heat.


XANTHORHIZA: Zanthorhiza.

XANTHORRHEA (Greek, yellow flow, referring to the resin which exudes from the trunk). Liliaceae. Persistent perennials with a thick woody caudex, adapted to greenhouse culture and which have been tried out-of-doors in the extreme South. Caudex very short to arborecent: lvs. in a dense tuft at the top of caudex, long-linear, brittle, spreading or recurved: scape or peduncle terminal, often several feet long, terminating in a dense cylindrical spike: fls. greenish, numerous, sessile; perianth persistent, segments 6, 3 outer glume-like, erect, concave or almost hood-shaped at the top, 3 inner much thinner, erect with the

4011. Xanthisma texanum. (X⅓)
outer but more or less protruded beyond them; stamens 6; ovary sessile, 3-celled; caps. protruding from the perianth, ovoid or acuminate, 3-valved, hard, brown and shining.—About 14 species, Austral.

The "grass trees," "grass gums," or "black boys," form a conspicuous feature of the Australian landscape. These picturesque desert plants are well worth trial in the warmer and more arid regions of the United States. The trunk varies from almost nothing in some species to 15 feet in the case of aged specimens of X. Preissii. The tall and palm-like trunks are thickly covered with the bases of the old dead leaves, which are cemented together by the black or yellow resinous gum that flows freely from the stems. In Australia the trunks are often charred and discolored by bush fires. The following species have been offered in southern Florida and southern California, but are practically unknown to cultivation in this country. All the species are long-lived perennials native to dry and rocky places. They are said to thrive in a compost of peat and loam and to be propagated by offsets. X. Preissii seems to be the most desirable species.

XANTHOSOMA

4012. Xanthoceras sorbifolia. (X 1/2)

Xanthoceras sorbifolia, R. Br. Lvs. 1–2 ft. long, 1–2 lines wide; scape shorter than the lvs.: spike less than 3/4 in. wide. B.M. 6297. —Belongs to the group in which the inner perianth-segments, have a white blade conspicuously spreading above the outer ones, while in the next two species the inner segments have a short whitish tip, little longer than the outer and scarcely spreading.

AA. Trunk becoming 5–6, or even 15 ft. long.


BB. Spike 1 1/2–2 ft. long.

hastiflora, R. Br. Lvs. 3–4 ft. long, 2–3 lines broad: scape often 6–8 ft. long, not counting the spike. Readily distinguished by the dense, rusty tomentum covering the ends of the bracts and outer perianth-segments. B.M. 6933. G.C. III. 39:228.

undulatifolia, Tod. ex Riccobono. Trunk 8 ft. or so high, 12 in. diam.: lvs. in a large crown, 5 ft. long, fragile, sword-shaped, reflexed, rhomboidal in section: scape quite erect, cylindric, about 12 ft. long, with a dense spike of golden yellow fis. Austral.

F. Tracy Hubbard.

XANTHOSOMA (Greek, yellow body, referring to the stigma). Araceae. This group is interesting to the horticulturist as containing the handsome variegated stove foliage plant known to the trade as Phyllostachis Lindeni, and part of the vegetables known as yautia, malanga, and tanner, a crop to which much of the arable land in Porto Rico is devoted.

Milky herbs of S. and Cent. Amer. with a thick sometimes elongated corm: lvs. arrow-shaped, 3-cut or pedately cut: fis. unisexual, naked; males with 4–6 stamens connate in an inversely pyramidal synandrium with 5 or 6 faces; ovary 2–4-loculed; ovules anatropous.—A genus of 25 species, according to Engler, who has given an account of them in DC. Mon. Phaner., vol. 2 (1879).

Many species of the arum family are noted for their huge corms, some of which are edible after the acrid and more or less poisonous properties are destroyed by cooking. Of this class the best known are the taros (Colocasia esculenta), Schott, the common taro of southern Asia and the Pacific islands, and C. antiquorum, Schott,
the Egyptian taro, and the auyatas, taniers, or malangas (Xanthosoma sagittifolium, and other species of this genus) of the West Indies. The botany of the species of Xanthosoma is confused. The corms and cormels (offsets) of some taros, and the cormels of some varieties of auyatas, are free from acridity even in the raw state.

as cultivated in southern United States. Auyata corms are strong-flavored and are seldom eaten. The young leaves of colocasia and xanthosoma when properly cooked are said to be equal or superior to spinach.

A. Caudex a short, thick, erect rhizome.

sagittifolium, Schott (Arum sagittifolium, Linn.).

YAUTIA. MALANGA. Fig. 4014. A tropical vegetable. "Young plants of this are stemless, but in age, from the decay of the old lvs., an annulated caudex or corm is formed some inches in height, each throwing out stout fibers from the base, and from time to time producing offsets by which the plant becomes tufted, and numerous lvs. are produced from the summit of the short, yet st.-like trunks" (B.M. 4089). Lvs. 1-2 or almost 3 ft. long, broadly sagittate-ovate, suddenly and shortly acute at apex, basal lobes obtuse: spathe large, with a creamy white tube; spadix bearing club-shaped neutral organs. Bntish Guiana.-X. belophyllum, Hort. Lf.-stalk whitish with dark purple blotches: spathe with green tube, purple inside, the limb white. Costa Rica. —X. maculatum, Nichols. is described as having immense pale green lvs. variegated with creamy yellow, the petiole violet-tinted. —X. Mauffa, Schott (Colocasia Mauffa, Hort.). Closey allied to X. belophyllum, has a similar caudex and a coradate-ovate If... but the posterior costa are separated by a right or acute angle, the angle in X. belophyllum being obtuse.—X. Michelia is said to be a very rapid grower, with green lvs. and dark sts.—X. maculatum, H. Offmanni, Hort. Lf.-stalk whitish with dark purple blotches: spathe with green tube, purple inside, the limb white. Costa Rica. —X. maculatum, Nichols. is described as having immense pale green lvs. variegated with creamy yellow, the petiole violet-tinted. —X. Mi

ROBERT A. YOUNG.

XANTHOXYLUM: Zanthoxylum.

XENIA. When sweet corn is fertilized by pollen from a starchy variety, the grains which result from this union become smooth and hard because packed with starch. In like manner the pollen of a purple-seeded variety like the Bt. Miller produces purple seeds on ears which would otherwise have white or yellow seeds, and pollen from a yellow-seeded variety produces yellow seeds on the ears of a white-seeded variety. Such direct effects of the pollen are known as xenia (Focke, 1881). While the phenomenon is best known in Indian corn, it has been demonstrated recently also in rye (von Rümker), in which a green-seeded variety bears yellow seeds if pollinated by a yellow-seeded variety. In both maize and rye, the xenia character affect only the endosperm (albumen) of the seeds, while characters of the seedcoat show no xenia. The correct interpretation of xenia in maize was given by de Vries (1899) and Cornens (1890), and almost simultaneously by Weber (1900). This explanation is briefly as follows: The pollen-tube contains two male nuclei, one of which fertilizes the egg, while the other units with certain other nuclei of the embryo-sac to form the endosperm-
nucleus from which the whole of the endosperm is developed. The direct effect of the pollen on endosperm characters is due to this participation of one of the male nuclei in the production of the endosperm. A slightly different phenomenon is seen in peas, in which pollen from a yellow-seeded variety produces yellow seeds in the pods of a green-seeded variety, for here the xenia character resides not in the endosperm but in the embryo itself. Physiological effects of pollen in causing local disturbances of nutritive or other functions in tissues surrounding the style or ovary, thus affecting the size and quality of the fruits, are not properly included under xenia. Many reported cases of xenia in plants other than those here mentioned are undoubtedly mythical and will not stand the test of careful experimental investigation. The deterioration of melons supposedly caused by growing in the proximity of pumpkins or cucumbers, is double-less a case of this kind.

Geo. H. Shull.

XERANTHEMUM (Greek, dry flower: it is one of the "everlastings"). Compositae. Annual erect herbs, densely pubescent or tomentose, of which X. annuum is one of the oldest and best known of the "everlastings" or immortelles.

The rays are yellow, but the large involucral scales are petal-like and persistent, giving the plant its value as a subject for dry bouquets: outer fls. few and sterile, inner ones fertile; receptacle chaffy; involucral scales in many series, glabrous; heads solitary on long naked peduncles.—Four or 5 species, Medit. region.

The culture of xeranthemums is very simple. Seeds are usually sown in the open, where the plants are to stand; but they may be started outdoors and the seedlings transplanted. Hardy or half-haIf-annual.

annuum, Linn. Fig. 4016. Annual, 2-3 ft. tall, erect, white-tomentose: lvs. alternate, oblong-lanceolate, acute: heads purple, 1½ in. across, the longer scales wide-spread and ray-like. S. Eu. G. 4: 74, 75.—Runs into many varieties. Var. ligulosum, Voss (X. plenissimum, and X. imperiale, Hort.). A double or half-double form. Var. purpurascens, Voss (X. superbussum, Hort.), has very full double heads. In these and the single types there are white-fld. (var. albus), rose-fld. (var. ramosum), and purple-fld. (var. purpureum) varieties. There are also violet-fld. forms. Var. multiflorum, Hort. (var. compositum) has a more compact and bushy habit, with somewhat smaller heads. X. edrus, Hort., is a trade name for mixed varieties. Xeranthemums are considerably used for a certain type of bedding, but they are mostly grown for cutting.

X. repandum, Mill. (X. erucinum, Presl), has white heads, of which the scales are little or not at all open or spreading. S. Far. to S. W. Asia.

L. H. B.

XEROCRÁDIA (dry branch, from the character of the growth). Loguminosae. One species, X. viridiramosa, Taub. (X. Zygieri, Harv. Actina viridiramosa, Burch.), of S. Afr., likely to be planted in warm dry regions in choice. The variations differ from Acaena paper only (rather than indefinite) stamens, powdery pollen, 3 free petals, and other technical characters. It is described as a small, dry, and very rigid bush 1-2 ft. high, with pale bark, spurious stipules, deciduous bipinnate lvs., and fls. 8-12 in nearly or quite sessile heads: petals oblong; filaments not much exceeding the petals; anthers with a very minute sessile gland; pod or legume seminiferous, indehiscent, 1-seeded, about 3½ in. long, winged.


The turkey’s beard of the eastern states (X. asphodeloides) is a strong herb, 3 to 4 feet high, resembling asphodel. It has a dense tuft of numerous long, wiry leaves from the center of which springs a stately shaft sometimes 5 feet high, with an oval or oblong raceme, 6 inches long, crowded with yellowish white 6-parted flowers, each ½ inch across. It blooms from May to July, flowers with delicate fragrance lasting a long time. The species is a native of the dry pine barrens from southern New Jersey to eastern Tennessee and Georgia. The chief species of the Pacific coast, X. tenax, has white and violet flowers, the latter color supplied by the stamens. Each region should cultivate its own species. The forms are too much alike for the same garden. A third species, X. douglasii, Watson, is a rare plant ranging from Montana to Oregon. It is distinguished by its six-valved capsule and is said to be inferior as a garden plant to the other species.

asphodeloides, Nutt. (Hedhinias asphodeloides, Linn. X. sejófólum, Michx.). Fig. 4017. Tall hardy perennial, 1-4 ft. high: lvs. 1 line or less wide: raceme 3-4 in. long: perianth-segms. exceeding the stamens. Pine barrens, E. U. S. B. M. 748. L.B.C. 4: 394. Gn. 27, p. 224; 39: 526 and p. 527; B. Y. R. 1: 3524. XENIA

There are also violet-fld. forms. Var. multiflorum, Hort. (var. compositum) has a more compact and bushy habit, with somewhat smaller heads. X. edrus, Hort., is a trade name for mixed varieties. Xeranthemums

4016. Xeranthemum annuum. (×50)
**XEROPHYLLUM**

Stems short, with many sheaths, soon thickened into fleshy pseudobulbs, which are 1-2-lvd.: lvs. large or elongated, petiole-vineated, contracted to the petiole: scapes erect, simple, arising from the base of the pseudobulb: fls. racemose, medium-sized or rather large, very shortly pedicellate: bracts linear, usually rather long; petals subequal, erect, finally spreading, lateral broader than the dorsal, forming a chin; petals similar to the dorsal sepal if not smaller; labellum somewhat articulate with the foot of the column, lateral lobes erect, surrounding the column, midlobe short, broad, surface smooth, lamellate or callous at the base; pollinia 4,Avoid: ovum: ovoid: —About 30 species, natives of Trop. Amer.

**XYLOBIUM**

Stems short, with many sheaths, soon thickened into fleshy pseudobulbs, which are 1-2-lvd.: lvs. large or elongated, petiole-vineated, contracted to the petiole: scapes erect, simple, arising from the base of the pseudobulb: fls. racemose, medium-sized or rather large, very shortly pedicellate: bracts linear, usually rather long; petals subequal, erect, finally spreading, lateral broader than the dorsal, forming a chin; petals similar to the dorsal sepal if not smaller; labellum somewhat articulate with the foot of the column, lateral lobes erect, surrounding the column, midlobe short, broad, surface smooth, lamellate or callous at the base; pollinia 4, Avoid: ovum: ovoid: —About 30 species, natives of Trop. Amer.

**XYLOPIA**

Stems short, with many sheaths, soon thickened into fleshy pseudobulbs, which are 1-2-lvd.: lvs. large or elongated, petiole-vineated, contracted to the petiole: scapes erect, simple, arising from the base of the pseudobulb: fls. racemose, medium-sized or rather large, very shortly pedicellate: bracts linear, usually rather long; petals subequal, erect, finally spreading, lateral broader than the dorsal, forming a chin; petals similar to the dorsal sepal if not smaller; labellum somewhat articulate with the foot of the column, lateral lobes erect, surrounding the column, midlobe short, broad, surface smooth, lamellate or callous at the base; pollinia 4, Avoid: ovum: ovoid: —About 30 species, natives of Trop. Amer.
with 3 valvate sepals connate for some distance from the base; outer petals elongate, thick, valvate, and connivent, or scarcely opening, and triquetrous above, inclining the 3 inner linear petals, which are concave at the base; after anthesis the receptacle undergoes a transformation, its center becomes depressed so as to form a cone-like sac, while its margin grows in such a way as to form a dome with an orifice at its apex; through this orifice protrude the styles, while the ovoids occupy the cavity, and the surface of the dome in most species is covered with the crowded stamens, the expanded connectives of which form a sort of tile-like covering to the pollen-sacs; carpels vary in number and the ovoids have a central placenta bearing an indefinite number of ovules primordially arranged in 2 vertical rows: fr. consists of clusters of berries either sessile or shortly stipitate, more or less elongate, often constricted between the seeds, which have a ruminant endosperm, like other members of the Annonaceae, and in many cases there is an aril on both sides of the terminal umbilicus. In the African species, sometimes separated as a distinct genus under the name Habzelia, instead of a central cavity there is only a slight depression in the orifice or even none at all. The genus Pseudannona, treated by Baillon as a section of Xylopia, but given generic rank by the writer (see Journ. Wash. Acad. Sci. 3:16. 1913), both the corolla and the fr. differ radically from those of Xylopia. The aromatic, acute, expanded and shell-shaped peduncles often 2 in. to 3 in., peduncles pilose, very short, bracteolate, solitary, or in 2's or 3's, growing from the axils of the lvs.: calyx connivent, or scarcely opening, and triquetrous above, petals oblong, acute at the apex; petals erect, the outer ones linear, tomentose above; the inner ones shorter and narrower, linear and triquetrous, acute, expanded and shell-like at the concave base, so as to cover the essential linear and triquetrous, acute, expanded and shell-like at the concave base, so as to cover the essential parts; receptacle hollowed in the center, forming a cavity in which the ovoids are included, the styles protruding beyond its opening. A wide geographical range, which has undoubtedly been extended through human agency. It is spread in S. Amer. from Brazil to Panama and also occurs in Cuba, where it is known as Malagueta brava, or "wild melegueta," and Guacima Maria, or St. Mary's guacima."—Varies considerably in the size and pubescence of its lvs. According to Baillon the frs. of this species, together with those of X. frutescens and X. sericea, are often offered for sale in the pharmacies of Brazil. They contain large cells filled with a volatile aromatic oil, having a pepper-like flavor, but more agreeable and delicate than pepper. Martius regards these frs. as worthy of intro. into the pharmacopoeia, on account of their tonic and carminative properties.

2. carminativa, R. E. Fries. (Unana carminath, Aruda da Cañada. X. sericea, St. Hill.). Pao d' Embr. Pindaíba. Pimenta de Macaco. A tree closely allied to X. frutescens, but with grandiflora, but with the petals forming a cone-like sac, while its margin grows in such a way as to form a dome with an orifice at its apex, in comparison with their length, and with the apex more attenuate and the base more acute, but the latter varies and is sometimes rounded; if-blade clothed with appressed silky hairs longer than those of X. grandiflora, and usually smaller, but often longer, but also varies in size: fls. much smaller than those of X. grandiflora, scarcely exceeding 1/4 in. in length, and serving at once to distinguish the two species: frs. either rounded at the tip or pointed, shorter than those of X. grandiflora, and usually contain 2 seeds, but sometimes only 1 or 2, in the latter case they resemble the frs. of X. frutescens, from which, however, they may be distinguished, when dry, by their black color and rough surface. Found from Minas Gerais in Brazil to British Guiana.—The seeds are commonly found in apothecary shops in Brazil, where they are sold as carminatives. According to St. Hilaire the bark is strongy and tenacious and is excellent for cordage, especially for boat-cables. The frs. have the odor and taste of pepper and are used as a condiment, but are not so pungent as pepper. Specimens were purchased at Januaria, state of Minas Gerais by Messrs. Popowecz, Shawel, and Dorsett, of the U. S. Dept. of Agr. during their recent mission to Brazil.

3. frutescens, Aubl. Malagueta hembra. Malagueta chico. Coumnerjav (Carib name). Jerejerecov (Cayenne). Embira. Pindaíba (Brazil). Fig. 4018. A shrub or small tree with dichotomous branches; new branches pilose, red-brown: lvs. oblong-lanceolate, acuminate at the apex, when mature suggesting the frs. of our common Asimina triloba. It is intended here to describe only the species of economic importance.

INDEX

| a. American species (Nos. 1-7) |
| b. Lvs. acut or acuminate |

1. grandiflora, Aubl. (X. cubensis, A. Rich. X. longifolia, A. DC.). Malaguetia macho. Malagueta grande. Zemfira. Fruta do Lum. Achon. Fig. 4018. Tree with younger branches rufous-tomentose near extremities: lvs. approximate, distichous, elliptical-lanceolate or oblong, acute at the apex, usually obtuse at the base, puberulous above, tomentose and rufescent beneath, the blade 2 in. or more in length, the petiole about 1/4 in. long, grooved above, tomentose and rufous: peduncles axillary, very short, 2-fl.; pedicels incurved, bracteate, villous, ferrugineous: fls. oblong, 2 in. long; calyx short, cup-splayed, shortly 3-parted; petals erect, the outer ones linear, acumen, concave at the base, silky near the base, sub-tomentose above; the inner ones shorter and narrower, linear and triquetrous, acute, expanded and shell-like at the concave base, so as to cover the essential

4. muriçata, Linn. (X. jamacaeinsis, Griseb.). Smaller Bitter-wood. Fig. 4018. A shrub with ovate or lanceolate, long-acuminate lvs., with "the slender acumen often obtuse at the tip, clothed beneath with...
XYLOPIA

strigose hairs, and bearded at the tip: fls. small, in axillary clusters; berries punctate.—This species, the type of the genus Xylopi, was described by Linnaeus on a plant growing in the mountains of Jamaica described and figured by Patrick Brown in his Natural History of Jamaica, and called by him Xylopiacum, on account of the bitter taste of its wood. The vernacular name was applied to it to distinguish it from X. glabra, Linn., a species based on Pluknet's Xylopecus, or Lignum anarum, of Barbados, commonly called bitter-wood.

5. discrētā, Safford (Unōna discrētā, Linn. f. Habzēlia discrētā, A. DC.). PETROCOBOLUS. A shrub or small tree with privet-like, or willow-like Ivs. and

available for the name of a second genus. The generic name Desmos is therefore valid, and must be used for the Asiatic plants commonly called Unōna. (See Desmos, Vol. II, p. 991 of this work.)

6. aromatica, Baill. (Habzelia aromatica, A. DC. Unōna zeylanica, Aubl.). MANIGUETTE, BOIS d’ ECOECE. POIVRE DES NEIGRS. A tree with a trunk 20 ft. high or more, with a spreading crown and leafy branches: lvs. ovate or oblong-globose, mucous, puberulent; fls. axillary, solitary or in pairs; calyx-divisions subrotund-ovate, acute, fleshy; petals 6, 3 outer ones longer, ovate-oblong, on the outside villos, numerous, on the inside glabrous, violet-colored, the 3 inner ones smaller, glabrous, violet-colored; berries reddish, numerous (12–25 in a cluster), oblong, suberete, shortly stipitate, with a longitudinal seam down one side; constricted between the seeds; seeds 3–6, orbiculate, reddish.—A species of doubtful relationship, owing to its broad petals and orbiculate seeds. It has been referred to Unōna concolor, Wildl., and may possibly be congeneric with Desmos or Unōnopsis. The type, described by Aublet under the name Unōna zeylanica, was collected in the forest of Timoutoll, French Guiana.

7. obtusifōlia, A. Rich. (Habzelia obtusifōlia, A. DC.). GUIMBA. GUAVICA. GUAVICO DE SAVANA. PICO DE GALLO. Fig. 4018. A shrub or small tree with numerous crooked branches, the extremities of which are ferrugineous-pubescent when young. It differs from all other species here described in its perfectly glabrous Ivs., which are quite obtuse or rounded at the apex and obovate or subobovate in outline, coriaceous, pale green and glossy above and paler beneath, and about 1–1 1/2 in. long; fls. axillary, solitary, very shortly peduncled, suberete by small scale-like bracteoles; calyx-divisions broad, subacute, and ciliate along the margin; outer petals narrowly linear, acutish, dilated and concave at the base, covered on the outside with rufous silky hairs; inner petals shorter and narrower, triquetrous above, expanded and concave: at the base, covering the essential parts; carpels included in the cup-like hollow of the receptacle, numerous, but usually only 2–8 developing into fr.; the latter a cluster of terete follicles more or less constricted between the 2–4 seeds, which have a whitish fleshy aril on each side of the hilum.—This plant is known only from the Island of Cuba, where it is prized for its fine wood. Its local name Pico de gallo (cock’s beak) is suggested by the form of its sharp elongated fl-buds.

AA. Asiatīc species.

8. parvifōlia, Hook.f. & Thom. (Patonia parvifōlia, Wight. Unōna tripetalaidea, Moon). NETAWU. ATUKETIYA. A tall aromatic tree of Ceylon, with a straight trunk, smoothish bark, and silky shoots and young branches: lvs. oval, acuminate, acute at the base, 3–5 in. long, glabrous; petiole 1/2–1 in., finely pubescent: fls. axillary, solitary or in clusters of 2 or 3 on very short peduncles bearing several short imbricated scale-like bracteoles; calyx-divisions small, broad, united half-way up, acute, pubescent; petals hairy, the outer ones linear, strap-shaped, acute, hollowed at the base; the inner a little shorter, thick, trigonous, expanded and hollowed at the base, covering the essential parts; stamens truncl’ed carpels 5, sunk in the center of the receptacle; ovules 4–8 in two rows; fruiting carpels 1–4 on very short thick stalks, broadly ovoid, 1–1 1/2 in. long, containing several smooth brown oblong seeds.—This species is common in the moist low country near Ceylon. Its bark, as that of the root, its yellow fls., and the fr. are all delightfully sweet-scented and aromatic, and are chewed by the natives with their betel. The wood is
XYLOPIA

yellowish gray and soft. Two other Ceylon trees with
fragrant yellow fls. are X. nigricans, with the calyx-
divisions divided almost to the base; and X. Cham-
ploni, with blunt ovoid fl.-buds.

AAA. African species.

glabrous and glossy above, finely appressed pilose
beneath, oblong-elliptic or oblong, obtuse or narrowed
at the base and more or less acuminate at the apex:
fls. solitary or in clusters of several, short-pedicelled;
calyx with the segms. broadly triangular and acute;
petals on the outside fulvo-sericeous, linear, subcon-
cave at the dilated base, the outer ones with thick
margins, the inner ones narrower, trigonous; stamens
with the dilated connective puberulous, outer circle
of stamens sterile, a little broader than the fertile ones;
carpels numerous; ovules 6-8 in a single series; mature
carpels subsessile, slender, cylindrical, somewhat in-
curved, about 2 in. long, slightly constricted between
the seeds, glabrous, vermilion-colored within; seeds
6-8, of medium size, ellipsoid, about 1⁄2 in. long; fr. globose, 1⁄2–3⁄4 in.
Japan, Korea, E. China. S.Z. 188. Var. pubescens, Rehd. & Wilson. Tree, to
80 ft.: branchlets pubescent:
lvs. ovate to oblong-ovate, glabrous, 1⁄4 in. long.
Cent. and W. China. —Only this variety seems to be
in cult. and Wilson pronounces it one of the handsomest
evergreen trees of China; it has proved hardy in S.
England and probably will do well in the southern
states and Calif.

Sälznannii, Eichl. Shrub, to 15 ft., glabrous, the
sts. and older branches armed with stout branched
spines: lvs. chartaceous, ovate to ovate-oblong, obtuse
or obtusely acuminate, cuneate at the base, crenate-
dentate, 3–4 in. long; fr. black, 3-4-seeded. Brazil,
Argentina, Paraguay.

X. Aquifolium, Sprague. Lvs. holly-like or occasionally nearly
entire, having pair of glands at base of blade, 3–4 in. long; racemes
short, axillary, of very small fls.: styles 5–7. Habitat unknown,
probably Polynesia or Austral.

XYLOSMA

(Greek, xylos, wood, and osme, odor; alluding to the aromatic wood of some species). Syns.,
Myroxylon, Hisingera. About 45 species

of evergreen, often spiny, trees or shrubs distributed
throughout the tropical and subtropical regions of both
hemispheres except Afr. Lvs. alternate, short-petioled,
usually dentate, extipulate: fls. small, in axillary ra-
cemes, usually daisy-like, apetalous; sepals 4–5, slightly
connate at the base; stamens many, distinct, surrounded
by a disk; ovary superior, surrounded by a disk and
sometimes by staminodes, 1-celled with several ovules;
styles 2–3, usually connate. Little known in cult.;
prop. by seeds and probably by cuttings of half-
ripened wood under glass.

racemosa, Miq. (Hisingera racemosa, Sieb. & Zucc. Myroxylon racemosum, Kuntze). TENG-CHING TREE. Small tree or shrub, unarmed or spiny, glabrous:
fls. ovate, acuminate, rounded at the base, serrate, 11⁄2–2
in. long; fls. yellow, fragrant, scarcely 1⁄4 in. across, in
axillary racemes 1⁄2–1 in. long; fr. globose, 1⁄2–1⁄2 in.
Japan, Korea, E. China. S.Z. 188. Var. pubescens, Rehd. & Wilson. Tree, to 80 ft.: branchlets pubescent:
lvs. ovate to oblong-ovate, glabrous, 11⁄4–3 in. long.
Cent. and W. China.—Only this variety seems to be
in cult. and Wilson pronounces it one of the handsomest
evergreen trees of China; it has proved hardy in S.
England and probably will do well in the southern
states and Calif.

ALFRED REHDER
YAM. The name yam properly belongs to the members of the genus Dioscorea, although unfortunately it has been applied for many years in the United States to the large varieties of the sweet potato, *Ipomoea Batatas*. The name as applied to the sweet potato is thought by some to be a corruption of an African word pronounced "nyam," brought by the negroes who were transported to America in the early days. This word was used for the true yam or other large roots or tubers used for food in Africa and was bestowed by the negroes on the large sweet potatoes in America.

The botany of the cultivated yams has not been cleared up. Many varieties are of mediocre quality, while some are excellent, being superior in flavor and mealliness to almost any other starchy vegetable. Single roots or tubers of some varieties, particularly of *D. alata*, attain great size, occasionally even reaching 100 pounds or more in weight, and several feet in length. The best varieties, however, are of small size, often less than a pound in weight. Among the best known of these are the yampis of Jamaica and the Isthmus of Panama, and other varieties of small quality, such as the cush-cush of the Island of Trinidad. The Chinese yam or cinnamon vine, *D. Batatas*, is of excellent flavor, but on account of its deep-growing habit is very difficult to dig. Several kinds of yam are grown scattering in Florida. For further discussion, see *Dioscorea*.

ROBERT A. YOUNG.

YARROW: *Achillea*.

YELLOW-WOOD: *Cladrastis*.

YEW: *Taxus*.

YÚCCA (*Yuca*, native name for the manihot or cassava, erroneously applied to the present plants by Gerarde). *Liliaceae*, tribe *Yuccoae*. Bold stiff-leaved plants suitable for lawn planting, subtropical massing, and a few of them for flower-garden use. Acaulescent to arborescent endogens with fibrous evergreen sword-shaped lvs. usually pungent and often dentilicate or fibrous on the margin; fs. white or shaded with cream or violet, cup- or saucer-shaped, usually pendent in large usually erect panicles, opening at night and then somewhat sickishy fragrant; pollination rarely occurs except through the aid of a small white moth, *Pronuba yuccasella*, found wherever yuccas occur wild on the continent, which deliberately gathers the pollen and thrusts it into the stigmatic chamber, its larvæ feeding exclusively on the maturing seeds of these plants: fr. either capsular and erect or fleshy and hanging in the principal groups or subdivisions.—About 30 species, confined to N. Amer. and the W. Indies, most of them native to the arid S. W. U. S. and the Mexican tableland. A few species have been cult. for centuries, and within the last decade a large number of artificial hybrids have been produced and intro. into cult., especially along the Medit. There are recent monographs by the writer in Rep. Mo. Cot. Gard., Vol. 13, pp. 42-116, with illustrations, and by Molon in a small manual "Le Yucche," Milano, 1914, in which many of the Sprenger hybrids are also figured. See *Hesperocereus*, Samuela.

Propagation is by seeds, offsets, stem-cuttings or rhizome-cuttings. These should be planted in well-drained sandy loam, usually in the succulent house. The only species hardy where frost is severe are *Y. glauca*, *Y. filamentosa*, *Y. flaccida*, *Y. baccata*, *Y. recurvifolia*, and *Y. gloriosa*, which flower in the sequence given, the last-named often blooming late in autumn. *Y. Treculeana* shows considerable resistance to frost. The tender species are kept in the cactus house. Well-drained sandy loam suits yuccas best, but with good drainage they are tolerant of a large range of soil and exposure. *Y. Treculeana* blooms usually in March in plant-houses, as when wild, and the Mexican species when brought to flower are usually spring bloomers but they often refuse to flower for long periods and then suddenly and unexpectedly produce an abundance of simultaneous bloom, even on the smaller plants. Of the hardy species, *Y. glauca* flowers in June and it is quickly followed by *Y. filamentosa* and *Y. flaccida*, while the forms of *Y. gloriosa*, which usually flower only at intervals of several years, bloom from late August to so late in the autumn as to be cut down by frost. The only well-known yucca in northern gardens...
YUCCA

is the common Adam's needle, *Y. flaccida*. This persists for years, sending up a tall panicle of cream-white flowers in late spring or early summer. All yuccas are suited to bold and formal effects in gardening; as tub specimens they may be used effectively in subtropical bedding or massing. Most yuccas may be fertilized if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. *Y. aloifolia* commonly fruits freely, but the others rarely fruit spontaneously in cultivation except *Y. filamentosa* and *Y. flaccida*, which are pollinated by the small white moth (*Prom thuộc yucca-sella*) that accompanies them when it emerges in the western states, but rarely when they are cultivated in the eastern states. This "Joshua tree" is now known in the more flaccid recurved lvs. var. concava, Baker (Y. concava, Haw.). See Rep. Mo. Bot. Gard. 13:10, 83.

The great yuccas, or "yucca palms," of southern California are chiefly *Y. arborescens*. They grow in the higher lands bordering the Mojave and adjacent deserts, reaching a height of 15 to 20 feet. The old plants are exceedingly weird and picturesque. Occasionally this species is transferred to gardens, but it is apparently not in the trade. This "Joshua tree" is now known in the more flaccid recurved lvs. var. concava, Baker (Y. concava, Haw.). See Rep. Mo. Bot. Gard. 13:10, 83.

**INDEX.**

| 1. flaccida, 4. | filliform, 13. | Acaulescent or with prostrate trunk: lvs. narrow, 4-5 lin. wide, gray-green, narrowly white-margined: infl. 3-6 ft. high, rarely branched: fls. greenish white, D to N. Mex. B.M. 2236. F.E. 14, p. 34. G.F. 2: |
AA. Les. not toothed, with marginal threads: fr. flaky.


AAA. Les. entire, transversely dentate, or slightly filiform.

b. Fr. flaky.


BB. Fr. dry but indiaceous.


BBB. Fr. not known.


AAAA. Les. sharply rough-edged: fr. flaky.


Y. Draco=Y. scieda X Y. aloifolia.—Y. farrukenii=Y. filamentosa X Y. glauca. —Y. rechsteineri=Y. filamentosa X Y. gloriosa.—Y. whipplei=Hesperoyucca

WILLIAM TRELEASE.
Three of the species are known as night balsams or star balsams, from their night-blooming habit. The name night-blooming phlox would be better, as the flowers are silver-shaped and five-lobed, each lobe being deeply cut. These plants are generally treated as half-hardy annuals, the seed being sown indoors in early spring. The plants bloom in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very unsatisfactory and urgent that the seed be sown in the autumn and the young plants wintered in a coldframe. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night.

A. **Corolla-tube slightly pubescent.**

b. **Duration perennial; bracts oblong-lanceolate; lvs. linear or the lower ones lanceolate.**

**lychnidea**, Walp. (**Nycterinia lychnidea**, D. Don. **Erinus lychnidea**, Linn. **E. gracilis**, Lehm., not Hort.). Subshrub, about 2 ft. high; lvs. oblong-linear, sessile, entire or few-toothed; corolla-tube 1-1 1/2 in. long, limb 1/2-3/4 in. across, white inside, purplish or red outside. B.M. 2504; 8215 (the latter as **Z. martitima**). B.R. 748. G.C. III. 42:162 (as **Z. martitima**).—Usually acts much like an annual and is generally treated as such when cult.

bb. **Duration annual; bracts oblong-lanceolate; lvs. linear or the lower ones lanceolate.**

**capensis**, Walp. (**Nycterinia capensis**, Benth.). Differers from the above, as described by Bentham, in stature, duration, strict sts. and smaller lvs.; same picture as Gn. 24, p. 89) the lvs. are commonly short and 4-8-fld., sometimes long and 15-20-fld. There is some evidence that this species and the next are confused in the trade. In R.H. 1851:221 the fls. are 3/4-1 in. long and less than 1/2 in. across.

AA. **Corolla-tube glabrous.**

**selaginoides**, Walp. (**Nycterinia selaginoides**, Benth.). Dwarf annual, branched at the base, 3-5 in. high, rarely 6 in., with spatulate lvs. and fls. 3-1/2 in. long, color of fls. not stated by Bentham, but in R.H. 1896, p. 308 (same picture as Gn. 24, p. 89) the fls. are said to range from white to lilac and darker depending on their stage of development, with an orange-colored eye, which becomes crimson later. This suggests the preceding species, and it is evident that the two must be distinguished by technical characters until the colors can be verified. G.C. III. 45:173.—The plant once advertised in America as **Nycterinia selaginoides** is said to be a pink-flit. half-hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardy at San Francisco.

WILHELM MILLER

F. TRACY HUBBARD.
ZAMIA (name used by Pliny, meaning L. 7.

dies or dam.

cate, and first applied to pine cones, and trans

defined to these plants apparently because of the cone-like fruit). Cycadaceae. Perennial, tropical and subtropical plants, resembling palms and in some respects ferns.

Caudex sometimes a low trunk, simply lobed or branched, standing above or almost below ground; lvs. few, developing one after the other, pinnately compound; pinnae broad or narrow, articulate at base, entire or serrate, parallel-veined; petiole smooth or spinulose: cones rather small for the order, globose or rarely sub-lobate, male cone oblong-cylindrical, female cone similar but larger and thicker: ovules sessile, ovoid.—About 36 species, Trop. and Subtrop. Amer. One of the 9 genera of the C y c a n e family, as constituted by Alphonse De Candolle (Prodr. 16, pt. 2, pp. 522–47). Other genera of horticultural interest and discussed in this Cyclopedia are Ceratozamia, Cycas, D i o o n, E n c e p h a l a r t o s, and Macrozamia. The lvs. of cycads are d i e c e cious, without envelopes; the pistillate fls. are mere naked ovules inserted under scales in cones, and the staminate fls. are simple anthers under similar scales. The plants are therefore gymnosperms (seeds not horned) and form a cylindrical cone; the anthers are numerous, and the ovules pendulous in pairs. The fecundation of Zamia has been studied by H. J. Webber (Bull. No. 2, Bur. Pl. Ind., U. S. Dept. Agric.). His conclusions respecting the Floridian species are accepted below.

The zamias are stocky short- and usually simple-stemmed cycas-like plants, the trunk sometimes subterranean, with long-pointing evergreen leaves or fronds; the leaflets being thickened and usually broadened at the base, and jointed. Zamias are warmhouse plants, to be treated like species of Cycas or E n c e p h a l a r t o s, which see. The plants are propagated by means of seeds and offsets; also by division when there is more than one crown.

a. Petiole prickly.

furfuracea, Ait. Trunk cylindrical, 1–2 ft. tall; peti

olate dilated and concave at the base, with several small prickles; lfts. about 10–12 pairs, opposite or alternate, oblong-lanceolate, entire on the lower half but serrate or jagged toward the top, acute or obtuse, nearly so, and narrowly linear, the base not narrowed, 6–8-nerved: pistillate cone oblong, 5–6 in. (12–16 cm.) long, marked by umbonate (projection on the scales), densely tomentose.—Abundant in S. Fla. on the coast below latitude 26° 30′, in open comparatively dry pine woods, sparingly.

pumila, Linn. Differs, according to Webber, in having shorter and broader lfts. which are less twisted and not so erect and rigid and in its shorter and non-umbonate cones with seed-bearing scales thinner and more flattened at outer end.—Abundant in Cent. Fla., ranging from 28° 30′ north for 1° of latitude, in dense moist woods.

Z. cordifolia, Versch., is Macrozamia spiralis.—Z. Désenoi, Auth., in Macrozamia P a r a f l o r a;—Z. pumila, Hort.—Cycas Rumphii (?).—Z. pumila, Ait.—E n c e p h a l a r t o s pumila.—Z. spinosa, Lod. = E n c e p h a l a r t o s A l t e n a s t e n i .

L. H. B.

ZAMIOCULCAS (Zamia and C ulcas). A r a c e a e. One species, sometimes grown in the warmhouse for ornament and curiosity, it being one of the very few aroids with pinnate lvs. Z. zamiifolia, Engler (Z. Loddigesi, Schott. C d u l t u r a zamiifolia, Lodl.), grows in Trop. Afr. It is an evergreen perennial herb, with stout creeping rootstock, and erect glabrous radical lvs. standing 1½–2 ft. high; lfts. about 12, opposite or alternate, oblong-lanceolate, acute, jointed to the petiole and forming small tubers at the base after falling; s a t h e convolute at base with spreading or reflexed blade, green, glabrous; spadix club-shaped, with female fls. below and male fls. on the longer upward part, whiteish, about 1½ in. long and ½ in. thick. B.M. 5985. L.B.C. 15:1408. Prop. by the If.-tubers and by division.

ZAMIOCULCAS 3533

4025. Stamin ate cone of Zamia floridana.

4026. Pistillate cone of Zamia floridana.

4027. Aggregate fruit of Zamia floridana. Cone not mature.
ZANNICHELLIA (named in honor of G. G. Zannichelli, a Venetian botanist). *Naidaeeae.* Horned Pondweed. Slender branching herbs, growing under water, of little horticultural value for ponds: lvs. mostly opposite, long and linear, thread-like, entire; stipules membranaceous, sheathing; fls. monocious, sessile, naked, usually both kinds from the same axil. About 5 species, scattered throughout the world. *Z. palustris*, Linn. Style at least half as long as the fr., which is flatish, somewhat incurved, or occasionally more or less toothed on the back (not wing-margined), nearly sessile. Cosmopolitan in fresh or brackish water.

ZANÒNIA (Jacob Zanoni, 1615–1682, botanist of Bologna). *Cucurbitaceae.* Under this genus, one species, *Z. sarcophylla*, Wall., is sometimes listed among cult. plants. This plant is now placed in the genus *Alismatix* and becomes *A. sarcophylla*, Hook. f. It is native of Burma: climbing shrub with very flaky 3-foliate lvs.; lfts. oblong, entire; fls. small, white, axillary, in compound panicles; corolla rotate, 5-parted, with obtuse segs.; calyx rotate and 5-parted, with acute segs.; male fls. with 5 stamens; females with a 1-celled elongate 3-4-styled ovary: fr. a medium-sized 3-valved caps.; seeds black, narrowed at base, with 2 flat curved horns at apex.

ZANTEDESCHIA (Francesco Zantedeschia, who wrote on Italian plants in 1825). Syn., *Richardia.* Calla of horticulturists. Perennial herbs grown for their ornamental corolla-like spathes and sometimes for spotted foliage; greenhouse subjects in the northern regions, but grown permanently in the open in California and other warm parts. The genus comprises the "calla lily." Herbsaceous plants with many long-peduncled lvs., all from a thick rhizome; peduncles appearing with the lvs.; pedicels spongy, often bristly below; blade sagittate, hastate, or lanceolate to cordate-ovate, the numerous primary and secondary nerves excurrent: peduncle as long or longer than the lvs.; spathe large, open, with a flaring, pointed, recurved tip; spadix staminate above, and pistillate below (Fig. 4029): fls. many and small, naked, crowded, staminodes sometimes mixed with the ovaries: fr. a 1–3-celled berry.—Engler assigns 8 species in his latest monograph (Das Pflanzreich, hft. 64, 1918), in Trop. and S. Afr. The common calla-lily is long known in commerce as *Calla athiopica*. Later it was known as *Richardia africana*, it having been found that the genus Calla, as more closely defined, could not include it. The *Richardia* of Kunth, 1819, under which the plant has been named, is antedated by another *Richardia*, and *Zantedeschia*, 1826, is considered by latest authorities to be the tenable name and is retained in the "nomina conservanda" of the International Rules as against both *Richardia* and *Aroides*. The genus *Calla*, as understood by modern botanists, comprises a single species, *C. palustris*, native in swamps in the northern hemisphere, including N. E. U. S. and Canada; see Fig. 742, Vol. II. For the black calla, see *Arum*.

When grown for the flowers only, *zantedeschias* may be planted out permanently on a bench, using very rich soil and giving an abundance of water while growing. They may be kept growing continually or given a season of rest, as desired. Plants in pots are usually started late in summer from dry tubers. The species having yellow or pink spathes seem to do best when grown without a resting-period.

**Culture of callas.** (T. D. Hatfield.)

The so-called calla of gardens (*Zantedeschia athiopica*) has been a favorite for generation. Although often grown as a window-plant, it is very unsuitable and seldom blooms under house treatment. When grown for winter flowers, it is customary to give the roots a rest during summer-time. They may be dried and stored if necessary. It is in this condition that Californian callas are received. It is the opinion of the writer that summer-resting would be the best treatment for those grown as house-plants, as well-grown dried roots are more likely to bloom. But rest must be enforced, for callas will grow all the year round, increasing in size and numbers when planted out. The largest blooms are always secured from summer-grown plants. They are taken up in the autumn, given good loam and plenty of root-room, with a liberal allowance of liquid fertilizer when well established. They thrive best under good light, and in a minimum temperature of 55°.

Some are said to be more odoriferous than others, although all are fragrant. Besides being invaluable pot-plants, they can be used with good effect in indoor water-gardens, growing luxuriously when partly submerged; and also in bog-gardens, and on the margins of ponds, to give sub-tropical effects. Although introduced to cultivation but twenty-five years ago, *Z. Elliottiana* is yet of secondary importance. Although an acquisition. It is a South African species, about which comparatively little is known in the wild. (N. E. Brown writes in "Flora of Tropical Africa," Vol. 8, 1902: "This species is stated to have been raised from seeds received from South Africa, but I have reason to believe that its habitat is somewhere in the northern part of the Transvaal." The plant was described as *Richardia Elliottiana* in Garden and Forest, New York, 1892.) When introduced, it was thought difficult to grow. It was first grown in this country by William Robinson, gardener to F. L. Ames, North Easton, Massachusetts, Mr. Harris, gardener to H. H. Hunnewell, Wellesley, Massachusetts, and Joseph Tailby, of Wellesley. The last named is a commercial grower, who looked on his importation as an investment. The bulbs (corms or roots) were expensive—a guinea or thereabouts—and about as big as marbles. Tailby's experience is interesting and it may be of interest to the reader. He came near losing his whole stock by cutting out the eyes, with the object of getting separate plants. There had been no sign of natural division, nor has there since; although some are still of the opinion that by proper manipulation they may be increased by division, as we now do potatoes, but the wounds must be given time to heal over. The roots are kept over in a cellar at a temperature of 45° F., or thereabouts, until
April, when they will show signs of starting. They should be potted then, but kept rather dry until the roots develop. The pots will be fairly well filled with roots before much growth shows, and they can be kept under benches in a coolhouse, or even in the cellar, for two weeks after potting. With the roots well started, they come along quickly, coming into bloom in ten to twelve weeks. A good bright intermediate house suits them best, and some liquid fertilizer will help them when the flower-stems appear. The blooms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully; and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when it is known.

Seeds of Z. Elliotiana sown in November usually come up strong, but the plantlets are difficult to handle and liable to go off when very young. It is the safest way to let them stay in the seed-boxes, ripen there, and plant them farther apart next season. Seeds have been sown outdoors with very gratifying results. Almost a year is gained in this way, as the roots (or bulbs) are considerably larger than box-grown seedlings. Older roots held over until settled weather and planted like potatoes bloomed freely all summer, making fine roots; they were green when cut by frost in October, but ripened seeds. To do this successfully takes a longer season, and the plants must be started indoors.

The calla in California. (Ernest Braunton.)

In considering the calla in California, it is necessary to note two general heads first, as an ornamental; and second, as an article of commerce. The popular and growing demand for calla bulbs (or tubers) speaks much for the plant as an ornamental. Many, indeed, are the uses to which it is put. It is, perhaps, most commonly used as a belt along fences, and not infrequently as a hedge between two properties; or nearly as often is found along one side of a house in a long narrow bed. For effective planting it is much in demand for grouping around hydras and unsightly objects in damp places, at watersides; sometimes as a border around a fish- or lily-pond, oftentimes growing in bunches or masses in the water itself; or massed on a slope near water; mixed with other tropical vegetation; or as a border to tropical jungles; and very effective, indeed, in the lower tiers of basins around a large fountain with myriophyllum hanging down from the base of the callas. For all of these purposes the foliage is of even more importance than the flowers. As it grows luxuriantly here in almost any location, it is very seldom seen as a pot-plant either in the dwelling or on sale at the nurseries. In the most favored places only is it entirely secure from the frost, although the damage to it from this source is not serious in or around Los Angeles. Although dozing fairly well in the full sun, summer climate is too dry for it to attain its greatest beauty and luxuriance wholly without protection, and it may therefore be seen in perfection only when grown in partial shade. A good supply of water and manure is taken as an important factor in its proper development.

The spathe is subject to many variations in form, both in size and shape, some being long, rather narrow and pointed, ending in a decidedly recurved awn, while others are nearly circular, with the sharp point almost wanting and standing upright the same as the remainder of the spathe. It frequently happens that the spathe is double and even triple, sometimes in its entirety but often only partially so. In the latter case it often assumes some very strange forms. The spadix is not so variable and seldom departs from the type, although an occasional double or abnormal spadix is found. Most other species or varieties than Z. ethiopica are found but sparingly in California gardens, the most common ones being the spotted-leaved and the dwarf form known as the Little Gem, but Z. Elliotiana is grown extensively in certain areas, especially about Santa Cruz, which is the center of the bulb-growing industry in California.

Commercially, the growing of the bulbs for eastern and foreign markets is a sure source of revenue, and is conducted extensively throughout southern California. The local market for the so-called flowers is of course neglected, but if grown in a practically frostless belt, the blooms will more than pay for the cultivation of the winter field, as in that season of the year flowers of all kinds are scarce. The average retail price for good blooms in midwinter is 50 cents a dozen; the wholesale price about $1 a 100. Bulbs at retail cost about one-half, or even less, what they do in the East. The commercial growers get at present (January, 1916), $25 to $60 a 1,000, according to size, the market calling for tubers 1½ to 3 inches in diameter. Larger sizes are quoted as “fas” and command extra prices. Although they can be grown in almost any soil with some success, a free cool blackish loam is best, and they do not thrive in a hot gravelly or stony soil. The lands near the coast, where swept by the cooling sea-breeze, are productive of the best results, both in bloom and flavor. Land containing sufficient alkali to prevent the growth of many common crops will produce good callas if other requirements are present. In field-planting it is much better to put in small bulbs about 4 inches apart than to sow the offsets promiscuously in the row; when the sets are thus sown, they should be taken up the following year and the small bulbs properly planted. Offsets sown as above and left four to six years (the usual time for a good crop) have never produced satisfactory results. No pest seriously attacks foliage or bloom, but in dry years more especially, the common sow-bug eats into the tubers very seriously and at times quite destructively. Both of these pests are a considerable nuisance to the California nurseryman and gardener.

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ZANTEDESCHIA 3535

4030. Calla with double spathe.—Z. ethiopica.

4029. Common calla lily.—Zantedeschia athiopica. Left-hand specimen shows the spadix, the spathe being removed. (×5.)

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africana, 6.
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baauniana, 2.
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godeffroyana, 6.
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Rehmannii, 1.
speciosa, 1.
sprengei, 4.
tropicata, 4.
4031. Zantedeschia rethiopica var. DEN CALLA. Lvs. about 6 in. long: berries about 3/4 in. diam., nearly subulate margined, about as large as those of Z. albo-maculata: spathe yellow, the tip erect, black-purple at the base. B.M. 7436.

4. melanoléca, Engler (Richardia melanoléca, Hook. f. R. Spréngeri, Comes). BLACK-TROTHED CALLA. Scape and petioles briefly below: lvs. 6-12 in. long, hastate-ovate-acute, the basal lobes obtuse, marked all over with oblong, white, translucent spots: spathe pale straw-colored, widely flowering and open from the base, the margins and cuspidate tip recurving, with an ample black-purple blotch at the base within. Natal, 1868. B. M. 5762. Var. tropicalis, Engler (Richardia melanoléca var. tropicalis, N. E. Br.), of Trop. Afr., differs in larger size and absence of bristles at base of petiole.

5. Elliottiana, Engler (Calla Elliottiana, Knight. Richardia Elliottiana, W. Wats.). GOLDEN CALLA. Lvs. glabrous; petiole 2 ft. or more long, lacking bristles; blade hastate, narrow, the basal lobes one-fourth the length of the apical one 20 in. long, 3 in. wide at the base; peduncle 4-1/4 ft. long; spathe about 3 in. long, yellow, red inside at the base. Angola.-R. Elliottiana: spathe cup-shaped, 4-5 in. long (with a tail 1 in. long), purple at the base, the margins and cuspidate tip recurving, with a black-purple blotch at the base within. Basutoland, S. Afr. B.M. 7397. Hooker writes (in B.M. 1857) that "R. Elliottiana is much the largest-leaved species, and is the only one with a deeply gamboge yellow spathe within, which is much the largest and broadest of any." First flowered in 1892 by R. Whyte, Pentland House (Lee, England).

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**ZANTHORHIZA**

*Zanthorrhiza* (Greek, yellow root). Often spelled *Xanthorrhiza*. Shrubby plants cultivated mostly for their handsome foliage, which is much like that of *Actea*, and which changes to a beautiful golden color in the autumn.

Leaves pinnate or bipinnate: fls. in drooping racemes or panicles; sepals 5, petal-like, deciduous; petals 5, smaller than the sepals, and 2-lobed; stamens 3-10; carpels 20, sessile, forming only 1-seeded follicles, 1 ovule of each usually not maturing.—One species, *Z. americanum*, Mill. *Z. fraxinum*, Michx.). *PRICKLY ASH*. Fig. 4033. Shrub or small tree, to 20 ft.; lvs. 3-7 in. long, glabrous; lfts. 13-21, elliptic-lanceolate to lanceolate, narrowed into a short stalk, minutely emarginate at the apex, crenate-erucent, ½-1½ in. long; fls. minute, with sepals and petals in terminal, short-stalked clusters, 2-4 in. across; fr. greenish or brownish. June; fr. in autumn. Japan, Korea. *S.I.F. 2:33.*—Sometimes cult. under the name of the following; handsomer in foliage and harder.

**ZANTHORHIZA** 3537

**ZANTHORHIZA** (Greek, *zanthos*, yellow, and *xylos*, wood). Also spelled *Zanthoxylum*. Including *Pagara. Rudceae.* Ornamental woody plants chiefly planted for their handsome foliage and for their ornamental fruits.

Deciduous or evergreen shrubs, sometimes sarmen­tose, or trees, with usually prickly branches; most parts, particularly the frs., emitting a strong aromatic odor when bruised: lvs. alternate, odd-pinnate, 3-foliolate or rarely simple; fls. dioecious or polygamous, small, in cymes or panicled; sepals, petals, and stamens 3-8; sepals often wanting; pistils 3-5; fr. composed of 1-5 separate small dehiscent caps, each with 1-2 shining black seeds.—The genus contains about 150 species in the tropical and subtropical regions of both hemispheres, and a few in temperate regions. Several species are used medicinally. The wood of some W. Indian species and that of the Australian *Z. brahyanthinum* is considered valuable. The frs. of *Z. pipertum* are used like pepper in Japan.

The zanthoxylums in cultivation are prickly shrubs or rarely small trees with mostly deciduous odd-pinna­te, medium-sized or rather small foliage and small greenish or whitish flowers in small, rarely large, axillary or terminal clusters, followed by usually reddish small pods disclosing lustrous black seeds at maturity. *Z. americanum* is the only species which is hardly North, while the species from eastern Asia, as *Z. schinifolium*, *Z. Bungei*, and *Z. alatum var. planispinum*, have proved fairly hardy in favorable positions as far north as Massachusetts, the first being the hardiest, but they probably will be perfectly hardy in the Middle Atlantic states. They do not seem to be particular as to the soil, but grow best in a well-drained soil and sunny position. Propagation is by seeds and by suckers or root-cuttings.

a. Rachi not or very narrowly winged.

b. Fls. before the lvs., in axillary fascicles.

c. Prickles solitary.

d. Schinifolium, Sieb. & Zucc. Shrub or small tree, to 20 ft.; lvs. 3-7 in. long, glabrous; lfts. 13-21, elliptic-lanceolate to lanceolate, narrowed into a short stalk, minutely emarginate at the apex, crenate-erucent, ½-1½ in. long; fls. minute, with sepals and petals in terminal, short-stalked clusters, 2-4 in. across; fr. greenish or brownish. June; fr. in autumn. Japan, Korea. *S.I.F. 2:33.*—Sometimes cult. under the name of the following; handsomer in foliage and harder.

c. Prickles in pairs.

**pipertum**, DC. Shrub or small tree; prickles rather slender, ascending: lvs. 2-6 in. long, with puberulous rachis; lfts. 11-19, ovate to oblong-ovate, narrowed into a short stalk, emarginate at the apex, remotely toothed, with conspicuous glands at the base of each tooth, midrib pubescent above, ½-1½ in. long; fr. with simple perianth, in small corymbs ½-1½ in. across, on short lateral branchlets; style slender; fr. reddish, glandular-dotted. Japan, Korea, N. China. June; fr. in Sept. *S.I.F. 1:32.*—The wood, according to Issa Tanimura, is dense and heavy with deep yellow grain; tree common cult. in Japan for ornaments, to make utensils, and for food; the seeds and inner bark are cooked or pickled; the fresh lvs. are added to soup; and the dried fr. used on roasted fish as a fragrant pepper.

**Büngel**, Planch. (*Z. Bungeanum*, Maxim.). Spreading shrub or small tree; prickles stout, flattened, very broad
ZAUSCHNERIA (named for a professor of natural history at Prague). *Onagraceae.* Low perennials, some of them subshrubby, few of them used in the flower garden.

Leaves, the lowest opposite, others alternate: fls. racemose, large, scarlet, fuchsia-like; calyx-tube globose, inflated just above the ovary, then becoming funnel-form, 4-lobed, bearing 8 small scales within; petals 4, obovate, or deeply cleft; stamens 8: caps. slender-uniflorous, obtusely 4-angled, 4-valved, many-seeded.—About 7 species, W. N. Amer.

**californica**, Presl. **CALIFORNIA FUCHSIA. HUMMINGBIRD’S TRUMPET. BALSAAM.** Half-hardy perennial with the fl. of a fuchsia and the fr. of an epilobium: height 3½-2 ft.; lvs. linear to oblong, ½-1½ in. long, pubescent or tomentose; fls. scarlet or vermilion, the trumpet-shaped calyx ½ in. long; calyx-lobes ovate; petals obovate, spreading; fr. 4-valved, imperfectly 4-loculed. Calif. P.M. 15:195. F. 1847-8:241. Gn. 31: 28 and p. 29. R.H. 1849:141. Var. splendens, Hort., is perhaps a little more luxuriant plant, otherwise not differing from the type. Var. inflata, Hook. Often nearly glabrous; lvs. broad-ovate to ovate-lanceolate, markedly feather-veined. B.M. 4493. F.S. 4:404.—Varieties have been made based on linear, lanceolate, or ovate lvs., but they run into one another. The plants also vary from glabrous and pubescent to tomentose. As a bedding-plant it has been occasionally used for novelty effects by European gardeners. To overcome its thin and leggy habit, it is well to set the plants rather close and pinch out the young shoots until compact bushes are secured. The plant is sometimes grown in pots for greenhouse decoration in late autumn. There are said to be forms that vary considerably in hardness. The plant is hardy in most parts of England.

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ZeA (an old Greek name for some common cereal, probably spelt). Gramineae. *A large annual grass with monocous inflo, the staminate fls. in the tassel at the top and the pistillate fls. in one or more ears in the axils of the lvs., each ear inclosed in several reduced lvs. or husks, the numerous styles protruding from the tip as the silk. As now limited the genus is founded on the single polymorphous cult. species, *Zea Mays*, maize or Indian corn (Figs. 4034, 4035, 4036), whose origin is unknown but is suspected by some to be teosinte (*Buch­lena mexicana*). Most of the evidence points to Mex., as the region in which it originated and from which it spread.

After a prolonged study of maize, teosinte, and hybrids between them, Collins advances the hypothesis (Journ. Wash. Acad. Sci. 2:520. 1912) that maize originated as a hybrid between teosinte and an unknown grass belonging to the Andropogoneae. This grass is thought to have been not unlike the earless varieties of pod or husk corn (*Zea Mays* var. *tunica*, Figs. 4037, 4038). The chief distinction between pod corn and the ordinary varieties of maize is that the glumes of the pis­glumes are reduced to minute scales at the base of the tillate spikelets are developed in pod corn and com­pletely inclose the grain, while in ordinary maize the same spikelet, or in perfect florets.

Plants will appear in some plant radically dif­ferent from teosinte, for only such a parent would account for the appearance of characters which characterize Eu­chima. Under the article *Corn* are given the botanical characters of the genus, a classification of the subspecies, as proposed by Sturtevant, and a discussion of sweet corn and pop-corn.

The following varieties of *Zea Mays* are grown for ornamental:


Var. gracilima, Koern. (Z. gracilima and Z. minima, Hort.). Very dwarf, slender form with green lvs., some­times cult. in Eu. A var. variegata is also mentioned.

Var. Curagua, Alef. (Z. Curagua, Molina), is described as a very robust green-lvd. form. Sturtevant places it in the pop-corn tribe. G. 42, p. 207.

A. S. Hitchcock.
equal; fls. few, sessile, in 2 conduplicate bracts.—Two species, Mex. and Texas.

 Pendula, Schnizl. (Tradescantia zebrina, Hort. T. tricolor, Hort., in part. Cynoglossus villosa, Lindl. Combretum zebrinum, Hort.). WANDERING JEW, in part. Fig. 4041. Trailing, half-succulent, perennial herb rooting at the joints: lvs. lance-ovate, sessile, the lf.-sheath about 1/2 in. long and hairy at top and bottom and sometimes throughout its length; under surface of lf. red-purple; upper surface silvery white, suffused with purplish, the central part and the margins purple-striped; fls. about 2, rose-red, contained in 2 boat-shaped bracts, one of which is much smaller than the other. Mex.—Commonly confused with Tradescantia fluminensis, Fig. 3828, and sometimes with Commetora nudiflora, See Tradescantia. The lvs. of Z. pendula seem never to be green. They vary somewhat in color. All forms are easily grown, and they prop. readily from pieces of st. Var. quadricolor, Bailey (forma quadricolor, Voss. Tradescantia quadricolor and T. multiflora, Hort.). Lvs. with metallic green undertone and striped with green, red, and white. Handsome. L. H. B.

ZELKÓVA (after the vernacular name Zelkoua in Crete, or Selkwa in the Caucasus). Syn., Abelica, and including Hemiptélon. Ulmácex. Ornamental trees grown for their handsome foliage and attractive habit.

Deciduous: lvs. alternate, short-petioled, penninerved, serrate, stipulate; fls. polygamous, the perfect ones solitary in the axis of the upper lvs., the staminate ones clustered in the axis of lower lvs. or bracts; calyx 4-5-lobed; stamens 4-5; styles 2: fr. a 1-seeded drupe, usually broader than high, oblique, with the style eccentric.

Five species in Crete, the Caucasus, and E. Asia. They are closely related to Celtis and Aphananthe and are chiefly distinguished by the connate sepal and the eccentric and oblique fr. Z. serrata is an important timber tree; the wood is very durable, and considered the best building material in Japan.

The young wood is yellowish white in color; the old wood is dark brown and has a beautiful grain.

The zelkovas are trees, sometimes shrubby, in general appearance much like some of the small-leaved elms, but either smaller or less two-ranked short-stalked leaves, with insignificant greenish flowers appearing at the base of the young branches and followed by inconspicuous fruits. Z. serrata and Z. Davidii are hardy North, while Z. ulmoides is hardy only as far north as Massachusetts, at least only in sheltered positions. Z. serrata is a very graceful round-headed tree and well adapted for avenues or as single specimens on the lawn. Z. Davidii, which is of recent introduction, may be useful as a hedge-plant on account of its upright rather stiff stems armed with spines. They do not seem to be very particular as to soil and position. Propagation is by seeds soon after ripening, also by layers and by grafting on Ulmus.

A. Fr. not winged; branches not spiny.


branches forming an oval or oblong head: lvs. oval or ovate to oblong, slightly cordate or rounded at the base, coarsely toothed with obtuse teeth, with 6–8 pairs of veins, usually almost glabrous above at length, pubescent on the veins beneath, 5½–3 in. long. April, May, of the Caucasus. Gn. 24, p. 571.


ALFRED REHDER.

ZEPHIRANTHES (Greek, flower of the west wind). Syn. Atemáceo Amaryllidaceae. ZEPHIR FLOWER. FAIRY LILY. Half-hardy tunicate-bulbous herbs, grown in the greenhouse, in window-gardens, and in the garden for summer- and autumn-blooming.

Leaves narrow, usually contemporary with the fls.: peduncle elongated, slender, hollow; spathe membranous, tubular, apex bifid: fls. white, red, or yellow, solitary in the spathe; perianth funnel-shaped, erect or slightly inclined, tube short or elongated, segms. subequal; ovary 3-celled: caps. subglobose, loculicidally 3-valved.—About 53 species, natives of the warmer regions of Amer. A general revision of Zephyranthes is found in Baker’s Handbook of the Amaryllidaceae, 1888, where the following subgenera are made: Subgenus ZEPHIRANTHES proper. Fl. erect; tube short; stamens inserted near its throat. Subgenus ZEPHIRITES. Fl. slightly inclined; tube short; stamens inserted near its throat; style more declinate than in the other two subgenera. Subgenus PROZANTON. Fls. erect; tube longer, dilated in the upper half; stamens inserted at the middle of the perianth-tube. For the further separation of the species, Baker uses the characters which appear in the key below, except the foliage-characters and the color of the fls. However, the genus may be readily separated into 2 sections based on the color of the fls., and this arrangement is here used as being more convenient to the horticulturist. The seasons of bloom indicated herein are those for localities where the plants will thrive outdoors the year round. For an account of bigeneric hybrids of Zephyranthes and Cooperia, see Lancaster, Journ. Roy. Hort. Soc. 35, p. 631.

The zephyr lilies must be wintered in a place free from frost, and as the best kinds are natives of swampy places it is fair to presume that they will need more...
moisture during the resting-period than the generality of bulbous plants. The best four species are: Z. candida (Fig. 4045), white, autumn; Z. Atamasco, white, spring; Z. carinata, rosy, summer; Z. rosea, autumn. All of these will probably survive the winter out-of-doors in the middle states if given a fair degree of protection.

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KEY TO THE SPECIES.


2. Zephyranthes rosea, S. Species closely allied to Z. Atamasco and best distinguished by the lvs. as indicated in the key; perianth-segments sometimes keeled with rose, but in both species the fls. turn pinkish with age. It is a Fla. species, found in damper localities and blooming several weeks later than Z. Atamasco. V. 6:299. Gn. 33, p. 11. G. 10:1003. J.H. III. 53:273.

3. Zephyranthes tubispatha, Herb. Bulb globose, 1 in. diam.; lvs. narrow-linear, flaccid, bright green, sometimes 1 ft. long; peduncle slender, 6 in. long; spathe 1½-2 in. long, slit at the tip only: perianth 1½-2 in. long, white, slightly tinged with green, never with red, tube scarcely any, segms. obovate. W. Indies, Venezuela, and Colombia.

4. Zephyranthes erubescens, Wats. (Amaryllis erubescens, Horsford). Rare white-flowered August-blooming species supposed to be native to sandy plains of Texas, but perhaps from N. Mex.: distinguished from the 2 preceding species by the larger, longer-necked bulb, shorter perianth, and fls. strongly tinged with rose outside: bulb over 1 in. thick; neck as long: spathe bifid above: tube equaling and closely embracing the pedicel (about 1 in. long).—Intro. by Horsford 1888 and probably lost to cult.


6. Zephyranthes Conzattii, Greenm. Bulb globose, about 1 in. diam.: lvs. produced after the fls.: peduncle 6-9 in. high, slender; spathe produced about 1 in. long; perianth (dried) rose-colored or crimson-purple, tube short, segms. oblanceolate, style deciduate. Mex.

7. Zephyranthes Lindleyana, Herb. Rare summer-blooming rose-colored species from the mountains of Mex., inferior to Z. carinata for general cult.: bulb globose, ¾ in.
thick; neck short: fls. 1½-2 in. long; ovary stalked; stigma 3-fid; spathe 3-fid only at tip.

8. **rösica**, Lindl. Autumn-blooming rosy-fl. species, with much smaller fls. than *Z. carinata* but, according to American catalogues, the most popular rosy-fl. species: fls. only about 1 in. long and 1½ in. broad; bulb globose, ½ in. thick; neck scarcely any: spathe 2 fls. at tip only; ovary stalked; stigma 3-fid. Oct.

9. **longitória**, Hemsl. Summer-blooming, yellow-fl. species, distinguished from the next by characters of pedicel and spathe: bulb ovoid; neck 1½-2 in. long; spathe tubular in the lower half; pedicel much shorter than spathe: fls. yellow, coppery outside, ¾-1 in. long. New Mex.—Intro. 1889, and probably lost to cult.

10. **texina**, Herb. Yellow-fl. Texan species: bulb globose; neck 1-1½ in. long: spathe bifid only at the tip: pedicel much longer than the spathe: fls. yellow, coppery outside, ¾-1 in. long. New Mex.—Intro. 1889, and probably lost to cult.

11. **veréndi**, Herb. (Z. strüita, Herb.). Rare spring- and summer-blooming species, distinguished from other white-fl. species cult. by the sessile ovary and long-necked bulb: bulb 1 in. or less thick; neck 1-2 in. long: fls. 1½-2 in. long; greenish white, more or less tinged outside or keeled with rose. Highlands of Cent. Mex. B.M. 2583; 2593.—Offered by Dutch dealers.


**Subgenus ZEPHYRITHE.**


14. **cardinalis**, C. H. Wright. Lvs. ligulate, acuminate, about 6 in. long, above shining green, slightly canaliculate, below keeled: scape cylindrical, rose below, green above; spathe rose; perianth cardinal-red, tube funnel-shaped about 1 in. long, green, segms. broadly oblong-ob lanceolate, subobtuse. Amer. B.M. 8553.

**Subgenus PYRILLION.**


Z. alba, Hort., with pure white fls. is offered in the trade.—Z. forbesii, Hort., is a trade name.—Z. sulphurea, Hort., is offered in the trade.

**ZICHA**

**ZINGBER (name ultimately derived from a Sanskrit word meaning horn-shaped; probably referring to the ginger root). Zingiberaceae.** Gingers. Perennial herbs sometimes grown as warmhouse plants, and also for summer bedding in the southern United States for their decorative value; source of ginger. Rhizomes horizontal, tuberous: stts. leafy, the flowering and sterile differing: lvs. oblong-lanceolate, clasping the st. by their long sheaths: infl. thyrsoid-spike-like, dense cone-like or rather long, terminal or lateral; bracts usually 1-fl.: calyx cylindrical, shortly 3-lobed; corolla-tube cylindrical, segms. lanceolate, upper concave; later staminodes none or adnate to the obovate-cuneate lip; anthers-contiguous, crest narrow, as long as the cells; ovary 3-celled, ovules many, superposed; caps. oblong, finally dehiscing.—About 120 species, natives of the tropics of the Old World. Monographed by K. Schumann in Engler’s Pflanzenreich, hft. 20 (IV. 40). It is said by gardeners that in Zingiber the leaves tend to roll up or inward and in Hedychium downward.

The ginger plant is a small reed-like plant 2 feet or more high, as cultivated in greenhouses, with tuberous rhizomes, aromatic leaves and dense cone-like clusters of bracts. The flowers, however, are very rarely produced in cultivation, and Roxburgh wrote that he never saw the seeds. The plant is supposed to be native to India and China, but, like many other tropical plants of economic importance, its exact nativity is uncertain.

Some idea of the importance of ginger to the world may be gained by the fact that as early as 1884 Great Britain imported 5,600,000 pounds valued at $620,000. Medicinal ginger is prepared from the dried root; condimental ginger from the green. Candied ginger is made from carefully selected succulent young rhizomes which are washed and peeled and then preserved while scraping the roots or they will 'burn' for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially even in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies ginger may be cultivated up to an altitude of 3,500 feet.

Zingibers are occasionally cultivated as warmhouse
decorative plants. The shoots having a reed-like appearance, they may often be used to good advantage in arranging plants for artistic effects. They are of the easiest culture. Propagation is effected by division of the rhizomes in spring. These should be potted in fibrous loam to which a third of well-decomposed cow or sheep-manure has been added. Water should be given sparingly until the shoots have well developed, when they should have an abundance. They are also benefited by an occasional watering with weak liquid manure water. Toward the end of summer the shoots will begin to mature, when the water-supply should be diminished, and as soon as the plants are ripened off the pots may be stored either under the greenhouse stages or in some other convenient place, where they should be kept almost dry for the winter.

A. Margins of lvs. colored creamy white or often pink.

D. récei, Hort.; also spelled d' récei and d' Arqüé. About 2-3 ft. high: lvs. lanceolate, 6-8 x 2-21/2 in., bright shining green with a broad creamy white or often pink margin and oblique stripes of the same color: fls. deep red, bull-like.—Intro. into Fl. This species is not treated by Schumann and is probably of horticultural origin.

AA. Margins of lvs. not colored.

b. Leafy st. different from the flowering st.: spike from the rhizome.

Mígsa, Roscoe. About 3 ft. high: lvs. moderately or shortly petioled, linear-lanceolate or nearly linear, attenuate-acuminate and caudate at base, both surfaces glabrous, 10-15 x 1-21/2 in., membranaceous: spike elliptoidal, 2-31/2 in. long: fls. white; calyx tubular, acuminate; corolla-lobes lanceolate or oblong-lanceolate, lip obovate, entire: heads terminal. Japan. B.M. 8570.—It is said to be still a saying in Japan that those who eat this plant forget everything, although no one has yet demonstrated it.

bb. Leafy st. not differing from the flowering st.: spike terminal.

c. Bracts green, often pale-marginated, rotundate.

d. Lvs. grass-like, scarcely 3/16 in. broad: lip purple, yellow-spotted.

Officinale, Roscoe. Ginger. Fig. 4047. Sts. normally more than 3 ft. high from a tuberous rhizome: lvs. sessile, lanceolate or linear-lanceolate, attenuate-acuminate at base, up to 8 in. long and scarcely 3/16 in. broad: spikes elliptoidal, obtuse, dense, 2 in. long; bracts ovate, pale green, margins often yellow: calyx crenate; corolla yellowish green, lobes lanceolate, acute, lip oblong-ovate, purple, yellow-spotted, lateral lobes ovate, acute. Native of trop. Asia, but cult. throughout tropics and intro. into S. Fl. Gn. 26, p. 284.

dd. Lvs. lanceolate or oblong-lanceolate: lip yellow.

Zerumbet, Roscoe. Sts. 12-20 in. high, stout, from a tuberous rhizome: lvs. densely aggregated, oblong-lanceolate, acuminate, base acute, both surfaces glabrous or scattered pilose beneath, 31/2-6 x 2-21/2 in.: spike subglobose, dense, 2-31/2 in. long; bracts obtuse, pale green, margins pubescent (sometimes, at least when older, red); calyx spath-like, white; corolla-tube slender, lobes lanceolate, white, lip short, broadly suborbicular or subovate, pale yellow, tinged orange in the center (sometimes red-spotted), lateral lobes short, rotundate. India and Malaya. B.M. 2000.

cc. Bracts red or at the beginning reddish green, later becoming obscurely red or rose, commonly acute.

d. Spike elongated cylindrical, 3 in. or more long, apex obtuse.

spectabilis, Griff. Leafy sts. 6 ft. or more high, robust: lvs. subsessile, oblong-lanceolate, acuminate at base, obscurely green above, paler pubescent beneath, 8-12 x 31/2 in.: spike 8-12 in. long, a little over 2 in. diam., laxy cylindrical, apex rounded; bracts yellow, finally scarlet, apex obtuse: corolla yellowish white, dorsal lobe deep concave, broad, anterior narrower, linear-lanceolate, lip obovate, emarginate, 2-lobed, lemon-yellow, apex almost black, lateral lobes half as long as midlobe, ovate. Malay Penins. B.M. 7957.

dd. Spike 4 in. or less long, elongated, narrow-fusiform, apex acute.

Cylindricum, Moon. Leafy sts. 6 ft. or more high: lvs. sessile, oblong-lanceolate or lanceolate, attenuate-acuminate; base acute, glabrous above, puberulent beneath, up to 8 x 21/4 in.: spike 31/2 in. long, cylindrical, narrowed at both ends, dense, bracts lower obtuse, upper acute, pale or reddish; corolla-labes lanceolate, greenish, subequal, greenish, lip yellowish white, lateral lobes small, obtuse. Ceylon.

Z. cortinum, Hance. Leafy sts. differing from the flowering, about 3 ft. high: lvs. sessile, linear-lanceolate, glabrous above, pilose beneath, 12 x 21/4 in.: spike oblong, obtuse, 7 in. long, bracts ovate, scarlet: corolla-labes red, oblong, acuminate: lip oblong, lateral lobes inconspicuous. China.—Once offered in Fl.

P. Tracy Hubbard.
ZINNIA are hardy plants, growing a foot or more high and covered from July until the first hard frost with double flowers 2 inches or more across. Several well-marked colors are commonly seen in zinnias—white, sulfur, yellow, golden yellow, orange, scarlet-orange, scarlet, flesh-color, lilac, rose, magenta, crimson, violet, purple, and dark purple. There are also variegated forms, but the solid colors are most popular. The zinnia is rich in shades of purple and orange, but lacks the blue and pink of the China aster and is poor in reds compared with the dahlia. Three forms or classes of the common zinnia (Z. elegans) may be noted here:

I. Tall zinnias are ordinarily 20 to 30 inches high. This size and the next smaller size are the favorites for general purposes. The tall kinds are available in twelve and more colors. A robust race, which attains 28 to 40 inches under perfect conditions, is sometimes known to the trade as Z. elegans robusta grandiflora plenissima. It is also known as the Giant or Mammoth strain. This strain was developed after many years by Herr C. Lorenz and was introduced in 1886. A maximum diameter of 6 inches is recorded for flowers of this strain. In G.C. II. 26:461 is shown a flower measuring 4 by 4 inches, with about eighteen series of rays, the latter being so numerous and crowded that the flower is less regular than the common type. A specimen zinnia plant 3 feet high is attained in the North only by starting the seed early and giving perfect culture.

II. Medium-sized zinnias range from 12 to 20 inches in height. They are available in several colors. Here belong most of the forms known to trade catalogues as Z. pumila, Z. nana, and Z. compacta.

III. Dwarf zinnias range from 3 to 12 inches in height and are of two subtypes, the pompons and the Tom Thumbs. The pompons, or "Liliputians," are taller-growing and smaller-flowered, generally about 9 inches high, with a profusion of flowers about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are available in several colors, not all of which are yet fixed in the seed.

Second in importance to Z. elegans is Z. Haageana. The single form was introduced to cultivation about 1861 and the double about 1871. It is dwarfer than most zinnias, and has smaller flowers, with a color-range restricted to shades of orange. It is distinct and pretty but less showy than the common zinnias. The first race of hybrids between Z. Haageana and Z. elegans appeared in 1876 under the name of Z. Darwinii. This group is said to resemble Z. elegans in size and color of flowers and to resemble Z. elegans in habit, being more branched and forming a broader and thicker bush.

Zinna are of the easiest culture, thriving in any deep good soil, whether loamy or sandy. The seeds may be sown about May 1, or whenever the soil is in fit condition for hardy annuals. Such treatment will give flowers from the first of July until frost. The young plants should be thinned so as to stand 1 to 2 feet apart, depending on whether they are of medium- or tall-growing habit. By midsummer the foliage should obscure the ground. For the very best results the seed may be started indoors about April 1, and the seedlings transplanted once or twice before being placed outdoors in permanent quarters. Dwarf varieties should be set 14 to 16 inches apart; taller kinds 2 feet each way. Zinnias are essentially coarse plants, but if the tall kinds are massed heavily in the borders or at some distance they produce striking and very acceptable effects. Their colors are strong, and the stoutness of stems and foliage add to the composition.

a. Plant annual.

b. Achenes of the disk-fls. short and broad, obovate, 2-2½ lines long.

c. Colors various: lvs. clasping, cordate-ovate or elliptic.

elegans, Jacq. Youth-and-Old-Age. Figs. 4049-4050. Erect annual, a foot or more high, but varying from 3 in.
3546 ZINNIA

to 3 ft.: lvs. ovate or elliptic, clasping, about 1 in. wide: rays becoming reflexed, originally purple or lilac, but now of nearly every color except blue and green; disk originally yellow or orange, but nearly or quite absent in the common double forms; fls. 2-5 in. across. July to Oct. Mex. Single forms are pictured in B.M. 527. P.M. 1:223, B.R. 1294 (the last two as Z. violacea). Double forms, F.S. 13:1394, R.H. 1861:251; 1864:331, G. 4:138. Pompons in Gn. 48, p. 464 (Liliput); 30:270 (deceptive as to size), R.B. 20, p. 152.—The common species from which most of the garden zinnias are derived.

c. Color of rays yellow; disk yellow.

**Haageana, Regel (Z. mezioida, Hort.)**. Fig. 4051. Distinguished from Z. elegans by the orange-colored fls., which are generally smaller; also the plant is dwarfer, as a rule, and the lvs. are merely sessile, not clasping. Trop. Amer. Single forms, Gn. 30, p. 270; 48, p. 494. Double, Gn. 30, p. 271; 48, p. 464, G. 2:73. F. 1871, p. 229, A.G. 13:218. Var. stellata, Hort. Florets twisted and acuminate, orange-yellow.—This is considered by Robinson & Greenman as a horticultural species not certainly distinguishable from Z. angustifolia, in spite of its broader lvs.

**pauciflora, Linn.** An erect annual: lvs. lanceolate to oblong-ovate, usually rough: heads yellow, about 1 in. across, with rather broad, spreading, red, purple or mostly yellow rays in cult. specimens: plant hisrute, with spreading hairs; somewhat corymbosely branched above: peduncles at maturity enlarged upward and hollow. Mex., Peruvian Andes.

d. Rays suberect or scarcely spreading; disk yellow.

**multiflora, Linn.** This and the next are included by most writers in Z. pauciflora, but Z. multiflora may be distinguished from Z. pauciflora by the pubescence of the st. being much finer, oppressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B.M. 149.

c. Color of rays red or purple.

d. Rays revolute; disk dark-colored.

**tenuiflora, Jacq.** Fig. 4052. Very distinct by reason of its linear rays which are cardinal-red in color, becoming revolute. It has a dainty fl. head about 1 in. across hardly comparable with the showy Z. elegans. This species has been cult. in Amer. but seems to be no longer advertised here. It is referred to Z. pauciflora by most writers, and to Z. multiflora by Robinson & Greenman. B.M. 555. A.G. 11:243.

AA. Plant perennial.

**grandiflora, Nutt.** Hardy, low-growing. Colo. perennial, with woody root, erect, stiff, and very rough st. having a shrubby base, linear lvs., and sulfur-yellow rays which are very broad, almost round in outline; lvs. less than 1 in. long and 3-nerved. Colo., New Mex., Ariz., Mex.

**ZIZANIA** (an old Greek name of some wild grain). Gramineae. Tall aquatic grasses with lush sts., long blades, and large terminal panicles of moncocious fls.; spikelets I-fl., the pistillate upper portion of the panicule narrow and appressed, the staminate lower portion spreading; pistillate spikelets long-awned.—Species 3, 2 in N. Amer. and 1 in N. Asia.

**palustris, Linn. (Z. aquatica, of Auth., not Linn.)**

**INDIAN RICE. WATER OATS. WATER RICE. WILD RICE.** Fig. 4053. Annual: culms tall, as much as 9 ft.: lvs. broad and flat.—Recommended for borders of lakes and ponds. The grain is excellent for fish and waterfowl. Wild rice lakes and ponds are favorite resorts of sportsmen in the fall. Before sowing, put the seed in coarse cotton bags and sink them in water for 24 hours. Sow in water from 6 in. to 5 ft. deep, with soft mud bottom, or on low marshy places which are covered with water the year round. In running water, sow as much out of the current as possible. Sportsmen are not generally aware that seed can be obtained in large quantities and at a reasonable price from seedsmen. Wild rice is very desirable for aquatic gardens, being one of
ZIZANIA


A. S. Hitchcock.

ZIZIA (named for I. B. Ziz, a Rhenish botanist). Umbellifera. Perennial herbs of little horticultural value, but offered by some dealers in native plants.

Leaves ternate or ternately compound or the basal undivided; fls. yellow, in compound umbels, the central fl. of each umbel sessile; involucres none; involucels of several small bracts; calyx-teeth prominent; fr. ovoid or oblong, glabrous or nearly so, ribs filiform, not winged.

Three species, N. Amer.

A. Rays of umbels 9-25, stout, ascending.

Z. aurea, Koch. GOLDEN ALFRED D. Height 1-2½ ft., glabrous and branched; basal and lower Ivs. 2-3-ternately compound; upper Ivs. ternate; fr. oblong, 2-1½ lines. April-June. Fields, meadows, and swamps, New Bruns., Sask. and S. D. to Fla. and Texas.—A weedy-looking plant.

Z. Bebbii, Brit. Distinguished from Z. aurea by the rays and by the fr., which is oval or broader, 1-1½ lines. May. Mountain woods, Va. and W. Va. to N. C. and Ga.

F. Tracy Hubbard.

ZIZYPHUS (from Zizouf, the Arabian name of Z. Lotus). Rhamnaceae. Jujube. Ornamental woody plants grown chiefly for their handsome foliage, and some species for their edible fruits.

Deciduous or evergreen shrubs or trees; Ivs. alternate, short-petioled, 3-5-nerved from the base, serrate or entire; the stipules mostly transformed into spines, often only one stipule spiny or one a straight and the other a hooked spine: fls. 5-merous; ovary 2-4, usually 2-loculed; style usually 2-parted: fr. subglobose to oblong, usually orange-red, ½-3¼ in. long, on a stalk nearly half its length. March-June. S. Asia, Afr., Austral. Gn. 13, p. 194. S.M. 3:447.—Variable in shape and color of the fr.; for figures of several varieties see Hooker Jour. Bot. 1 (1834):321. The jujube is somewhat planted in Fla. and Calif., although it yet has no commercial rating as a fr.-plant. The frs. or berries are ripe in Nov. and Dec., and the plant begins to bear at 3 years from planting. The jujube fr. is used in confectionery.

Z. sativa, Gaertn. (Z. vulgata, Lam.). COMMON JUJUBE. Shrub or small tree, attaining 30 ft., glabrous; prickly or unarmed; the longer prickle up to 1½ in. long; branchlets often fascièd, slender and having frequently the appearance of pinnate Ivs.: Ivs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes but it is tender north of Washington, D. C. Most kinds have handsome foliage and are well adapted for planting in shrubberies in the southern states and California. They seem to thrive in any well-drained soil. Propagation is by seeds, by greenwood cuttings under glass and by root-cuttings.

Jujuibe, Lam. Fig. 4054. Tree, 30-50 ft. high; branches usually prickly; young branchlets, petioles and inf. densely rusty tomentose: Ivs. broadly oval or ovate to oblong, obtuse, sometimes emarginate, serrate or entire, dark green and glabrous above, tawny or nearly white-tomentose beneath, 1-3 in. long: fls. in short-stalked many-fl. axillary cymes: fr. subglobose to oblong, usually orange-red, ½-3¼ in. long, on a stalk nearly half its length. March-June. S. Asia, Afr., Austral. Gn. 13, p. 194. S.M. 3:447.—Variable in shape and color of the fr.; for figures of several varieties see Hooker Jour. Bot. 1 (1834):321. The jujube is somewhat planted in Fla. and Calif., although it yet has no commercial rating as a fr.-plant. The frs. or berries are ripe in Nov. and Dec., and the plant begins to bear at 3 years from planting. The jujube fr. is used in confectionery.

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4053. Zizania palustris.
emarginate, serrulate, glabrous, ½-2 in. long; fls. yellowish, fascicled, in axillary cymes: fr. ovoid to oblong, dark blue black, 1½-2 in. long; fr. red, flat, short-toothed, May to December. The trees are regular bearers and the crop is never cut off by spring frosts, as they do not blossom until desired for consumption fresh is gathered when showing the characteristic reddish brown or mahogany color, but if to be dried it is left on the tree until it assumes a darker shade and the skin is wrinkled. In this condition, after a short exposure to the sun the fruit will keep a year or longer. For preserving in syrup or glazing, the unwrinkled fruit, being slightly more pitted, is preferred.

The jujube is well worth the attention of fruit-growers and when produced in sufficient quantities will find an active demand from citizens from the south of Europe, It will appeal to all when fresh from the tree when properly processed, and for its medicinal virtues when simply dried or made into pastes or tablets. 

G. P. RIXFORD.
CXX. Zinnia, Giant Yellow and Scarlet.

V. in a close spike-like panicle; spikelets closely appressed, 1-fl., awnless, the single glume coriaceous, acute, compressed, inclosing the lemma and palea. —Species 4. S. E. Asia and Australasia.

japonica, Steud. KOREAN LAWN-GRASS. PALM-BEACH GRASS. Somewhat coarser than Z. Matrella, the blades as much as ½ in. wide, the panicles about 1 in. long, often purplish. A native of Japan and China; intro. many years ago from Korea; now grown in Fla. and is hardy as far north as Conn. Recommended for use on sandy soil from N. C. to Fla. Dept. Agric., Div. Agrost. 20:29.

Matrella, Merr. (Z. pungens, Willd. *Osterdinium Matrella*, Kunze). MANILLA GRASS. Sts. creeping, throwing up numerous short leafy shoots and flowering sts.: lvs. crowded, firm, 1-3 in. long, ending in a sharp hard point; spikes 1-2 in. long; spikelets ½ in. long, smooth and hard. A native of S. E. Asia, E. Indies.—Grown in Fla. and along the Gulf Coast.

tenuifolia, Willd. MACARENE GRASS. VELVET-GRASS. Lvs. thread-like, finer than in the other species. Forms a beautiful turf resembling that of red fescue. Native of the Mascarene Isls. Intro. into the U. S. from Guam in 1912. Used in Calif. where it is called velvetgrass, and along the Gulf Coast.

The name velvet-grass describes it very aptly as it looks like dark green velvet. It grows so thickly that it will smother out any other plant, even Bermuda- or "devil"-grass. Even if frozen off it will come up from roots. It needs little water, no cutting, will run out all other plants, will not become a pest as it sets no seeds in California, and is lovely in appearance. It is so fine that it may be pulled into thousands of pieces to the square foot and every little piece will grow, so that a small quantity will plant a large area. (Ernest Braunton.)

A. S. Hitchcock.

**ZYGADENUS** (Greek, yoke and gland, some of the species having two glands in the base of the perianth). *Liliaceae*. Smooth and somewhat glaucous perennials with non-bulbous rhizomes or with tunicate bulbs; some of the species are grown as ornamentals in the open ground; interesting plants of secondary importance horticulturally.

Leaves radical or gathered at the base of the stem, linear, those of the st. small and few: raceme terminal, simple or paniculate-branched: fls. perfect or polyamous, white, yellowish or greenish; perianth withering persistent, spreading, the petal-like oblong or ovate segms. 1-2 glandular near the more or less narrow but not clawed base; stamens 6, free: caps. 3-celled in fr., the cells separate at the top or for their entire length.—About 25 species have been described, one of which is *Z. Kuntze*). Three feet or less, wide, green on both sides: racemes paniculate: fls. about ½ in. across, the segms. oblong and not clawed. N. Y. to Cal.

**AA.** Sts. from a more or less bulbous base.

**BB.** Locules dehiscing only above middle: stamens inserted on perianth-segms.: glands none: bulbous. (Antimium; preferably retained as distinct genus.)

**CC.** Glands very obscure: bulb somewhat fibrous, narrow.

**leimanthoides**, Gray (Oceanbrus leimanthoides, Small). Sts. slender and leafy, 4 ft. or less tall: lvs. ½ in. or less wide, green on both sides: racemes paniculate: fls. about ½ in. across, the segms. oblong and not clawed. N. Y. to Cal.

**DD.** Fls. polygamous, small.

venenosus, Wats. Slender, 2 ft. or less tall: lvs. very narrow (½ in. or less), sebaceous, not glaucous, the st., lvs. not sheathing, flowers long (½ in.), simple or branched raceme, the perianth free from the ovary, the segms. ½ in. or less long, elliptic-ovate to elliptic, short-clawed. Calif.—Bulb poisonous.


**ZYGOCÁCTUS** (cactus with zygomorphic flowers). *Epiphyllum* of horticulturists. *Cactaceae*. CHAB-CACTUS. This genus is confined to Brazil, so far as known, where the plants grow as epiphytes upon the trees, along with orchids, growing in large clusters on the branches: stts. flat and jointed, becoming rounded with age, and then areces only on the margins and more or less truncated ends, from which grow the new branches and the conspicuously zygomorphic fls. ovary devoid of bracts, and those of the tube comparatively large and colored as the petals. The genus is allied to *Epiphyllum* (Phyllocactus), with which it was at first united; but it is still more closely connected with Schlumbergera. In cult. many forms have been produced through hybridization between the different species and with *Epiphyllum* and the allies of Cereus, so that typical plants are rarely met with.
**ZYGOCACTUS**

Truncatus, Schum. (Epiphyllum truncatum, Haw.).

Clara Cactus, Christmas Cactus. Fig. 4055. Sts. much branched and hang in large bunches from the trees; joints obovate to oblong, with strongly truncate apex, 1½–2 in. long, by about ¾–1 in. broad, bright green, margins coarsely serrate, with 1–3 large, acute teeth on each side, the 2 upper ones forming more or less incurved horns on either side of the truncation; areoles bearing a few short yellowish or dark-colored bristles, or none: fls. horizontal, growing from the truncated end of the younger joints, strongly irregular, 2½–3½ in. long, in various shades of red, fr. petal-shaped, red, about 3 in. diam. Brazil.

B.M. 2562. G.C. III. 19:9.—Most of the forms in cult. are hybrids between this species and some other of the genus with allies of Cereus. A common basket- and ruffle-plant.

For Epiphyllum Buseellanum and E. Garthi, see Schlumbergera.

**J. N. Rose.**


**ZYGOPELALUM** (name referring to the united flower parts). Orchidaceae. Mostly epiphytic orchids of easy culture.

Plants with numerous distichous lvs. sheathing a short st. which usually becomes thickened into a pseudobulb; lvs. membranaceous, veiny or plicate; fls. solitary or in racemes, showy; sepalis and petals nearly alike in form and color, often united to each other at the base, the lateral sepalis forming a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a prominent fleshy crest on the disk; column incurved, wingless or with small wings; pollinia 4, not appendiculate.

The Z. Mackaii group grow well under pot culture. One or two species with creeping rhizomes, like Z. maxillare, thrive best on sections of tree fern, osmunda rhizome, or in baskets. A good compost consists of equal parts of chopped sod, peat-fiber and sphagnum moss, well mixed and interspersed with pieces of rough charcoal, about one-half of the pot space being devoted to clean drainage material. After distributing the roots, the compost should be worked in carefully but not too firmly about them, leaving the base of the plant even with, or just above, the rim of the pot. Repotting should be done when the plants show new root-action. The temperature should range about 60°F. by night and 65° to 70°F. by day in winter, and in summer as low as possible, with free ventilation during inclement weather. A cool, light location in the cattleya department is favorable. The compost should be kept in a moist condition at all times. The plants are propagated by cutting through the rhizome between the pseudobulbs at a good eye, potting up the parts and removing them to a rather higher temperature until they start into new growth. (Robt. M. Gray.)

**a. Anther long-rostrate.**


**a.a. Anther not rostrate.**

**b. Petals spotted or blotched.**

**c. Labellum glabrous.**

**Mackaii**, Hook. Fig. 4056. Pseudobulbs large, ovate: lvs. many, linear-lanceolate, 1 ft. long: scape 1½ in. long, bearing 5 or 6 large fls.: sepalis and petals dingy yellowish green, with blotches of purple on the inside, lanceolate, acute, erect, spreading, all united toward the base; labellum large, rounded, emarginate, white with radiating vein-like deep blue lines, glabrous. Brazil. B.M. 2748. B.R. 1433 (as Eupophia Mack- aiana). P.M. 3:97. L.B.C. 17:1664. J.H. III. 33:295. G.M. 53:1037.—This is distinguished from Z. intermedium and Z. crinitum by its smooth labellum and narrower lvs. Var. supérbus, grandiflorum, majus are also advertised. Var. Charlesworthii, Hort. Sepalas and petals emerald-green, without purple markings. G.C. III. 51:33.

**Gaútheri**, Lem. Pseudobulbs oblong-sulcate, 4 in. high: scapes 2–3-ft.: fls. 3 in. across; sepalis and petals green blotched with brown; labellum broadly reniform, deep purple at the base, white in the middle, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. I.H. 14:555. G.N. 49:118.—The lvs. are fasciculate, narrowly oblong, keeled, 12–16 in. long: infl. shorter than the lvs.
maxillare, Lodd. Pseudobulbs 2 in. long; lvs. lanceolate, 1 ft. long; scape 9 in. long, 6-8-fl.: fls. 1½ in. across; sepals and petals ovate-oblong, acute, green, with transverse brown blotches; labellum horizontal, purple, with a very large, glossy purple, notched horse-shoe-shaped crest, middle lobe roundish, waved, and obscurely lobed. Winter. Brazil. B.M.3886. L.B.C. 18:1776. J.H. III. 33:295. P.M.4:271.—Distinguished by its small fls. and very large crest.

cc. Labellum pubescent.

crinulum, Lodd. Habit of Z. intermedium: lvs. broadly linear-lanceolate; fls. on long, stout scapes; sepals and petals 2 in. long, oblong-lanceolate, green with rather few brown blotches; labellum 2 in. across, spreading, wavy, scarcely emarginate, white with purple veins radiating from the thick crest, disk hairy. Fls. at various times. Brazil. L.B.C.17:1687. B.M.3402 (as Z. Mackaaii var., crinulum).—This has fewer brown blotches on the sepals and petals than Z. intermedium. There are varieties with pink, blue, or almost colorless veins on the labellum. Var. caesileanum, Hort., has the veins deep blue. G.M. 46:153; 50:50. J.H. III. 46:197.

intermedium, Lodd. Lvs. ensiform, 1¾ ft. long, 1½ in. wide: scape longer than the lvs., bearing 5-6 fls. each nearly 3 in. across; sepals and petals oblong, acute, green with large, confluent blotches of brown; labellum rotund, narrowed at the base, deeply 2-lobed in front, pubescent, bluish white with radiating broken lines of purplish blue; column green and white. Fls. in winter. Brazil. R.H. 1873:190 (as Z. Rivieri).—Plants of Z. Mackaaii are often cult. under this name.

dd. Petals uniformly colored.

Sédentii Reichb. f. Plants strong, with the scape, about as long as the lvs. and bearing several fls.; sepals and petals deep purple-brown, bordered with green; labellum pale purple in front, becoming deep purple toward the base. F.M. 1880:417. Gr. 28:265.—A garden hybrid raised by Veitch.


HEINRICH HASSELBRING.

GEORGE V. NASH.

**ZYGOPHYLLUM** (yoke leaf, from the paired or opposite lfts. or lvs.). **Zygophyllaceae.** Small often spiny twiggy shrubs or subshrubs, with stiff branches, of about 60 species in Eu. and Asia but mostly in S. Afr. and Austral., apparently not in the American trade but likely to be planted for ornament now and then by amateurs in the warmer and drier parts of the country. Lvs. simple or 2-foliolate: fls. white or yellowish or red, on 1-fld. peduncles; calyx 4-5-parted; petals 4 or 5, clawed, twisted; stamens 8-10; disk fleshy and angled; ovary 4- or 5-celled, sessile: fr. an angled or winged caps. Prop. by seeds or cuttings. The species most likely to appear in collections are perhaps Z. Fabago, Linn., the Syrian bean-caper, with obovate lfts., copper-yellow fls., deep strong root and nearly or quite herbaceous top, S. W. Asia; Z. Morgana, Linn., with obvate obtuse lfts., long yellow petals, and shrubby habit, from S. Afr.; Z. spinifera, Linn., with linear lfts., yellowish or whitish nodding fls., a small bush only 1-2 ft. high, from S. Afr.
Supplement

Here are assembled certain lists and addenda that are supplementary to the body of the Cyclopedia, to provide the consultant with additional facilities for the use of the volumes. These appendices are as follows:

Collaborators in the making of the Cyclopedia .................................................. 3555
Cultivator’s guide to the articles ................................................................. 3562
Additional species ...................................................................................... 3565
New combinations in Latin names ............................................................... 3574
Finding-list of trade names ........................................................................ 3575
Index to the six volumes ............................................................................... 3611

Other articles of a similar character, providing keys and synopses, are printed in Vol. I, as follows:

Explanations, comprising a statement of the authorship of articles, nomenclature, pronunciation, spelling, the keys, abbreviations of botanical terms and expressions, books and periodicals to which reference is made, the authors of botanical names .......................................................... 31
Synopsis of the plant kingdom .................................................................... (with index) 1-78
Key to the families and genera ...................................................................... (with index) 79-147
Name-list, comprising the English equivalents of Latin names of species ..................... 148
Glossary of the usual botanical and horticultural technical words ................................. 160
A fuller discussion of nomenclature will be found under “Names and Nomenclature,” Vol. IV, 2095; also in the Finding-list ........................................................................................................ 3575

For five years the work of compiling the Standard Cyclopedia of Horticulture has been actively under way. The present office was opened in March, 1912, but the organizing of the work had been started before that time. Although founded on the Cyclopedia of American Horticulture, completed in 1902, the present Cyclopedia is newly organized and newly written. Whenever the articles in the former work have been used as a basis, they have been brought down to date. The preface to Vol. I states the scope and intention of the present work.

The List of Collaborators (pages 3555 to 3561) comprises upward of 400 names, and many other correspondents have aided in less formal ways. To all these helpers the reader will extend his gratitude for the satisfaction he may find in any of the pages. The publishers, printers, artists, writers, and others have cooperated in the freest spirit.

If the consultant desires to know the office methods in compiling a work of this character, he may read the introductory account in Vol. IV of the former Cyclopedia, for the general details do not differ greatly between the two. The Editor gathers his force, finds himself a table and a very few simple accessories, supplies himself with writing materials and books, and then goes to work and holds to it through all the letters from A to Etc. If the reader finds a misplaced letter or accent mark, he may consider that each page comprises about 10,000 pieces of type metal, or more than 36,000,000 pieces for the entire work; these pieces are of many technical devices; and human eyes are fallible. In the first year or two of the work, the Editor was engaged otherwise and could give only small fragments of his time to the Cyclopedia.

If the reader desires statistics of such work, the following figures may interest him:

I. The Number of Articles.
Total number of entries or articles, including cross-references (the sub-articles are the independent articles or parts in the main articles and in the symposia, indicated by black-face lower-case type):

Volume I ........................................ 693
Sub-articles .................................. 38
Volume II .................................... 1,101
Sub-articles .................................. 29
Volume III ................................... 756
Sub-articles .................................. 212
Volume IV ................................... 808
Sub-articles .................................. 94
Volume V ..................................... 650
Sub-articles .................................. 64
Volume VI ................................... 905
Sub-articles .................................. 19
Supplement (additional generic entries) ..................................................... 3

II. The Number of Plants.
The number of genera entered:

Volume I ..................................... 422
Volume II ..................................... 769
Volume III ................................... 442
Volume IV ................................... 550
Volume V ..................................... 449
Volume VI ................................... 639
Supplement .................................. 3

The number of main species described or entered, in black-face type:

Volume I ..................................... 1,801
Volume II ..................................... 2,741
Volume III ................................... 1,512
Volume IV ................................... 1,001
Volume V ..................................... 2,094
Volume VI ................................... 2,372
Supplement .................................. 102

(3553)
SUPPLEMENT

The number of minor species-entries in the main articles, in italic type:

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The number of Latin-named varieties (of species) of all grades in main articles:

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The number of synonyms:

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Total Latin names accounted for (aside from a few new entries in the finding-list in Supplement to Vol. VI):

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III. THE NUMBER OF SPECIES (IN BLACK-FACE TYPE), NATIVE TO NORTH AMERICA NORTH OF MEXICO:

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IV. THE DATES OF PUBLICATION:

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<td>Volume II</td>
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<tr>
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<td>May 12, 1915</td>
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<td>October 4, 1916</td>
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<td>Volume VI</td>
<td>March 28, 1917</td>
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Within the five years several horticulturists have passed away, whose biographies would have been proper subjects for entry in the Cyclopaedia. Among such losses are C. E. Bessey, who died February 25, 1915; H. E. Van Deman, April 28, 1915; G. B. Brackett, August 2, 1915; Edwin Lonsdale, September 1, 1915; W. Atlee Burpee, November 26, 1915; William Tricker, July 11, 1916; William S. Lyon, July 20, 1916; Jackson Dawson, August 3, 1916; Ernest Walker, December 5, 1916; W. C. Barry, December 12, 1916.

To spend five years in a review of the vegetable kingdom, with all its marvels and its unsolved problems, is in itself a great privilege. If in addition one may see the applications to the desires of man, may hold associations with several hundred enthusiastic and competent correspondents, may have relations with the commercial and financial questions involved, and may at the same time catch some glimpses of the reaches of evolution and feel a new contact with the earth, the making of a Cyclopaedia of this kind becomes not a task but an experience in life. The Editor hopes that the reader may share some of these prospects. The Editor is well aware of the shortcomings of the volumes and he would like to do the work all over again for the delight of it; but this reward must be left for other hands in the years that are to come.

Ithaca, New York,
February 1, 1917.

L. H. BAILEY.
COLLABORATORS

Comprising those persons who have aided in the making of the Standard Cyclopedia of Horticulture by the writing of articles, proof-reading, and the contributing of information.

*Means a contributor to the Cyclopedia of American Horticulture (1800–1902), whose name appears in the present work.

†Means contributor deceased since contribution was made for present Cyclopedia.

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BERCKMANS, P. J. (Arboreturm, Magnolia, Pinckneya.)

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*MATHWS, WM. (Culture of many orchids.)

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McFarland, J. HORACE, Printer, Author, Lecturer, Harrisburg, Pa. (Border, Garden Cities, Photography.)

McKelton, T. H., Prof. of Horticulture, State College of Agriculture, Athens, Ga. (Rueгр-phia, Georgia, Pear.)

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*MEREDITH, A. P. (Hameca.)

Michel, Eugene H., Supt. Dreer's Nurseries, Riverton, N. J. (Help on Name-List.)

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Miner, Wm. W., Farmer and Fruit-Grower, Palmyra, N. Y. (A. M. Purdy.)

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Montillon, Eugenie D., Instr. Landscape Art, New York State College of Agriculture, Ithaca, N. Y. (Topiary Work.)

Moon, Henry T., Nurseryman, Morrisville, Pa. (James Moon.)

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Muller, Route T., Surgeon, 616 Madison Ave., New York City. (Nut-culture.)

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Morrison, Wm. S., Prof. of History and Political Economy, Clemson College, S. C. (J. S. Newman.)

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* Munson, T. V., Nurseryman, Denison, Texas. (Grape, Texas.)

*Munson, W. M. (Vaccinium.)

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Nekeling, H., Horticulturist, Palm Cottage Gardens, Gotta, Fl. (Cultural notes on many Florida plants.)

Nelson, Aven., Prof. of Botany, University of Wyoming, and State Horticulturist, Laramie, Wyo. (Wyoming.)

*NEWBURY, H. E. (Polianthes.)

Newbury, W. R., Magnolia, N. C. (Polianthes.)

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O’Gara, P. J., Pathologist and Chief in Charge of Agricultural Investigations, American Smelting and Refining Co., Salt Lake City, Utah. (Frost.)

*O’MARA, PATRICK. (Potting.)

Oliver, G. W., Plant-Breeder, U. S. Dept. of Agric, Washington, D. C. (Many articles on palms, aroids, eucalyptus, and rare plants.)

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Oswe, O. E., Plant Propagator, U. S. Plant Introduction Field Station, Chico, Calif. (Culture of many orchids, Border, Osmundine, etc.)

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Parsons, Samuel, Landscape Architect, Architects' Bldg., 101 Park Ave., New York City. (Lawns.)

*Peacock, Lawrence K. (Dahila.)

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Pate, H. L., Dean of Agricultural Dept., Virginia Agricultural College, Blacksburg, Va. (Virginiana.)

*Prince, L. B. (Wm. Prince.)

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Raffaelle, C. T., Gardener, Royal Botanic Gardens, Kew, England. (Culture of Achimenes, Calathea, etc.)


Rankin, W. H., Ass't. Prof. Plant Pathology, New York State College of Agriculture, Ithaca, N. Y. (Arboriculture.)

*Rawson, Grove P. (Lantana.)

*Reasoner, E. N. (Banana and many other articles on semi-tropical plants.)

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Reed, J. L., Ph.D., Washington, D. C. (Musa, Nictiana, and several leguminous genera.)

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Robinson, B. L., Prof. of Systematic Botany and Curator of the Gray Herbarium, Harvard University, Cambridge, Mass. (Acaparum, Eupatorium.)

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Rogers, Stanley S., Assoc. Prof. of Plant Pathology, College of Agriculture, University of California, Berkeley, Calif. (Ceratocephala, Platicarpa, Zygophyllum.)

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*Roth, F. (Raphus.)

Rover, Richard, Nurseryman, Glenside, Pa. (Notes on culture of many hardy garden herbs.)

Rowlee, W. W., Prof. of Botany, Cornell University, Ithaca, N. Y. (Liatris, Saizia.)


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Schinder, John, & Co., Inc. Flower Bulb Specialists, 2 Stone St., New York City. (Help on Tulips.)

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*Scott, William. (Many cultural articles.)

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*Sixton, Joseph. (Pomos-Grass.)

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*Skore, Robert. (Bedding, Begonia, Marguerite.)

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Smith, Irving C., Market-Gardener and Fruit-Grower, Ashland, Wis. (Onions.)

*Smith, Jared G. (Many genera of palms.)


*Steele, E. S. (Perugynium-Gardening.)

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*WARD, R. H. (J. A. Warder.)


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WOODBURY, C. G., Prof. of Horticulture, Purdue University, LaFayette, Ind. (W. H. Bagan.)

WOODS, ALBERT F., Dean Colleges of Agriculture and Forestry and Dir. of Experiment Stations, University of Minnesota, University Farm, St. Paul, Minn. (Variation.)

WOOLVERTON, LINUS, Fruit-Grower, Grimsby, Ont. (Many biographical sketches.)

WORK, PAUL, Instr. in Vegetable-Gardening, New York State College of Agriculture, Ithaca, N. Y. (Irrigation, Kitchen-Garden, Vegetable-Gardening.)

WRIGHT, J. HARRISON, Fruit-Grower, Riverside, Calif. (Help on palms.)

WYMAN, A. PHELPS. (Many genera of trees and shrubs.)


ZVOLANEK, ANT. C., Seed-grower, Lompoc, Cali. (Sweet Pea in California.)
CULTIVATOR'S GUIDE TO THE ARTICLES

The numerals refer to pages when the articles are not in the regular alphabetic sequence.

The articles in the Cyclopaedia are of four general classes: (1) cultural directions for the gardener, fruit-grower, vegetable-gardener, florist, and home planter; (2) identification, comprising the botanical accounts of genera, species and varieties; (3) general information about plants, comprising much of the introductory material in Vol. I and articles in the alphabetic text as Autumn Colors, Bull Horn, Color, Standards of Color, Cuttings, Evergreens, Insects, Ivy, Japanese gardens, Landscape gardening, Lawns, Perennials, Pests of fruits, Planting, Rose, Rusts, Shrubs, Roses, Spraying, Trees, and Vines; (4) geographical articles, comprising British North America, Island Dependencies, North American States. The identificational and informational articles appear, for the most part, in regular alphabetic order. The cultural directions, however, are in part contained in class articles of many kinds, inasmuch as they have only indefinite alphabetic designation. With each important generic entry, cultural directions will be found, as under Wisteria, Rhamnus, Ardisia, Pyrola, treatment, With list of lead- Vines: see under Planting, 2684.

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1. Leading or important class articles of a cultural or plant-handling character.

Some of the leading class articles, dealing with the cultivation and handling of plants and products and with arrangement of plant materials, are as follows:

- Alpine plants.
- Annuals.
- Ants.
- Aquatics.
- Arboriculture.
- Arboriculture (Symposium), comprising contributed parts on uses, insects and diseases, culture, transplanting, lists.
- Autumn-gardening.
- Bamboo.
- Banks.
- Basket plants.
- Bedding, or bedding-out.
- Bees.
- Birds.
- Bog-gardening; also page 2666.
- Border.
- Botanic garden.
- Bouquet.
- Breeding of plants.
- Bulbs.
- Conifer; also page 258.
- Conservatory.
- Culinary herbs.
- Cut-flower industry.
- Cutting.
- Design, floral.
- Diseases and insects (Symposium), comprising extensive lists, also fungicides, insecticides, sprays.
- Drainage.
- Dwelling.
- Electro-horticulture.
- Elision.
- Everbearing fruit.
- Evergreens.
- Everlastings.
- Exhibitions (Symposium).
- Ferns (Symposium), with lists and culture.
- Fertility.
- Fertilizers.
- Floral designs: see Designs, floral.
- Floriculture.
- Foliage-garden: see Kitchen-garden and flower-garden.
- Forage.
- Forestry.
- Formal-gardening; see under Landscape gardening, 1705.
- Frost.
- Fruit-growing.
- Fumigation: see under Diseases and insects, 1044.
- Fungi.
- Grafting.
- Grasses.
- Greenhouse and management (Symposium).
- Herbals.
- Herbs (Symposium), with lists.
- Horticulture.
- Hotbeds and coldframes.
- House plants.
- Insects: see under Diseases and insects.
- Inspections of horticultural merchandise.
- Irrigation, including sub-irrigation.
- Japanese gardens; see under Landscape gardening, 1709.
- Kitchen-garden and flower-garden (Symposium).
- Labels.
- Landscape gardening (Symposium), including formal gardens, cemeteries, parks, lawn-making, and other.
- Lawns; see under Landscape gardening, 1840.
- Lawn planting; see under Landscape gardening, Herbs, Planting, Arboriculture (see List No, 9, page 3564).
- Layers.
- Light for greenhouses.
- Lists of trees (including Arboriculture), herbs (Herbs), shrubs (Planting); also under Ferns, Orchids, Palms, Machinery and implements (Symposium).
- Mastic.
- Market-gardening.
- Misting.
- Mush-chund-gardening.
- Mushrooms.
- Planting.
- Nut-culture.
- Nuts.
- Orchids (Symposium), comprising different parts; see also to the culture under the alphabetic orchid entries.
- Orchard; see Fruit-growing.
- Packages.
- Parks (Symposium), comprising different phases of botany and treatment, with list of leading palms and their culture.
- Park; see under Landscape gardening, 1801; also 2694.
- Pest control.
- Perennials.
- Perforating-gardening.
- Perforations.
- Planting (Symposium), comprising more than twenty articles on special phases of the work, with lists of shrubs.
- Pollen, Pollination.
- Potting.
- Rooting.
- Railroad-gardening.
- Rock-gardening.
- Rustic work: see under Planting, 2677.
- Scenic; see under Planting, 2681.
- Seaside planting; see under Planting, 2695; 2700; under Fruits, flowers, vegetables, also Arboriculture, 1467, 1472, 1473, 1475.
- Shade-loving plants; see under Planting, 2695; 2700; under Herbs, 1467, 1472, 1473, 1475.
- Shade trees; see under Arboriculture.
- Soil management; fertilizing; cover-crops.
- Solls.
- Tillage machinery, 1942.
- Drainage.
- Mulching.
- Irrigation.
- Manure.
- Fertilizers.
- Lime, in horticulture.
- Compost.
- Pest.
- 3. Insects, diseases, birds, weeds; frost; means of control.
- Ants, 1034.
- Bees.
- Insect injury to trees, 364.
- Milk, 1041.
- Nematodes, 1011.
- Sowbugs.
- Rose insects, 3018.
- Diseases.
- Disease of trees, 368
- Rose diseases, 3018.
- Fungi.
- Fungicide-off.
- Mildew.
- Moths.
- Shrubbery; see under Planting.
- Small-fruits: see the separate articles, as Blackberry, Blueberry, Buffalo berry, Current, Dewberry, Gooseberry, Raspberry, also Fruit-growing, 2672.
- Sprouting-gardening.
- Storage.
- Sub-tropical gardening; see under planting, 2666.
- Succulents; see under Planting, 2672.
- Sun-loving plants; see under Planting, 2695; also Bog-gardening, 2695, 2697-2700, 2703.
- Wall-gardening; see under Plantings, 2658.
- Walks, paths and driveways.
- Water-gardening, see under Planting, 2684, also Bog-gardening, 2695, 2697.
- Aquatic; Aquatics, Nym- phaours, Victoria, and others.
- Watering.
- Wild-gardening; see under Planting, 2658.
- Windbreaks.
- Window-gardening and window-boxes.
- Winter-gardening; see under Planting, 2677.
- Winter protection; see under Planting, 2684.
- Woods; see under Planting, 2692; also Landscape gardening.
- Also articles on the different fruits, flowers, vegetables, trees, shrubs, ornamental plants, in regular alphabetic order.
4. Propagation; breeding.

Seeds and seedage.

Cuttings.

Grafting.

Budding, 1364.

Layering, propagation by, 1831.

Pieces, grafting.

Roses, prop., 3064.

3. Marketing; transportation; inspection; exhibitions.

Marketing of horticultural produce.

Package.

Storage.

Cold-storage.

Transportation.

6. Gardening; greenhouse; floriculture; florists' plants; flower-growing. (See List No. 9, on Landscape Gardening, etc.)

Autumn-gardening.

Basket plants.

Bedding.

Bog-gardening; also 2665.

Border.

Bower.

Flower-garden, 1747.

House plants.

Perfumery-gardening.

Railroad-gardening.

Rock-gardening.

Sea-side-gardening, 2670.

Spring-gardening.

Stove plants.

Subtropical-gardening, 2669.

Vegetables, culture of, 2972.

Wall-gardening, 2850.

Water-gardening, 2658.

Wild-gardening, 2663.

Window-gardening.

Machinery and implements, 1669.

Fence, 1781.

Trellising, 3375.

Potting soils, 3178.

Pots and potting, 2777, 2778.

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Cut-flower industry.

Light, for greenhouses. 1855.

Labels, 1761.

Pruning.

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Piceas, grafting.

Wall-gardening. 2680.

Winter protection, 2684.

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Transplanting.

Greenhouse.

Light, for greenhouses, 1855.


Sub-irrigation in greenhouse, 1864.

Conservatory.

Hardy plants, forcing of, 1265.

Floriculture.

Florist's plants.

Cut-flower industry.

Cultural plants.

Forcing.

Alpine plants.

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Hedges.

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Palm.

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Aquarium.

Aquatics.

7. Vegetable-gardening and vegetables; sweet herbs, and the like.

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Market-gardening.

Nursery-gardening.

Kitchen-garden.

Vegetable-growing tools and implements, 1953.

Irrigation for vegetable-growers. Vegetables, forcing-houses, 1409.

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Artichokes, Jerusalem.

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Beet, fertilizer for, 1225.

Sugar beets, fertilizer for, 1225.

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Cabbage and cole crops, fertilizer for, 1226.

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Carrot, fertilizer for, 1226.

Cauliflower.

Celery.

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Chayote (Chich. tall. 3124.

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Chicory.

Chicory, fertilizer for, 1226.

Chives.

Chress, fertilizer for, 1226.

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Corn-salad.

Cucumber.

Cucumber, fertilizer for, 1227.

Cucumber, forcing, 1257.

Eggplant.

Endive.

Endive, fertilizer for, 1226.

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Greens.

Horseradish.

Kale.

Kohlrabi, Lape, 1833.

Lettuce, fertilizer for, 1226.

Lettuce, forcing, 1255.

Leek, 1833.

Kohlrabi.

Potato.

Potato, fertilizer for, 1225.

Potato, fertilizer for, 1226.

Potato, fertilizer for, 1227.

Tomato, fertilizer for, 1227.

Tomato, forcing, 1259.

Tomato, fertilizer for, 1226.

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9. Landscape gardening; lawns and planting; herbs, shrubs, trees.

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Shrubs and woody plants, lists of, 2660 for Northeast; 2693 for Middle West; 2695 for Midcontinental Region; 2696 for South; 2700 for California.
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Vines for California, 2705.
Trumpet-vines, 631.
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Hedges.
Osage orange for hedges, 1961.
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Lilac (Syringa), 3297.
Evergreens.
Arboretum.
Arboriculture.
Conifers, 358.
Oak (Quercus), 2380.
Pine.
Spruces, ornamental, 2615.

And many other entries under the generic names of trees and shrubs.
ADDITIONAL SPECIES

The first volume of this Cyclopaedia was published in March, 1914. The lists of plants on which it was founded were brought down to the close of 1912, and it was with this date, as stated on page xi, that the Cyclopaedia undertook to cover its task, although subsequent introductions have been inserted up to the closing of the pages so far as possible and as the information has come to hand. Undoubtedly some names were overlooked. Four years and more have passed since the original lists were prepared, and cross-referenced back and forth throughout the letters of the alphabet. Within this time, species have been introduced to cultivation within the United States and Canada, and which may now be described. The present list is not complete for the subtropical parts, and probably not all the introductions have been discovered for the other parts. The commerce in plants is incessant, and the situation is never at rest.

The consultant will probably be disappointed in not finding some of the well-advertised binomials in either the body of the Cyclopaedia or this Supplement. The Editor has a long list of such names, but, without the plants themselves before him, he cannot know what the names mean. They are such as have no botanical standing, and the descriptions in the catalogues do not identify them. Probably some of these binomials represent generic and varietal names, with the species-name omitted. This is a prevalent but very faulty practice, as it obscures all relationships and plunges the subject into confusion. So long as this practice prevails, it is impossible to make clear identification of cultivated plants.

Only in one group does there appear to have been any marked extension of species, and this is in the willows (Salix). Some of the very attractive Chinese and other willows are very recently offered, and the account of that genus is therefore much extended. The additions in the willows are made by Alfred Rehder, as are also the additions and modifications in all the articles originally prepared by him.

††ÅBIES. Page 172.

Delavayi, Franch. (Ketéch Friri, Mast.). (After No. 11 in the treatment of Åbies.) Tall tree, to 200 ft.; young branches yellowish or reddish brown, lustrous, usually glabrous: winter buds obtuse, resinous: Ivs. spreading, crowded, usually blunt and emarginate, strongly recurved at the margins, silvery white below, ½-1 in. long: cones oblong-ovate to oblong-cylindric, usually truncate, deep violet, about 2½ in. long; bracts usually slightly exerted. Ch. China. G.C. III. 39:212 (as A. Fargesii on p. 218).

Faxoniana, Rehd. & Wilson. (After No. 11.) Tall tree, to 120 ft.: young branches yellowish or reddish brown, lustrous, usually glabrous: winter buds obtuse, very resinous: Ivs. crowded, distichously spreading, linear, short-pointed or obtuse to emarginate, ½-1 in. long, silvery white beneath: cones ovoid or ovoid-oblong, usually truncate violet-purple, about 2¼ in. long; bracts exerted. W. China.

recurvata, Mast. (After No. 11.) Tall tree, to 120 ft.: young branches pale yellowish gray, lustrous, glabrous: winter bud slightly pointed, very resinous: Ivs. crowded, spreading or recurved, sometimes falcate, pointed, bright green or glaucous, of about the same color on both sides, about ½ in. on fruiting branches, about 1 in. long and more pointed on young plants: cones oblong-ovoid, usually flattened at the apex, violet-purple before maturity, later gray-brown, about 3 in. long; bracts not exerted. W. China.

squamata, Mast. (After No. 11.) Tall tree, to 120 ft.; bark purplish brown, exfoliating in thin flakes like the river birch: young branches brown, glabrous; winter buds obtuse, very resinous: Ivs. very crowded, ascending, mucronate or obtuse, often falcate, glaucous yellow while young, becoming nearly green, ½-1 in. long: cones oblong-ovoid, obtuse, violet, 2-3 in. long; bracts slightly exerted. W. China. G.C. III. 39:290.

—Very remarkable for its bright purplish brown bark, scaling off in thin flakes. It has violet-purple resinous cones, and short relatively broad leaves.

ALEURITÉS. Page 245.

montana, Wilson. (After No. 11.) Tall tree, to 120 ft.; bark purplish brown, exfoliating in thin flakes like the river birch: young branches brown, glabrous; winter buds obtuse, very resinous: Ivs. very crowded, ascending, mucronate or obtuse, often falcate, glaucous yellow while young, becoming nearly green, ½-1 in. long: cones oblong-ovoid, obtuse, violet, 2-3 in. long; bracts slightly exerted. W. China. G.C. III. 39:290.

AMPELOPSIS. Page 278.

Watsoniana, Wilson (Vitis leceodae, Veitch, not Planch.). (After No. 10.) Tall climbing shrub, with slender forked tendrils, glabrous: Ivs. simply pinnate; lfts. 5, stalked, ovate to ovate-oblong, acuminate, rounded at the base, remotely serrate, bright green above, glaucious beneath, 3-4½ in. long: fls. and frs. not known, but probably not much different from those of A. leceoides to which this species is closely related, but easily distinguished by the always simply pinnate lvs. with fewer and larger lfts. Cent. China. J.H.S. 28:235, figs. 95, 96, erroneously cited under A. lanoides on p. 278 of this work.

ANGOPHORA. Page 288.

intermedia, DC. (Metrosideros floribunda, Smith, not Hort.). Tree, described by Bentham as having rough persistent fibrous bark, the parts nearly or quite glabrous: Ivs. lanceolate to ovate-lanceolate, distinctly stalked, 2-4 in. or more long, sharply acuminate: fls. rather small, in loose corymbs or trichotomous panicles; calyx about 2 lines long or longer, with 5 prominent ribs, the teeth short-subulate. Austral.—In Calif. said to be a very fine drought-resisting shade and avenue tree.

lanceolata, Cav. Described in Calif. as a mediumsized white-fld. tree; by Bentham said to be "a tree of considerable size," with bark deciduous in large smooth flakes, the parts glabrous or essentially so: Ivs. lanceolate, acuminate, 3-5 in. long, distinctly petiolate, with numerous parallel pinate veins: fls. in rather dense terminal clusters, larger and denser than in A. intermedia; calyx about 3 lines long, the teeth shorter and thicker than in A. intermedia. Austral.

AQUILÉGIA. Page 339.

akitenisis, Huth. St. erect, branched above: radical and lower cauline lvs. twice ternate, uppermost cauline lvs. simple, narrowly lanceolate: sepal. oval, longer than the limb of the petals, pale purple when dry; petals with a rather straight spur, limb subtruncate, pale yellow. Japan; intro. as an alpine species, with blue-and-yellow fls.; the author of species does not state its relationships.
ARGYREA

splendens, Sweet. (Convulvulus splendens, Hornem. Lettsomia splendens, Roxbg. Iponma splendens, Sims.) Described by Clarke as "a large climber!" Lvs. elliptic and acuminate, never coriaceous but the base rhomboid or rounded, blade about 7 in. long and petiole 3 in., glabrous above and silky beneath; fls. rose-colored or pale red, in few- or many-flld. pedunculate corymb; corolla tubular-canopanulate, 1 1/2 in. long, the plait hairy outside; sepals tomentose, ovate and obtuse, 1/2 in. long; caps. scarlet, papery. India. B.M. 2925.—Doubtful whether known in this country. The plant in cult. as Convulvulus splendens may be a form of the common morning-glory, Ipomoea purpurea.

BÉBERIS. Page 487.

R-regeliana. No. 2. Fig. 539, represents B. amurensis rather than B. Regeliana, which is probably better considered a variety of B. amurensis, and to be called B. amurenensis var. japonica, Rehd.

lævis, No. 24. The species described under this name is B. atrocarpa, Schneid. (B. lævis, Hort., not Franchet). The true B. lævis is not in cult.; it has more closely serrate dark brownish pubescent leaves and the middle one. W. China. Var. szechuannica, Schneid. (var. mandschurica, Schneid., not Winkler). Tree with widespread branches; lvs. rounded or broadly cuneate at the base, glabrous or nearly so, dull or bluish green above; lateral lobes of scales spreading, half as long as the lanceolate middle one. W. China.

BUDDLEIA. Page 585.

Färquharii, L. Barron (B. asiatica × B. officinalis), (After No. 5.) Intermediate between the parents. Lvs. lanceolate, 4-6 in. long, white or yellowish white beneath; fls. pale mauve, fragrant, in slender spikes forming large terminal panicles to 1 ft. long; the spikes are composed of stalked, 5-7-fld. clusters. Raised by R. & F. Farquhar & Co., Boston, in 1913. Gn.M. 21:155.

CALLISTEMON. Page 630.

Other names, than those described in Vol. II are listed in California, but their botanical standing is in doubt. The best that can be done at present is to make the following statements:

coccineus, Muell. Similar to C. lanceolatus but lvs. smaller, 1-1/2 in. long, pungent and acute; midrib and nerve-like margins prominent but lateral veins inconspicuous: stamens 1/2-1 in. long, red, with yellow anthers: fr. strongly contracted at summit. Austral.

Cunninghamii, Koch. Listed in Calif.: "Lvs. extremely narrow. Growth low and compact." Botanically described as follows: Lvs. elliptical, wide-spreading, pale green, pellucid or sometimes roughish, marginal nerves and veins rather prominent; young lvs. reddish, somewhat silky: stamens scarcely 3 times longer than the petals. Austral.

floribundus pendulus. A trade name used in Calif. for an unknown form recently intro. from European gardens. Described as of compact growth with short slender drooping branches well covered with short broad and rather blunt lvs. Probably a form of C. lanceolatus.

hybrida, DC. Described only from lvs. which are rigid, linear, almost pungent, and with marginal nerves. Not recognized by recent authors. The plant offered in Calif. under this name is probably a garden hybrid from Eu.

C. robustus, and C. splendens are trade names used in Calif. for forms recently intro. from Eu. Their botanical status is unknown.

CELSIA. Page 709.

Arcturus, Jacq. Probably perennial, but sometimes perhaps annual or biennial, differing from C. cretica, among other things, in its long-pedicilled rather than
subsessile fls.: more or less woolly, especially below: lvs. all alternate, canescent beneath, short-petioled, lyrate, the terminal segm.; large and obovate-oblong with cre­nate margins, the later segms. smaller and ovate; caul­ine lvs. few, obovate and slightly clasping; fls. verben­cum-like, yellow, the five spreading lobes oblong, pur¬ple-hairy stamens deflexed and ascending. Crete. B.M. 1962.

CENTAURÉA. Page 712.

orientalis, Linn. (After No. 9.) Perennial, 3 ft., erect and branching, the branches sparingly cobwebby: lvs. coriaceous, glabrous or roughish, pinnatisect into lanceolate or linear divisions: heads yellow-flld. (said to be a red-flld. form); large, ovoid, bracts of involucre pale or colored at tip, the intermediate or outer ones ovate and prominently pinnate. Caucasus region.—A hand­some species, with long-stalked heads. Centaurea is a large genus, with many ornamental species, and other kinds than those described in the Cyclopaedia are likely to come into the trade from time to time as flower-gar­den and border subjects.

CHÆNOMÈLES. Page 727.

japónica. It has been shown recently that Thun­berg, when describing his Pirus japonica, had the spe­cies now called C. Maulei in mind; therefore the name C. japonica, Lindl., must replace the name C. Maulei, and the species called here C. japonica must bear the name C. lagénaria, Koidzumi (Cydonia lagénaria Lois.).; and C. cathayensis should be a variety of it: Var. cathayensis, Rehd. (C. cathayensis, Schneid.). Lvs. narrower, lanceolate, pubescent beneath while young. Cent. China. H.T. 27:2657, 2658. Another variety is: Var. Wilsonii, Rehd. Lvs. covered beneath with a persistent fulvous woolly tomentum. W. China.

C. Maulei, Schneid., becomes C. japonica, Lindl.

CLÉMATIS. Page 787.

No. 14, C. nutans. Var. thyrsoides is now considered a distinct species and has been named:

C. Rehdériana, Crab. (C. nutans var. thyrsoides, Rehd. & Wilson.)

No. 28, C. montana, add: forma platyspála, Rehd. & Wilson. A form of C. montana var. Wilsoni with broadly obovate, rounded or truncate sepals: the fls. are very round in shape and appear at the same time as the lvs.


CÓCOS. Page 812.

schizóphila, Mart. Trunk; 6-9 ft. high: lvs. 6-9 ft. long; segms. 30-40, linear, acuminate, 12-16 in. long: spadix up to 3 ft. long: drupe orange-red. Brazil.—Described as a strong-growing species, useful for plant­ing out in Flá. and Calif.

CÓRNUA. Page 851.

Wáteri, Wang. (After No. 13.) Tree, to 40 ft.; branchlets nearly glabrous: lvs. elliptic, acuminate, broadly cuneate at the base, sometimes nearly rounded, usually crisped at the margin, dark green above, pale green and slightly canescent beneath, with 4 pairs of veins, 2-4 in. long: panicle corymbose, about 3 in. across; style club-shaped: fr. black, about 24 in. across. Cent. China.—This plant has been confused with C. Wilsoniana which is apparently not in cult. and is clearly distinguished by the whitish under side of the lvs. and the cylindric style.

Hémislesi, Schneid. & Wang. (After No. 14.) Shrub, to 20 ft.; branchlets appressed-pubescent at first, becoming glabrous and reddish brown or purple: lvs. ovate to ovate-elliptic, short-acuminate, rounded at the base, with 6-7 pairs of veins, whitish and appressed pubescent beneath, often with brownish hairs along the midrib and veins, 2-3 in. long: corymb umbel-like, 2-3 in. broad, slightly pubescent or with brownish woolly hairs; style cylindric: fr. 2j5 in. across, bluish black. W. China.

CRATÁGUS. Page 878.

coloradensis, A. Nels. (After No. 35.) Low tree, to 12 ft., with glossy brown, sparingly spiny branches: lvs. broadly oval to orbicular, acute, rounded or some­what cuneate at the base, incised and coarsely toothed, sparingly pubescent above, nearly glabrous beneath except pubescent on the midrib and veins, about 2 in. long; pétioles rather short: corymbs many-flld.; pedi­cels and calyx-tube hisrate; stamens 10; styles usually 3: fr. subglobose, about 34 in. across, dark scarlet, with juicy pulp. Colo.

C. Wilsoniana, A. Nels. (After No. 35.) Small tree, to 15 ft.; branchlets glabrous, purple-bush, spiny: lvs. elliptic-ovate or obovate, acute, abruptly narrowed at the base, incised and slightly lobed above the middle, lustrous and sparingly pubescent above, particularly on the veins, glabrous beneath, 1½-2½ in. long: corymb gla­brous; stamens 5-8, with purple anthers: fr. subglobose, 2½ in. across, brown. Colo.

saligina, Greene. (After No. 37.) Tree, to 20 ft., with spreading or drooping branches, spiny; branchlets bright red, glabrous: lvs. oblong-elliptic to rhombo­lanceolate, acute or sometimes rounded at the apex, cuneate at the base, slightly hairy and dark green above, paler green and glabrous beneath, 1½-2 in. long; corymbs glabrous: frs. 2½ in. across; stamens 20, anthers yellow: fr. globose, blue-black, 3½ in. across, with 3-5 nutlets. Colo. S.M. 491. B.B. 482.

CÝPERUS. Page 939.

nervosus, Benth. Plant hairy-pubescent, to 3 ft., perennial: lvs. many, nearly sessile, elliptic or oblong-acute, those on the st. 4 in. long and not prominently nerved, the radical ones narrow-ob lanceolate and with several pairs of strong nerves: fls. deep cobalt-blue, about 1½ in. across, in many lax axillary and terminal racemes which are 3-6 in. long; corolla broadly cam­panulate with a short tube. Himalayan region. B.M. 7513, where it is said to be “the largest-flowered Himalayan Cynoglossum, and a very handsome plant.”

CYPÈRUS. Page 940.

adenophorus, Schrad. About 2 ft. high: culm gla­brous: lvs. shorter than the culm, linear, caninate: umbel 9-14-rayed; umbelules 6-9-rayed; rays 10-20­spiked; spikelets linear-lanceolate, many-flled, 3 lines long, the ind. whitish green: fr. obovate, 3-angled punctate-seabrous. Brazil.—Useful for pots.
DEMÓNOROPS. Page 951.

fissus, Blume. Lf.-segms. many and graceful, 6-8 in. long, lanceolate, subulate-acuminate, pilate, apex penicillate, obtuse; spadix erect, contracted: fr. ovoid-globose, about the size of a small cherry. Borneo.—Foliage described as bronzy green.

DECKÉNIA (after Karl von der Decken, German explorer of East Africa, killed in 1884 by the Somalis). Sometimes misspelled Deckeria: but there is a genus name Deckeria which, however, is regarded as a synonym of Eriactea. Palmae. One species, by some referred to Acanthopus, from the Seychelles, now intro. as a warhouse palm. D. mabillis, Wendl., is a tall palm, reaching 100 ft. and more, and 1 ft. or more in diam.: lvs. pinnate, 10-12 ft. or more long, the sheath 3-6 ft. long and usually spiny; petiole about 1 ft. long, pale green and smooth; pinus narrow, hairy beneath, bily when young; midrib yellow: fls. monocious, in 3's, the middle one female, the male with 9 stamens and minute perianth, the female with imbricate perianth: spadix with slender pendulous branches which are spiny at the base; spathes 2, spiny, seldom exceeding 1 ft.; fr. much compressed, ovoid-deltoid, 3'/2 in. long and 3'/4 in. thick, black turning to straw-colored.

DELFHINIUM. Page 975.

speciosum. The trade name may apply to a showy garden form of undetermined origin. D. speciosum, Bieb., to which the botanical name applies, is a tall gray-tomentose perennial of the Caucasus: st. angled, paniculate above: lvs. palmately parted, the upper ones alternate: fis. crowded in the uppermost axils, sessile; calyx tubular-funnel-shaped, the lobes 5, triangular with a connate at base into a cylindric spike 1 ft. or more long; stipules membranaceous, 4-6 in. long, 1'/2-2 in. broad, obtuse, entire, undulately lobed or coarsely toothed, sometimes deeply and narrowly lobed, acuminate, base rounded, 3-4 in. long; stipules membranaceous, 4-6 in. long, 1'/2-2 in. broad, obtuse, yellowish with brown spots: fr. solitary or clustered, almost globose, pubescent. Natal and Zululand.—Used for the manufacture of native cloth and rough cordage.

DIÁNHTHUS. Page 997.

marginalis. The trade name may represent a marginate or edged form of one of the common annual garden pinks; if D. marginalis, Poiret., it is a perennial of Europe, with linear marginate lvs. and solitary white fls.; calyce scales or bracts acute and shorter than the calyx.

ÉLYMUS. Page 1111.

giganteus, Vahl. Giant Siberian Rye-Grass. A tall species resembling E. condensatus: spike 1 ft. or more long; glumes narrow below, subulate above, longer than the several florets; lemma pubescent, awnless. Siberia.—Sometimes cult. as an ornamental.

ERÉMURUS. Page 1128.

turkestánicus, Regel. Plant about 4 ft. high, with very long and dense terminal raceme of reddish brown fls. with long-exserted stamens and white-margined perianth-segms.: lvs. broadly linear, acuminate. Turkestan.

EUCAÝLPTUS. Page 1152.

álba, Reinw. (E. platypodióla, F. v. M.). Related to E. popúlifólia, but lvs. much more variable, from lanceolate to broadly ovate or almost orbicular, acute to cordate at base, mostly 3 in. long; umbels in the axils, unifl., 1-7-fld.; pedicels short or almost none, angular: cap hemispherical, low: valves slightly protruding. Austral. Maiden, Crit. Rev. Eucal. 105, 106, 107.—Growing at Las Angeles.

EUßATÓRIUM. Page 1166, after No. 22 (but lvs. stalked).

serécinum, Michx. An attractive species, 4-8 ft. high, with grayish white numerous fls. in a broad, cymose infl.: branching, pubescent at least above: lvs. ovate-lanceolate, long-acuminate, 3-7-10 in.; stipules membranaceous, 3-7-10 in. long: fr. 7-15 in the campanulate involucre, of which the bracts are obtuse or truncate. Minn., south and southeast.

ÉVÓDIA. Page 1155.

hypéhénzis, Dode. (After E. Henryi.) Tree, to 60 ft.: lfts. 7-9, short-stalked, elliptic-ovate to elliptic-lanceolate, long-acuminate, rounded or rarely narrowed at the base, glaucescent or pale green beneath and glau­eous or nearly so except villous in the axis of the veins, 3-6 in. long: infl. slightly pubescent, 4-5 in. broad: fr. beaked, yellowish grey, slightly hairy. Cent. China.

FÍCUS. Page 1229.

ulmifólia, Lam. (F. sinuósa, Miq.). Shrub, 9-15 ft. high: lvs. alternate, variable, very harsh, oblong, sub­entire, undulate lobed or coarsely toothed, sometimes deeply and narrowly lobed, acuminate, base rounded, 3-4 in. long; stipules membranaceous, 4-6 in. long, 1'/2-2 in. broad; fr. axil­lary, solitary or in pairs, orange-red to purplish, ovoid to ellipsoid, about 3'/4 in. long. Philippines.

útillus, Sim. Large tree: lvs. elliptic-cordate, 6-10 in. long; 4-5 in. broad, obtuse, leathery; petiole thick, 2-4 in. long; stipules membranaceous, 4-6 in. long, 1'/2-2 in. broad, obtuse, yellowish with brown spots: fr. solitary or clustered, almost globose, pubescent. Natal and Zululand.—Used for the manufacture of native cloth and rough cordage.

GALÉGA. Page 1311.

bicolor, Hausskn. Perhaps a form of G. officinalis: lfts. oblong-linear rather than oblong-lanceolate, often retuse: raceme more lax or open: calyx-teeth mostly shorter than the tube rather than longer: standard deep blue, the wings and keel whislh blue. Mesopotamia.

GENTIÁNA. Page 1323.

tibética, King. A Himalayan species of which no close relatives from that region are described in this Cyclopædia, and which now appears as a name in the trade. Described by King as follows: st. very stout, erect, 18 in. high, simple: st.-lvs. 6 in. long, lanceolate, connate at base into a cylindrical sheath, the uppermost sessile and whorled and forming an involucre to the infl. fls. crowded in the uppermost axils, sessile: calyx tubular, membranaceous, truncate, split on one side, the mouth minutely 5-toothed; corolla nearly 1 in. long, tubular-funnel-shaped, the lobes 5, triangular with a triangular fold in each sinus: caps. included; seeds elliptical.

HELICHRÝSUM. Page 1450, after H. arenarium.

angustifólium, DC. Subshrub, the many virgate stts. oppressed-canescent: lvs. linear, odorous, margins revolute: fl.-heads in a compound lax terminal corymb, small, oblong-cylindric, the pale involucre with few imbricate scarious obtuse scales. S. Eu.—said to be a good plant for edgings, with white foliage.

HITEBS. Page 1483.

The names H. cruéntus and H. Lambertianus in lists are probably forms of H. Rose-sinensis; however, the botanical species bearing these names may be described, as surely:

cruéntus, Bertol. St. erect, unarmed: lvs. petiolo, palmately 3-6-fld, base cuneate, lobes oblong, lanceolate, obtuse, obtusely crenate: fls. racemose, red, 2-3 or solitary; outer calyx half shorter than the inner, many-parted, the segms. lanceolate-linear, acuminate, inner deeply 5-fld, much larger, about 1 in. long: caps. ovate. Guatemala.
HIBISCUS

LamBERTIÀNUS, H.B.K. Herb: st. simple, 6 ft. high, aculeate, minutely pilose: lvs. petioled, ovate-lanceolate, acuminate, base rounded, serrate, hispulate and green above, below canescent-tritomentose, 5 in. or more long; stipules linear-subulate: fls. axillary, solitary, pedunculate, large; calyx double, outer 11-parted, divisions linear, inner campanulate, 5-parted; corolla 5-parted, unequally oblong, apex rotundate, base cuneate. Venezuela.

ÍNULA. Page 1555, after J. hirta.

montana, Linn. Perennial, with erect mostly 1-headed villous st.: lvs.-lanceolate, entire, villous, the radical ones narrowed into petiole: outer involucre scales oblong-lanceolate and somewhat obsolescent, the inner ones acute: achenes hairy: plant about 1-1½ ft. high, the heads bearing many narrow yellow rays. S. Eu.

IRIS. Section Evansia, species 1-5, page 1669.

gracilipes, Gray. Rootstock slender and branched: lvs. 3-4, radical, linear and grass-like, becoming 1 ft. long: peduncle filiform, about the length of the lvs., 1-3-headed: fl. solitary and sessile in the scarious I-1vld. spathe, lilac; tube exceeding the 3-angled ovary, the segments oblong-lanceolate, the outer 2 long glabrous; crest yellow; stigma 2-fid, cut. N. Japan.—Small plant, about 8 in. high, flowering freely in May.

JUNIPERUS. Page 1728.

chinensis var. procumbens, No. 11. Under this name apparently three different forms have been confused; these are:

chinensis var. japonica, Vilm. (J. japonica, Carr.). A dwarf shrub with foliage mostly of the juvenile type; of this two forms are in cult.: Var. japonica aürea, Bean (J. chinensis var. procumbens aürea, Beiss.). Of more spreading habit with a few long branches, the young growth yellow golden. Var. japonica aüreo-variegata, Bean (J. chinensis var. procumbens aüreo-variegata, Beiss.). Of more compact and upright habit, the young growth variegated with golden yellow.

chinensis var. Sargentii, Henry. A prostrate form with long spreading stems, the lateral branchlets ascending, forming dense mats; lvs. on young plants almost all acicular and grass-green, on fruiting plants all or nearly all scale-like and bluish green. Japan.—As a ground-cover this juniper is one of the most valuable. Intro. in 1892 to the Arnold Arboretum by Sargent and subsequently distributed as J. chinensis var. procumbens.

procumbens, Sieb. (J. chinensis var. procumbens, Endl.). Low prostrate shrub with the branches ascending at the ends: lvs. bluish green or glaucous, all acicular, in 3's, lanceolate, pungent, with a broad white band above divided near the apex by the green midrib: fr. not known. Japan.—Closely related to J. squarrosa. Winter.
NEPHROLEPIS

a. *Nephrolepis exaltata* and its varieties.

*b. Forms with once-pinnate foliage.*

- *exaltata*: with species, tropics generally.
- *bostoniensis*.
- *Childsii*.
- *Davallii*.
- *Dwarf Boston*.
- *Emontoniensis* (English) *falcata*. (There is also an *English falcata*).
- *Grettni*.
- *Grunatri*.

**BBB. Forms with twice-pinnate foliage.**

- *Anna Foster*.
- *Goodly Pierson (parentage uncertain)*.
- *Barrowsi*.
- *Clarkii*.
- *Dumplex Barrosei*.
- *Elmsfordi*.
- *Fosteriana (same as Anna Foster)*.

**BBBB. Forms with thrice-pinnate foliage (sometimes producing 2-pinnate forms).**

- *Clarkii*.
- *elegantissima*.
- *elegantissima "improved."
- *elegantissima compacta*
- *elegantissima cristata* (English).
- *exaltata cristata* (Eng.).
- *Galvestoni*.
- *Icyporoides* (English).
- *muscosa*.
- *Piersonii compacta (elegantissima compacta)*.

**BBBBB. Forms with 4-pinnate foliage.**

- *Amerophili*.
- *dissecta* (English).
- *Glandii*.
- "gracillima" (not certainly the original gracillima of Barrows).
- *magnifica*.

**BBB. Forms with 5-pinnate foliage.**

- *Craigi*.

**AAP. Nephrolepis varieties and species other than exaltata.**

- *acuminata*.
- *acuta*.
- *Barteri*.
- *Bausei*.
- *bisserrata*.
- *bisserrata (davallioideus) furcans*.
- *bisserrata furcans minor (davallioideus furcans minor)*.
- *bisserrata var. (Undetermined form)*.
- *concinna* (English).
- *cordata compacta: cordifolia compacta*.
- *cordifolia compacta*.
- *cordifolia gigantea*.
- *cordifolia elegans*.
- *cordifolia tessellata*.
- *crispata congesta*.
- *davallioideus: bisserrata*.
- *davallioideus furcans: bisserrata furcans*.
- *Duffii*.
- *enfolia* (English).
- *enfolia (= *enfolia*).
- "exaltata furcans" = bisserrata furcans.
- "exaltata grandiceps" = bisserrata furcans minor.

**PELARGONIUM.**

Page 2532.

- *acerifolium*, L'Her. One of the Pelargonium section, allied to No. 20, inserted here because *Geranium citriodorum* is a name in the trade and the G. citriodorum, Cav., is considered to be referable to *P. acerifolium*: the species *P. acerifolium* is shrubby or subshrubby, 6-8 ft. tall, glaucous-green, differing from *P. angulosum* (of which Harvey makes it a variety) in having the lvs. more cuneate at base, more deeply lobed, and more scabrous. S. Afr.—Knuth, in his recent Monograph, keeps the species distinct.

**ALFRED B. BENEDICT.**

**NYMPHAEA.** Page 2310.

- *ovalifolia*. (After No. 4.) The plant called *Nymphaea ovalifolia*, as intro. into gardens in 1916, is from newly imported African seed, and was first raised by E. T. Harvey, of Cincinnati. It is not the true *N. ovalifolia*, Conard. The new plant has more oval lvs. than *N. cerulea*, and larger and paler fls. It is to be regarded as a form of *N. cerulea*, deserving a personal name rather than a Latin name. In 1908 Gilg of Berlin described 6 new species of African water-lilies, all allied to *N. cerulea*. The new form here mentioned falls between *N. magenta* and *N. spectabilis* of Gilg, having certain characteristics of both species. The plant is "a prodigious grower, the fl.-stalks extending 10 or more ft." The fl. is "a rich cream color tipped with blue at the end of the petals." (Quotations from letters from Mr. Harvey.) Petals 20; stamens 92; carpels 21; sepals thickly marked outside with black lines and dots. Fl. 6-8 in. across. (Data from specimens furnished by Mr. Harvey.)

**PASANIA.** Page 2479.

- *P. acerifolium*: apparently not in cult. Lvs. narrowly elliptic, with large irregular brown blotches above but plain green beneath: fls. deep blue, closed in dull weather.

- H. S. CONARD.

**PÁSÁNIA.** Page 2470.

- *P. acerifolium*: apparently not in cult. Lvs. narrowly elliptic, with large irregular brown blotches above but plain green beneath: fls. deep blue, closed in dull weather.
RHODODENDRON. Page 2938.

In the Suppl. List under R. Culverwellii, strike out var. wollense, which has turned out to be nothing but R. divaricatum (see Kew Bull. 1914:382).

SALIX. Pages 3052.

To No. 6, after var. decipiens, W. D. Koch (S. decipiens, Hoffm.) add: Var. bullata, Spaeth (S. bullata, Hort.). Forms a compact subshrub bush.

Between Nos. 6 and 7 insert:


To No. 7, add the following variety: Var. calva. C. F. W. May. (S. alba var. calva, Smith.). Of pyramidal habit: lvs. larger, at maturity glabrescent, more bluish green above and more glaucous below.

After No. 7 insert:

hexandra, Ehrh. (S. alba × S. pentandra). Low tree; mature branchlets glabrous: lvs. lanceolate, green on both sides, silky at first, becoming glabrous: cymes like those of S. alba; stamens 4-5. In Eu., with the parents.

After Salix No. 17 invert several species and hybrids, as follows:

latifolia, Forbes (S. Câpea × S. myrsinifolia). Shrub: branchlets pubescent: lvs. oval or oblong to oblong-obovate, usually acute, irregularly serrate, dark green and finally glabrous above, glaucous and silky below at first, finally glabrescent; ovary thinly silky or partly glabrous. Occurs with the parents.

Erdinger, Kern. (S. Câpea × S. daphnoides). Tall, arborecent shrub: young branchlets short-pubescent, older branchlets glabrous: lvs. obovate-oblong to oblong, acuminate, usually narrowed at base, entire or slightly serrate, pubescent while young, nearly glabrous at maturity: ovary usually glabrous or thinly silky. Occurs with the parents. Var. cremenesis, Rehd. (S. cremenesis, Kern.). Closer to S. Caprea: lvs. broader, more densely pubescent beneath: ovary silky.

Winterianâ, Gren. &. Godr. (S. Câpea × S. purpurea). Shrub with upright branches: young branchlets sparingly short-pubescent, later glabrous, brown: lvs. obovate or oblong to oblong-lanceolate, acuminate, usually narrowed at base, irregularly serrate, thinly silky-pubescent while young, later glabrous, dark green and lustrous above, glaucous below: stamens connate at base; ovary grayish pubescent. Occurs with the parents.

cinerea, Linn. Large shrub or small tree, to 25 ft.: 1- and 2-year-old branchlets tomentose: stipules often persistent: lvs. obovate or elliptic, acute or rounded, narrowed or rounded at the base, irregularly serrate, pubescent on both sides, 1½-2½ in. long: catkins sessile, before the lvs.; staminate ovoid; filaments pilose, free; pistillate cylindrical; ovary pubescent; style very short or wanting. April. Eu., N. Af., W. and N. Asir. Var. eelifolia, Rechb. (var. angustifolia, Doll.). Lvs. elliptic-lanceolate.

Lestadiâna, Hartm. (S. cinerea × S. lapponum. S. canescens, Fries). Low or medium-sized shrub: young branchlets pubescent, older glabrous: lvs. obovate to oblong, acute or short-rounded, narrowed at the base, irregularly serrate or entire, pubescent above, tomentose beneath: lvs. before the lvs.; stamens sparingly hairy at the base; ovary pubescent; style to one-third as long as ovary. N. Eu. with the parents.
A very variable glabrous, style slender. Eu., W. Asia to Kamchatka.

aula, Linn. Shrub, 3–8 ft.: branches spreading, unifoliate, glabrous: lvs. elliptic to lanceolate, acute, cuneate or rarely obtuse at the base, irregularly serrate, pubescent when young, later glabrous above, glabrescent and glaucous beneath: catkins on short, often leafy stalks; stamens usually connate one-half; ovary pubescent with short style. Eu. with the parents.

ambigua, Ehrh. (S. aulsa × S. répens). Shrub, about 3 ft., ovary peeping st.: branches glabrous: lvs. elliptic to lanceolate, obtuse, pubescent, later glabrescent above, about 1 in. long: catkins a little before the lvs.; ovary pubescent; style rather long. In Eu. with the parents.

ludiciana, White. (S. aulsa × S. phylicifolia). Shrub: branches glabrous at maturity: stamens usually persistent: lvs. elliptic to narrowly oblong-obovate, crenulate, glabrous at maturity, glaucous beneath: catkins rather small, on leafy stalks, cylindric; ovary pubescent. N. Eu., with the parents.

sesquifolia, White. (S. aulsa × S. phylicifolia × S. purpurea). Intermediate in general appearance between S. aulsa and S. phylicifolia: lvs. in shape like the former but with the nervation of the latter and nearly glabrous at maturity: stamens quite connate; ovary pubescent with slender style. Observed in England with the parents.

grandifolia, Scop. (S. appendiculata, Vill.). Shrub, to 10 ft., with spreading branches: branches tomentose while young; stamens often conspicuous, semi-cordate: lvs. oval to obovate-lanceolate, acute, cuneate or rounded at the base, crenately serrate, glabrous at maturity except the pubescent midrib beneath, dark green above, light green or glaucous and reticulate beneath, 4–6 in. long: catkins before or with the lvs. on short stalks with small bract-like lvs.; stamens hairy below; ovary long-stalked, pubescent; style short. Higher mountains of Cent. and S. Eu.

nerifolia, Schleich. (S. grandifolia × S. purpurea. S. Pontederina, Schleich., not Willd. S. austriaca, Kerner). Shrub, to 6 ft., with upright slender branches: young branchlets pubescent, later glabrous, greenish or brown: stamens rather narrow: lvs. obvoate-lanceolate to lanceolate, acute, serrulate, glabrous at maturity, glaucous and reticulate beneath, 2–3 in. long: catkins shortly before the lvs.; filaments more or less connate; ovary pubescent; with very short style. Cent. Eu. with the parents.

mysirifolia, Salisb. (S. nigricans, Smith. × S. vadanca, Cháix.). Shrub, to 12 ft.: branchlets hairy or glabrescent, dull: stamens often rather large, subcordate: lvs. varying from elliptic, or rarely suborbicular to oblong-obovate or broadly lanceolate, usually acute, rounded at the base, crenate to nearly entire, glabrous or glabrescent above, more or less pubescent beneath, 1–3 in. long, usually blackish when dried: catkins with or a little before the lvs., short-stalked, bracted or leafy at the base; staminate rarely exceeding the style; ovary glabrous, style slender. Eu., W. Asia to Kamchatka.

tetraglia, Smith (S. myricifólia × S. phylicifólia). Intermediate between the closely related parents. It can best be recognized by the combination in various degrees of the characters of the two species which are chiefly the duller and more pubescent branches and lvs. and the larger stamens of S. myricifólia and the more shining and glabrous branches and lvs. and the smaller stamens of S. phylicifólia. Occurs in Eu. between the parents.

phylicifolia, Linn. (S. major, Ehrh.). Upright shrub, to 3 or rarely 8 ft., with stiff and rather short branches: branches glabrous, polished: stamens small, caducous, or wanting: lvs. short-petioled, elliptic or elliptic-oblong, acute, rounded at base, nearly entire or minutely crenate-serrate, glabrous at maturity, yellowish green and glossy above, glaucous beneath, 1–3 in. long, not black when dried: catkins before or with the lvs., on short leafy stalks; ovary pubescent or sometimes glabrous, stalked; style rather long. N. and Cent. Eu., N. Asia.


After Salix, No. 24, insert three:

stipularis, Smith (S. cinerea × S. viminála. S. holoóvrea, Willd.). Shrub or small tree: branches long and stout, persistently pubescent: lvs. lanceolate to oblong-obovate, acute or acuminate, irregularly serrulate or crenulate, hairy on both sides, more densely beneath, 3–7 in. long: catkins before the lvs., short-stalked or nearly sessile; stamens very long; ovary stalked, pubescent, with short style and slender stigmas. Eu., N. Asia, with the parents.

daphnoides, Vill. Tall shrub, to 30 ft., rarely tree: branches yellowish or brownish, bloomy, glabrous; stamens cordate: lvs. short-stalked, lanceolate, acuminate, glandular-serrulate, glabrous, glaucous beneath, 1½–3 in. long: catkins sessile, before the lvs.; staminate nearly 2 in. long, filaments sometimes united at the base; pistillate rather shorter; ovary short-stalked, glabrous, with long style. N. and Cent. Eu., N. and Cent. Asia.


After Salix, No. 27, insert three:

Piperi, Bebb. Shrub, to 20 ft.: branchlets glabrous, dark brown: lvs. elliptic-oblong, obovate or ob lanceolate, acute, undulate crenate or nearly entire, glabrous, glaucous beneath, 4–6 in. long: catkins sessile or short-peduncled; stamens united or free at base; ovary smooth; style rather long. Wash.

hastata, Linn. Shrub, to 6 ft., young branchlets pubescent, older glabrous, brown: stamens often very large, obliquely ovate: lvs. elliptic or ovate, acute, glabrous, irregularly serrulate, 1½–2½ in. long: catkins with the lvs., in leafy stalks; filaments glabrous; ovary glabrous, style rather long. Eu., N. and Cent. Asia.

glabra, Scop. Low shrub, to 4 ft., with short, stout branches: young branchlets glabrous, brown: lvs. broadly oval or ovate to oblong, acute, rarely obtuse at the ends, minutely crenulate, glabrous, glaucous beneath, 1½–3 in. long: catkins with the lvs., on leafy stalks: filaments pubescent at the base; ovary stalked, glabrous, style rather long. Cent. Eu.

After Salix, No. 29, insert two:

Reuteri, Mortizii (S. daphnoides × S. inéna, S. Wimmer, Kerner). Tall shrub: young branchlets densely pubescent, older brown, glabrous, often bloomy: stamens small, lanceolate; lvs. lanceolate or narrowly...
lanceolate, acute at both ends, serrulate, silky pubescent while young, glabrescent at maturity, dark green above, glaucescent beneath, 1½–3 in. long; catkins before the lvs., nearly sessile, cylindric; staminate 1–1½ in. long; ovary short-stalked, glabrous, with short style. Cent. Eu., with the parents.

**gracilista**, Miq. (S. Thunbergiana, Blume). Shrub: young branchlets tomentose, older reddish brown: stipules cordate: lvs. oblong-obovate to oblong-lanceolate, acute at both ends, serrulate, pubescent when young, later glabrous above, thinly pubescent and glaucescent below with prominent veins, 2–4 in. long: catkins cylindric, before the lvs., sessile; staminate 1–1½ in. long, stamens 2, with connate filaments; pistillate longer; ovary pubescent with long and slender style. Japan.

To *Salix*, No. 30, add the following varieties:

**Var. Lambertiana**, W. D. Koch. Lvs. broader, generally obovate-lanceolate, more abruptly acuminate, usually more rounded at the base, up to 4 in. long and ¾ in. broad. **Var. sericea**, W. D. Koch. Lvs. silky when young, becoming glabrous. Here belongs the "Kecks Willow" (var. *Kecksi*, Hort.). **Var. amplexicaulis**, Boiss. Lvs. sessile or subsessile, cordate or rounded at the base, acuminate, oblong to oblong-lanceolate, glabrous.

After *Salix* No. 30 insert two:

**rubra**, Huds. (S. purpurea × S. viminalis, S. Forbyana, Smith). Small shrub: young branchlets short-pubescent, older glabrous: lvs. linear to lanceolate-oblong, acute or acuminate, denticulate, pubescent while young, later glabrescent: catkins subsessile, stamens 2, with more or less connate filaments and red anthers; ovary short-stalked, pubescent, with distinct style. Eu., W. to N. E. Asia, with the parents.

**Sieboldiana**, Blume. Upright shrub: young branchlets tomentose, older glabrous: lvs. ovate to oblong, acute, rounded at the base, obtusely serrate, dark green and glabrous above, glaucescent and glabrous below, pubescent only when young, 2–3 in. long: catkins cylindric, short-stalked, with small lvs. at the base; stamens 2, distinct or connate, or only 1; ovary stalked, pubescent, style half as long as ov. ½ or shorter, with short oval stigmas. Japan.

**SOLANUM**. Page 3185.

**giganteum**, Jacq. (next to No. 34). An erect shrub-like plant growing to a height of 10–25 ft.: sts. somewhat woody, thickly set with short, stout prickles and white-woolly with stellate pubescence: lvs. oblong or oblong-elliptical, narrowed at both ends, about 8 in. long by 3 in. broad, smooth above, and white-tomentose beneath: fls. cymose, pale violet or blue; calyx small, hoary, unequally 5-cleft; corolla about ½ in. diam., rather deeply lobed; ovary puberulous: fr. red at maturity and about ¼ in. diam. India and Ceylon.—A tender species flowering under cult. when about 4 ft. in height. It is doubtful whether this species is in the American trade, although probably it is as ornamental as other species more or less grown. The *S. giganteum* of lists may be merely a trade name applied to one of the tall-growing species otherwise described under *Solanum*. W. F. Wight.
NEW COMBINATIONS IN LATIN NAMES

When a species is transferred to another genus, and when a variety is transferred to another species or associated with another species-name or reduced from specific to varietal rank, the names follow them and a "new combination" results. Thus, if an author desires to place the almond in Prunus rather than in Amygdalus, in which Linnaeus originally described it as Amygdalus communis, the new combination Prunus communis results. If Rubus leibostis of Koehne is considered by Zabel to be only a form of R. auratum, the new combination R. auratum var. leibostis, Zabel, results.

To enable botanists and bibliographers to record and trace the different dispositions and properly to understand the standing of various names of relationships, all such new combinations are entered whenever complete synonyms are made.

In the Cyclopedia, it has been the desire to avoid the making of new combinations, as explained on page xi of Vol. I; although, under the exigencies of the work, a very small number has arisen. In Vols. V and VI, many combinations were inevitable, and those were duly published in Rhodora, XVIII, 152–160 (July, 1918); these were largely in the genera Polycarpa, Pyrus, Prunus, Passiflora, Prunus, Stachys, Limonium, Saxifraga, Tropeolum.

A list of several incidental scattered new combinations made in the Cyclopedia itself is here given, so far as desired, without histories, for the easy reference of the bibliographer. These are such combinations as the authors designed to make. Undoubtedly other combinations are mostly of horticultural varieties and of those who have occasion to work over special groups; but these may not be considered here. The new combinations are mostly of horticultural varieties and of species-forms of minor importance. Numberless associations of varietal names cannot be traced to one definite source, as they are found in trade catalogues, periodicals, and other non-botanical publications, or may be customarily employed by horticulturists; these are therefore given the designation "Hort." (hortorum, "of the gardens;" page xvii, Vol. I). In those cases in which no authority is given for varietal rank, the names follow them and a specific to varietal rank, the names follow them and a

RUBUS PEOEVII, Muh.), var. roribaccus (Bailey) Bailey, V. 2847.

RHODODENDRON FORTIIEI, Planch., var. amarum (Lindl) Rehd. V. 2844.

RHODODENDRON QUINQUEFOLIUM, Moore, new name, VI. 3571.

RHODODENDRON OBTUSUM, Pancb., var. amrenum (Lind) Rehd.; var. Penicillata, Bailey, subvars. laciniata, macrophylla, variegate, microphylla (Hort); Bailey, V. 2556.

RHODODENDRON CANDIDUM (Small) Rehd., V. 2845.

RHODODENDRON QUINQUEFOLIUM, Moore & Boies, var. roseum, Rehd., V. 2847.

RHODODENDRON LATIEVERNS, Rehd., new name, VI. 3571.

RHODODENDRON AUSTRINUM (Small) Rehd., VI. 3571.

RHODODENDRON RUFORELLII, Bailey, var. albidosus, Bailey, V. 3024.

RUBUS PROCEECENS, Muhl., var. ribicacces (Bailey) Bailey, V. 3031.

SAXIFRAGA DISCUSA, Bailey, var. suberosa (Moench) Bailey., VI. 2846.

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SAXIFRAGA DISCUSA, Bailey, var. suberosa (Moench) Bailey., VI. 2846.
Organized as a Joint Committee in 1915, with J. Horace McFarland as Chairman and Harlan P. Kelsey as Secretary. The organizations participating, with list of committees, are as follows:


American Association of Park Superintendents.—Hermin W. Merkel, Forester Zoological Park, New York City; John Dunbar, Assistant Superintendent of Parks, Rochester, New York; Theodore Wirth, Superintendent of Parks, Mnnneapolis, Minnesota.

American Society of Landscape Architects.—Frederick Law Olmsted, Brookline, Massachusetts; Sid. J. Hare, Kansas City, Missouri; William Pitkin, Jr., Rochester, New York; Warren H. Manning, Boston, Massachusetts.

American Pharmaceutical Association.—Dr. H. H. Rusby, Columbia University, New York City; Oliver A. Farwell, Detroit, Michigan; Dr. Lyman F. Kebler, Washington, District of Columbia.


The primary or first-given entries under the genus in every case are the trade names or those used commonly in journals and elsewhere; when these names differ from the Cyclopedia name they are in Ital type; when the same as the Cyclopedia name, they are in black-face type.

A name in parenthesis is one that is used in the trade or in periodicals: thus, "Acanthophenix rubra (Areca)" means that the plant may appear in catalogues under the name Areca. Such entries are cross-references.

The stars (*) denote the names recommended by the American Joint Committee on Horticultural Nomenclature for the use of nurserymen. These markings are made wholly on the responsibility of the Committee, the List being lent for this purpose, and they are not supervised or recommended by the Editor.

While it is desirable that the names used by botanists and horticulturists shall be the same, yet the dealer is confronted with trade conditions which may modify his practice in some cases. The Editor naturally prefers to stand for the accepted botanical names.

To save space, the abbreviation var. (variety) is omitted; but the Editor does not thereby commit himself to the use of trinomials.

STATEMENT OF THE AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE

At a meeting August 1, 1916, in which the representatives of the American Association of Park Superintendents, and the American Society of Landscape Architects also participated, the same officers were continued and the American Joint Committee on Horticultural Nomenclature was adopted. The representatives of the American Pharmaceutical Association were added to the committee a few weeks later.

Scope of work.

So far as practicable, it is proposed to secure the standardizing of a single botanical name, together with a single vernacular or "common" name for every tree, shrub, and herbaceous plant in the American horticultural trade.

It is probable also that the Joint Committee will undertake later to recommend a list of "plant-name abbreviations," as an aid to those who use plant names daily and continually, such as nurserymen, seedsmen, florists, landscape architects, pharmacists, park officials, and others.

The subjoined starred list of Latin binomials should be considered only as a preliminary report. The magnitude and manifest difficulties of the problem, and lack of time occasioned by the early publication of the last volume of this Cyclopedia, have made it necessary for the Joint Committee to confine its recommendations almost wholly to the "botanical" names of woody plants as given in this "Finding-List." The even more important work of endeavoring to standardize popular or "common" names must follow later.

Practical importance of stability in nomenclature.

The confusion of names in the horticultural plant world is at present so great as to clog popular plant knowledge and actually to limit to no small degree the use of certain trees, shrubs and flowers in our American plantings. The
A striking case of this sort is that of the tree so widely disseminated for street planting under the common name “Carolina Poplar.” Experts on the poplar state that this is probably Populus Eugenia, a hybrid originated in Europe, and that the native Carolina Poplar practically never passes in the trade under that name. In this extreme case the transferred name is so universally accepted by the trade that an attempt to correct the original mistake would be inadvisable at present.

Other causes than mistaken identification of plants have contributed to the existing confusion. These involve differences of opinion and of practice among botanists in regard to plants names when there is no question at all about the identity of the plants. For one thing, in doubtful cases they are not yet wholly agreed upon the rules or “code” which shall apply, to decide which of two or more names shall stand; but these differences are comparatively few. Much more important are differences of personal judgment among botanists as to what constitutes in any given case a sufficient difference between two groups of related plants to place them in different genera, for example, whether the known difference between apples and pears is enough to separate them into two genera, Malus and Pyrus, or is so slight that they should be consolidated into a single genus. The same sort of difference in judgment arises as to what constitutes a sufficient difference to call for separation into distinct species, and as to what are “varieties.” These differences are inevitable and are independent of rules or other arbitrary decisions.

For example, Azaleas is now classed under Rhododendron by some botanists, yet for trade reasons it seems inexpedient to catalogue the Azaleas as Rhododendrons.
in descriptive, euphonious, and short, in distinct contrast to many Latin names. Common names are usually easier to remember by those who are not botanists, and they serve a most useful purpose in linking up the plant with its correct, or accepted scientific name. The Joint Committee expects in the near future to publish in connection with the scientific names a list of common names, with recommendations for horticultural use, believing that such a list will serve purposes of plant knowledge and identification even more effectively than the present starred list of botanical names.

Identification.

As has been stated, a leading cause of plant-name confusion lies in the careless dissemination of plants under a wrong name. In doubtful cases when means are not at hand for positively identifying plants and labeling them properly, it is earnestly urged that adequate specimens (including flowers, fruit, leaves, and roots, where possible) be sent to a competent authority for correct identification and naming, such as Dr. L. H. Bailey, Ithaca, New York; the United States Department of Agriculture, Washington; any well-equipped botanical garden; or the Arnold Arboretum, Jamaica Plain, Massachusetts. Specimens should be pressed and dried smooth, and sent flat between cardboards.

Acknowledgment.

The Joint Committee wishes to acknowledge its gratitude to Dr. Bailey for the opportunity afforded of presenting to the American horticultural public its first efforts toward standardizing plant names through the medium of the "Standard Cyclopedia of Horticulture." Moreover, the Committee has enjoyed the earnest cooperation and advice of Dr. Bailey, and thus the work has been made far more complete and helpful than it could possibly have been otherwise.

Recommendations of the Joint Committee on the use of the Finding-List.

1. The stars (*) denote the names recommended for uniform use by the American horticultural trade, for such period of time as shall elapse until a new list is agreed upon.

2. In cases in which the starred name differs from the Standard Cyclopedia name and the cataloguer or writer for any reason does not wish to use it, the Joint Committee urges the use of the Cyclopedia name rather than the use of a third alternative.

3. When no star appears in the list, as in the case of nearly all the herbaceous plants, the Joint Committee has not yet specifically passed on the names.

4. In cataloguing, the Finding-List will enable one to place other names in parentheses with the name recommended by the Joint Committee, and to use them also as cross-references. Customers seeking a plant will thus be enabled to locate it readily under any of its well-known names if cross-reference is freely used. The Joint Committee believes that there is no better method known of educating the tradesman and public alike to a correct knowledge of plant names and to the consequent adoption of the recommended or standardized name.

Examples: If he were cataloguing certain plants formerly known to systematists as Andromeda, a good treatment would be as follows:

Andromeda floribunda. See Pieris.

And under Pieris the entry would be:

PIERIS (Andromeda) FLORIBUNDA.

(Note: The genus Andromeda is not entirely obsolete, but now includes in America only two species, A. polifolia and A. glaucophylla.)

In some cases, it is only the species that is involved, the genus remaining the same. Thus, the name Magnolia stellata is now used in place of M. Halliana. Perhaps the best entry would be:

Magnolia Halliana. See M. STELLATA.

And again in its proper place carrying description, sizes, and prices—

MAGNOLIA STELLATA (M. Halliana).

Other examples are—

AZALEA NUDIFLORA (Rhododendron nudiflorum).

FRAXINUS NIGRA (F. sambucifolia).

HALESIA TETRAPTERA (H. carolina, Mohrodendron carolinum).

CORNUS STOLONIFERA var. FLAVIRAMEA (var. aurea).

ACER PALMATUM (A. polymorphum) var. ATROPURPUREUM.

These examples will suggest how to make up proper entries. It is further recommended that synonyms introduced in cross-reference or in parentheses always be printed in italics or in smaller type than the accepted standardized name.

5. In cataloguing, labeling, etc., the abbreviation "var." (variety) following a species name may be omitted for the sake of brevity.

The name of a variety or horticultural form is often further abbreviated by omitting the species-name (for example: Acer purpurascens for A. pseudoplatanus var. purpurascens); but this practice is liable to cause confusion, as when specific and varietal names in a given genus are similar or alike, and therefore when a varietal name is so contrasted the abbreviation "v." or "var." should be retained (for example: Acer var. purpurascens for Acer pseudoplatanus var. purpurascens).

6. It is suggested that all tradesmen publishing catalogues or lists print in a conspicuous place a notice similar to the following: "The names of trees and shrubs in this catalogue are based on the recommendations of the American Joint Committee on Horticultural Nomenclature as they appear in Bailey's Standard Cyclopedia of Horticulture, pages 3575 to 3591."

The Joint Committee takes this opportunity to urge all members of the organizations represented in it and all others interested in standardizing plant names to offer criticisms and suggestions for the help and instruction of the Committee in its future work. It is only by persistent effort and cooperation that we may hope to bring reasonable order and understanding out of the existing chaos in plant nomenclature.

AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE

HARLAN P. KELSEY, Secretary, Salem, Massachusetts.
<table>
<thead>
<tr>
<th>Latin Name</th>
<th>English Name</th>
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</thead>
<tbody>
<tr>
<td>ANACARDIUM.</td>
<td>A. alatum.</td>
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<tr>
<td>AMOMUM.</td>
<td>A. Cardamom.</td>
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<tr>
<td>ANGUIFOLIA.</td>
<td>A. canadensis.</td>
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<tr>
<td>ANGELICA.</td>
<td>A. archangelica.</td>
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<td>ANIMOSITY.</td>
<td>A. cardamine.</td>
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<td>ANEMONE.</td>
<td>A. acutiloba.</td>
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<tr>
<td>ANONYMOUS.</td>
<td>A. Cardenii.</td>
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<tr>
<td>ANOXYPHILUS.</td>
<td>A. Rivieri.</td>
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<tr>
<td>APIUM.</td>
<td>A. graenolens (Celery).</td>
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<tr>
<td>APHIS.</td>
<td>A. tuberosa (Glycine Apios).</td>
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<tr>
<td>APHRODISIA.</td>
<td>A. hyemale.</td>
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<tr>
<td>APORRHEA.</td>
<td>A. Scherzerianum.</td>
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<tr>
<td>APORRHEA.</td>
<td>A. lutea.</td>
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<tr>
<td>APRICOTUS.</td>
<td>A. persica (Persica).</td>
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<tr>
<td>ARCTOSTAPHYLOS.</td>
<td>A. glauca.</td>
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<tr>
<td>ARBUTUS.</td>
<td>A. Menziesii.</td>
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<tr>
<td>ARBORETUM.</td>
<td>A. distachyon.</td>
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<tr>
<td>ARBUSTUS.</td>
<td>A. breviscapa.</td>
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<tr>
<td>ARCTOSTAPHYLOS.</td>
<td>A. glauca.</td>
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<tr>
<td>ARDOMEDA.</td>
<td>A. arborea.</td>
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<tr>
<td>ARHIS.</td>
<td>A. sativus.</td>
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<tr>
<td>ARNICA.</td>
<td>A. margaritacea (Antennaria).</td>
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<td>ARNICA.</td>
<td>A. Barrelieri.</td>
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<tr>
<td>ARNICA.</td>
<td>A. Ilia.</td>
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<tr>
<td>ARNICA.</td>
<td>A. sativa.</td>
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<td>ARNICA.</td>
<td>A. Ilia.</td>
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<tr>
<td>ARNICA.</td>
<td>A. sativa.</td>
</tr>
</tbody>
</table>

Note: This table provides a list of binomials, which are scientific names used in botany. Each entry consists of the genus and species names, separated by a space. The table includes various plant species, each with its common name in parentheses where applicable. The list covers a wide range of plant species, from flowering to coniferous types, and includes both common and scientific names. The table is designed to provide a quick reference for identifying and listing binomials, useful for educational or research purposes.
ARUNDINARIA (Bambusa). *A. auricoma.
- *Falcata.
- *Falcata i.
- folis variegatis; probably *A. Fortunei.
- *Hindii.
- *Japanica.
- *Simoni.
- *Velchii.

ARUNDO. *A. Donax.

ASARUM. A. arifolium.
- canadense.
- virgincum.

ASCELEPIAS. A. Curassavica.
- Hallii.
- Incarnata.
- Tuberosa.

ASIMINA. *A. triflora.

ASPARAGUS. A. asparagoides (Mysriphyllum. Florista' Smilax).
- Cooperi.
- *Hatcheri: probably A. plumosus robustus.
- madagascariensis.
- medioideae: A. asparagoides.
- navus: A. plumosus nanus.
- officinalis (Edible Asparagus).
- plumosus.
- scandens.
- Sprengeri.
- tenuissimus: A. plumosus tenuisimus.

ASPERULA. A. azures: A. orientalis.
- hexaphylla.
- odorata.

ASPHODELINE. A. lutescens (Asphodeleus).

ASPHELODUS. A. albus.
- lutescens: Asphodeline lutescens.

ASPIDISTRA. A. lurida.

ASPIDODON. A. arborescens.

ASPIDIUM. A. albus.

ASPHODELINE. A. lutea (Asphodeline).

ASPHODELUS. A. azurea.

ASSARICA. A. vulgaris.

ASSATTUS. A. bulbuscum.

ATHERMATUM. A. bulbosum: A. elatus tuberosum.

ASTER. continued.
- *bassarabicus: A. Amellus bessarabicus.
- Chapmannii.
- cordifolius.
- corymbosus.
- Curtisii.
- decorum: A. levis.
- ericoides.
- formosissimus.
- grandiflorus.
- himatanesis: A. hirta.
- levis.
- liacinus.
- longifolius.
- maackii.
- macrophyllus.
- Meea granda: possibly is Erigeron macranthus.
- multiflorus.
- nove-angliae.
- novi-belgii.
- patens.
- punicus.
- ptarmicoides.
- Shortii.
- speciosus: A. alpinus speciosus, not A. speciosus of botanists.
- spectabilis.
- subcneurus.
- tatarius.
- Thomsonii.
- *Toumehnadi: A. Bigelovii.
- *Tradescantii.
- *Trinervius.
- turbellius.
- umbellatus.
- undulatus.
- varicolor.

ASTILBE. A. Ariendii: hybrids of A. Davidii with other species.
- asteroides (Spiraea).
- chinensis.
- Davidii (Spiraea).
- grandis.
- japonica.
- similifolia.

ASTRAGALUS. A. alopecuroides.

ASTRANTIA. A. major.

ATRIPLEX. A. Eortensis (Orach).

ATROPA. A. Belladonna.

AUERBIETIA. A. Bougainvillei: A. deltoidea Bougainvillei.
- deltoidea.
- *gracia: A. deltoidea gracia.
- *Heuderonii: A. deltoidea Henдерсонii.
- *olympica: A. deltoidea olympica.

AUCUBA. *A. himealaica.
- *japonica.

AVENA. A. sterilis.

AZALEA. *A. amena: Rhododen-
- dron obtusum amoenum.
- *arboreascens: R. arborescens.
- *calendulacea: R. calendulacea.
- caliginosa: R. caliginosa.
- *Candicans: R. canescens.
- *Pandorea: R. Morteri.
- *Hindus: form of R. obtusum.
BERBERIS (see page 3566). *B. agrestis.

AQUIFOLIUM: *Mahonia Aquifolium.

brevipinaculata: perhaps sometimes applied to B. aggregata.

*buxifolia.

*canadensis.

*Dawsonii.

*dirichthylla. but often misspelled to B. Neubertii latifolia.

*Japonica: *Mahonia japonica.

*nervosa: *Mahonia nervosa.

*purpurea: *B. vulgaris atropurpurea.

*Regeliana: *B. amurensis japonica (page 3566).

*repens: *Mahonia repens.

* recapitulata: *B. simulans. *Sargentiana; but the plant in cultivation under this name is often B. Juliane (page 3566).

*Sieboldii.

*staphyphylla. *Thunbergii.

*tricaryoides. *Dendropanormus.

*Vaccinium. *B. glabra.

*laetivirens: *B. spectabilis lateritia.


*speciosissima.

BOUSSINGAULTIA. B. baseloides.

BOUVERARDIA. B. Humboldtii.

*Jaquinotii: B. triphylla.

*triphylla.

BRACHYCHITON, B. diversifolium; also perhaps refers to B. populneum.

BRACHYCOME. B. iberidifolia.

BRAHEA. B. filifera: Washingtonia filifera.

*robusta: W. filifera robusta.

BRASENIA. B. pellata: B. Schreberi.

BRASSICA. B. oleracea: B. oleracea acephala (Kale).

*alba (Sinapis).

*arvensis (Sinapis).

*brotetia: B. oleracea botrytis (Caulifower).

*capitata (Cabbage).

*capitata (Cauliflower).

*capitata (Rutabaga).

*capitata: B. oleracea capitata (Cabbage).

*chinesis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.

*cinerea: B. chinensis.
CINERARIA, continued.

— maritima: Senecio Cinera. 
— stellata: a race of florists' cinera.
— (offshoots of Senecio cruentus).

CINNAMOMUM. *C. Camphora
— *Cassia.
— *Loureiritl.
— *reylanicum.

CIRSIUM. C. diacantha (Champe-
— *C. Virginica.

CISSUS (often listed as Vitis. Pages
— *C. Saligna
— being replaced).

CITRANUS. *C. Virginica.
— *C. Americana.

CITRULUS. C. Colocynthis (Colo-
— vulgaris (Watermelon).

CITRUS. C. *Aurantium.
— *Aurantiifolia (Lime).
— *Aurantifolium (Lime).
— *Aurantium (Sour or Seville
— Orange).
— Bigaradia: *C. Aurantium.
— *deliciosa: *C. nobilis delicosa
— *grandis (Grapefruit).
— *Limonia (Lemon).
— *Citrus (Citron).
— *-growing Mandarin Orange).
— *nobilis (King Orange).
— *sinebis (Common Orange).
— *trifoliate: Poncirus trifoliata.
— *shrub: *C. nobilis shubhu (Sat-
— *sumo Orange).

CLADRAVUS. C. arcticum.
— Brrlagdianum: a strain of C. car-
— *C. Henryi of botanists.
— *C. Lawsoniana Henryi; a
— *C. Henryi of botanists.
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DESMODIUM. D. bicolor: *Lespedeza bicolor.

--- ^japonicum: L. japonica.

--- ^penduliflorum: L. formosa.

--- Koehne (L. Sieboldii not tenable under the rules).

DEUTZIA. D. candidissima; *D. scabra candidissima. 
--- corymbiflora: *D. setchuenensis
corymbiflora.
--- crenata: *D. scabra crenata.
--- *discolor.
--- Fortuni: *D. scabra Fortuni.
--- *gracilis.
--- *Lemoinei.
--- *myriandha.
--- *parviflora.
--- *scabra.
--- *Schneideriana.
--- *Vulgarina.
--- *Watereri: *D. scabra Watereri.

DIANTHUS. D. albus: *Dianthus albus plenus, mirabilis, densis.
--- *myriantha.
--- *Lemoinei.
--- *penduliflorum; 

DEUTZIA. D. albiflora: *D. albiflora.
--- *formosa.

DODONAEA. *D. cuneata. 

DOLICHOS. *D. biflorus.
--- *Bismpetetus: a form of D. Lablab.
--- *japonicus: Pueraria hirtuta: *P. Thunbergiana.
--- *Lablab.
--- *lignosus.
--- *sequispedalis: *Vigna sequispedalis.

DORONICUM. D. australis.

--- caucasicus.
--- *Clusi.
--- *excelsum: D. plantagineum excelsum.
--- *magnificum.
--- *plantagineum.

DRAKE. *D. androsaceae: D. fladnizensis.

DRAZEDA. *D. amabilis: Cordyline amabilis, a form of C. terminalis.

--- australis: C. australis.
--- Baptista: C. Baptista, a form of C. terminalis.
--- demersum.
--- Draco.
--- *fragrans.
--- Godseffiana.
--- *Goldiesiana.
--- *imperialis: C. imperialis, a form of C. terminalis.
--- *indica: C. indica; but often applied to C. australis.
--- Kernerii, a form of D. fragrans.
--- Liddeni: D. fragrans Lindeni.
--- Massangeana: D. fragrans Massangeana.

DROBA. *D. andreanae: D. fladnizensis.

DROBA. *D. andreanae: D. fladnizensis.

DROBA. *D. andreanae: D. fladnizensis.

DROBA. *D. andreanae: D. fladnizensis.

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DROBA. *D. andreanae: D. fladnizensis.

DROBA. *D. andreanae: D. fladnizensis.

DROBA. *D. andreanae: D. fladnizensis.
ECHEVERIA (see *Cotyledon). E. agavoides: Cotyledon agavoides (out equally correct as E. agavoides).
- metallica: E. gibbiflora metallica.
- secunda (Cotyledon).
ECHINACEA (Brauneria). E. angustifolia.
- parviflora: E. purpurea serotina.
- purpurea.
ECHINOCACTUS: *E. viridiflorus:
- Echinocereus viridiflorus.
ECHINOCEREUS: E. viridiflorus.
ECHINOCYSTIS. *E. lobata.
ELEODENDRON. *E. orientale
- Pungens:
- .nacrophylla.
- refiexa:
- *langipes:
- multiflora. *E. longipes.
ELLEAGNUS. *E. angustifolia.
- papyrifera:
- Chrysantha.
ECHENTIALIA. E. cristata.
ELEOPEA. E. canadensis (Anacharis).
ELLEOPEA. E. angustifolia.
ECHIUM. E. fastuosum.
- exaltatus.
- humilis.
ECHINOPS. E. bannaticus.
ECHINOCEREUS viridiflorus.
ECHINOCYSTIS. E. lobata.
ECHINOCYSTIS. E. viridiflorus.
ECHOCACTUS. E. secunda (Cotyledon).
ECHINACEA (see *Cotyledon).
ECHINOCERUS. E. cristata.
ELCHAMIS. E. angustifolia.
- argentea.
- aurea:
- ciliaris.
- cinerea.
- Macrophylla.
- multiforma. *E. longipes.
- Pungens.
- reflexa. E. pungens reflexa.
- Simonii: E. pungens Simonii.
- umbellata.
ELHIS. E. gymnospermus.
ELHIS. E. orientale (Aralia Chabrieri).
ELUSINE. E. barbata nomencl:
- tristachya.
- coracana.
- indic.";
ELODEA. E. canadensis (Anacharis).
ELHIS. E. orientale.
ELIS. E. cristata.
- Stauononii.
ELMUS. E. arenarius.
- Giganteus (page 3568).
- glaucus.
ELMILL. E. spicata: E. flammea (Cacalia).
EMENAMETH. E. penduliflora.
ENKIANTHUS: *E. campanulatus.
- japonicus: *E. perulatus.
EOMECON. E. chionanthus.
EPHECRA. *E. alutissima.
EPIC. *E. repens.
EPILIBRA. E. angustifolium.
- fairtanum.
EPILIBRA. E. angustifolium (out)
- hirsutum.
EPIMEDIUM. E. alpinum.
- colchicum: E. pinnaeolus colchicum.
- diphyllum: Aceranthus diphylla.
- macranthum.
- Muschinenhum.
- nivum: E. macranthum niveum.
- violaceum: E. macranthum violaceum.
EPIPACTIS. E. pubescens: Goodyera pubescens.
EPHYLLUM. E. Makoyanum: Schlumbergera Russeliana.
- truncatum: Zygocactus truncatus.
ERAGROSTIS. E. abyssinica.
- amabilis (Posa).
- elegans: E. interrupta.
- geniculata (Briza).
- maxima.
- minus.
- obtusa.
ERANTHIS. *E. byemalis.
EREMURUS: E. himalacicus.
- robustus.
- turkestanicus (page 3568).
ERIANTHUS. E. Ravenneae.
ERICA. *E. carnea.
- ciliaris.
- cinerea.
- Maackii: supposed to be a hybrid of E. ciliaris X E. Tetralix.
- Mediterranean.
- melanthera.
- persulcata.
- stricta.
- Tetralix.
- vagans.
- vulgaris:
- Calluna vulgaris.
- Wilmoreana: *E. Wilmorei.
ERGERON. E. alpinus.
- aurantiacus.
- bellidifolius: E. pulchellus.
- glabellus.
- glaucus.
- grandiflorus:
- E. speciosus grandiflorus, not E. grandiflorus of botanists.
- intermedius: not identified.
- macronatus (Vittadinia).
- multiradiatus.
- speciosus (Stenactis).
- umbellatus: not identified.
ERNIS. E. alpinus.
ERIOTRYA. *E. japonica (Loquat. Platina).
ERIANGAEA. E. tomentosa.
ERODIUM. E. cicutarium.
- E. maritimum.
- hybridum.
- meridimum.
- Olivenarian.
- planum.
- yuccifolium: E. aquatricum.
ERYNGIUM. E. alpinum.
- Manescavii.
- polyanthemos.
- sideroxylon.
- stuartiana.
- Berteriana.
- jacobeus.
- polyanthemos.
- resinifera.
- robusta.
- rostrata.
- rudis.
- sideroxylen.
- Stuartiana.
- tetricornis.
-と言is.
- virgata.
EUCHARIDUM. E. grandiflorum.
ERYTHRONIUM. A. albidad.
- americanum.
- Californicum.
- citrinum.
- giganteum: E. grandiflorum.
- grandiflorum.
- Hartwegii.
- Hendersonii.
- purpurascens.
- revolutum.
ESCALLONIA. E. Beteriana: *E. pulvulenta.
- *Jeucantha.
- Mgoalsdevia.
- Philippiana: E. virgata.
- rosea: not known botanically.
- rubra: *E. rubra glabriuscula, not E. rubra of botanists.
- *virgata.
ESCHSHOLTZIA. E. alba: a white form of E. Californica.
- aurantica: a form of E. californica.
- californica.
- crocea: E. californica crocea.
- Douglasii: E. californica Douglassi.
- maritima: the cultivated plant is a form of E. californica, not E. maritima of botanists.
- tenuifolia.
- Thorbirnii: a form of E. californica.
EUCALYPTUS. *E. alpina.
- angustifolia.
- incraseata angulosa.
- bicolor.
- Botaniol.
- botryooides.
- cajaputea: E. odorata.
- calophylla.
- citroidora: E. maculate citroidora.
- cornuta.
- corynocalyx.
- crebra.
- diversicolor.
- fibifolia.
- globulus.
- Gunnii.
- hemiphloia.
- incraseata.
- Lehmannii.
- leucoxylen.
- macrophylla.
- maculate.
- mellelora.
- Muelleriana.
- obliqua.
- occidentalis.
- pasciflora: E. coriacea.
- odor.
- Piperita.
- polyanthemos.
- resinifera.
- robusta.
- rostrata.
- rudis.
- sideroxylen.
- Stuartiana.
- tetricornis.
- speakis.
GALLARDIA, continued.
— *maxima: G. aristata.
— *vita: G. pulchella pita.

GALANTHUS. G. nivalis.

GALAX. *G. aphylla.

GALEGA. G. biicolor; probably a form of G. officinalis (page 3568).
— *Hartlandii: G. officinalis Hartlandii.
— *officinalis.

GALEORCHIS. See Orchis.

GALIUM. G. boreale.

GALONIA. G. candidans (Hyacinthus).

GAMOLES. G. Tagetes.

GALEGA. *C. multiflorus.
— *Spartium junceum.

GLADIC. G. puniceus.

GLADIC. G. canariensis.
— *C. scoparius racemosus.
— *C. scoparius fragrans.
— *C. scoparius ciliaris.
— *C. scoparius ciliaris variegata.

GAPPING. *G. eliptica.

GAUTHIERA. *G. procumbens.
— *G. divergens.
— *G. grandiflora.
— *G. officinalis Hartlandii.

GARLANDIA. *G. biloba.

GARDENIA. *G. jasminoides.
— *G. floribunda.
— *G. chiloense miniatum.

GARDENIA. *G. jasminoides Hartlandii.
— *G. floribunda.
— *G. grandiflora.
— *G. flavum.

GARKILIA. G. Lindheimeri.

GAYLUSSA. *G. frondosa.
— *G. armenum.
— *G. officinalis.
— *G. grandiflorum.

GLECHOMA. *G. ciliaris.

GEOXINFO. G. Rothchildiana.

GEOXINFO. G. argenteum.
— *G. lanatum.
— *G. virgineum.
— *G. fruticosus.

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— *G. lanatum.
— *G. virgineum.
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— *G. lanatum.
— *G. virgineum.
— *G. fruticosus.

GEUM. G. atrosanguineum.
— G. acaulis.
— G. officinalis.
— G. tricolor.
— G. arguta.
— G. maritima.
— G. chinens.
— G. fruticosus.
— G. coccineum.
— G. chiloense.
— G. chiloense miniatum.
— G. officinalis Hartlandii.

GEOXINFO. G. argenteum.
— *G. lanatum.
— *G. virgineum.
— *G. fruticosus.

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— *G. fruticosus.

GEOXINFO. G. argenteum.
— *G. lanatum.
— *G. virgineum.
— *G. fruticosus.
HELIANTHEMUM. *H. alpestre.  
— roseum (Acroclinium).  
— roseum album (Acroclinium).  
—*porcina (Acroclinium).

HELICHRYSUM. *H. angustifolium.  
—*elegans.  
—*paniculata.  
—*radiata.  
—*serrata.  
—*syriacus.  
—*villosum.  
—*squalida.
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<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<tbody>
<tr>
<td>Algeria</td>
<td>L. alba</td>
</tr>
<tr>
<td>Rosea</td>
<td>L. rosea</td>
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<tr>
<td>APHRODUTIA</td>
<td>L. cruenta (Anmonthea)</td>
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<tr>
<td>LIRIX</td>
<td>L. americana</td>
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<tr>
<td>Decidua</td>
<td>L. europaea</td>
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<tr>
<td>Hybrida</td>
<td>L. decidua</td>
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<td>KAMPERI</td>
<td>L. leptolepis</td>
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<td>LAMANDRA</td>
<td>L. macrantha</td>
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<td>ASTREA</td>
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<tr>
<td>Dryopteris spinulosa dilatata</td>
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<tr>
<td>LEROUSCERUS</td>
<td>L. Bertinii</td>
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<tr>
<td>Prunus Laurocerasus Bertinii</td>
<td>L. officinalis Bertinii</td>
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<tr>
<td>Caroliniana</td>
<td>L. officinalis caroliniana</td>
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<tr>
<td>Laurocerasus</td>
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<td>L. Benzin:</td>
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<td>Cerasus</td>
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<td>L. Spica</td>
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<td>Lavatera</td>
<td>L. alba:</td>
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<td>Tristis alba</td>
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<td>Arborae</td>
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<td>Rosa</td>
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<td>Layia</td>
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<td>Palustre</td>
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<td>Leophyllum</td>
<td>(Dendrimum)</td>
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<td>Buxifolium</td>
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<td>L. Leonurus</td>
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<td>Glaphyl (Glaphyllum)</td>
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<td>Lepachys</td>
<td>L. columnaaria</td>
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<td>Olbelaria</td>
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<td>Pinnata</td>
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<td>Legaryra</td>
<td>See Shepherdia</td>
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<tr>
<td>Lepidium</td>
<td>L. sativum (Cres)</td>
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<tr>
<td>Leptosiphon</td>
<td>L. androsaceus</td>
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<td>Gilia androsacea</td>
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<td>Aureus</td>
<td>G. micrantha</td>
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<td>Carmines</td>
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<td>Leptospermum</td>
<td>L. flexuosum (Agnonis)</td>
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<td>*Levigation</td>
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<td>Leptosyne</td>
<td>L. maritima</td>
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<td>*Sullimanii</td>
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<td>Lespedeza</td>
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<tr>
<td>Japanica</td>
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<td>Sieboldii</td>
<td>L. formosa, Koehne</td>
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<td>L. Sieboldii</td>
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<tr>
<td>Leucania</td>
<td>L. glutaca</td>
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<td>Leucocrinum</td>
<td>L. montanum</td>
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<td>Leucoujum</td>
<td>L. aestivum</td>
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<td>Verum</td>
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<tr>
<td>Leucotoheo</td>
<td>L. Catesbaei (Adromeda)</td>
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<td>Racemosa</td>
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<td>Recurva</td>
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<tr>
<td>Leycesteria</td>
<td>L. elegans, L. formosa</td>
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<td>*L. elegans</td>
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<tr>
<td>*L. formosa</td>
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<td>Liatris (Lacinaria)</td>
<td>L. elegans</td>
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<td>L. villosus</td>
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<td>L. punctata</td>
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<td>L. scariosa</td>
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<td>L. spicata</td>
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<td>Libocedrus</td>
<td>L. chilensis</td>
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<td>Decurrers</td>
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<td>Libonia</td>
<td>L. exobunda, Jacobinia</td>
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<td>Lithocarpos</td>
<td>L. grandis</td>
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<tr>
<td>Ligularia</td>
<td>L. clivorum (Senecio)</td>
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</tbody>
</table>
| Kaempferti (Parfibugion, Senecio) 
| Wilsoniana (see Senecio, page 3153) |
| Ligustrum                   | L. acuminatum                    |
| Amurensis                   |                                |
| Chinense                     | L. sinense                       |
| Corniculum                  | L. corinae                       |
| Ibota                        |                                |
| *Ibota                       |                                |
| *Japonicum                   |                                |
| *Lucidum                     |                                |
| Macracarpum                 | L. acuminatum macrocarpum        |
| Macrophyllum                 | L. lucidum                       |
| Marginitatum                | Probably L. vulgare argenteo-marginatum or auro-marginatum |
| medium                        | *L. acuminatum                   |
| Nepalense                    |                                |
| *Ovaliformes                 |                                |
| *Ouboui                      |                                |
| Regelianum                  | L. Ibota Regelianum              |
| *Sinense                     |                                |
| *Spicatum                     | The cultivated plant is probably L. Masseolangeanum, L. japonicum, L. lucidum or L. nepalense |
| *Vulgare                      |                                |
| Lilium                       | L. auratum                       |
| Batemarie                    |                                |
| Bloomeramia                  | L. Humboldtii                    |
| Bolanderi                    |                                |
LONICERA, continued.
- *fugrantiissima; sometimes also used for L. Standishii.
- *fuchsioideae: *L. Brownii fuchsioidei, not L. fuchsioidei of botanists.
- *gigantea: either L. etrusca pubescens or L. etrusca superba.
- *glaucus: *L. dioica.
- *grandiflora: *L. tatarica grandiflora.
- *Halliana: *L. japonica Halliana.
- *Heckrottii.
- *Henri.
- *involutus.
- *japonica.
- *Ledebouri.
- *Maackii (Chamaecerasus).
- *Morrowii.
- *muendeniensis.
- *muscaviensis.
- *pulchella.
- *oblongifolia.
- *Periclymenum.
- *pileata.
- *pfennigeri.
- *pynenaica.
- *Ruprechtiana.
- *segreziensis.
- *sinensia: *L. Standishii.
- *spinosa (Chamaecerasus). Name sometimes applied to *L. spinosa Albertii.
- *Standishii.
- *Sulivani: *L. prolifera.
- *tatarica.
- *thibetica.
- *trichosantha.
- *virginalis: *L. tatarica virginalis.
- *Xylosteum.

LOPHOSPERMUM. *L. scandes (Maurandia Lophospermum).

LOTUS. *L. Bertholetii.
- *corniculatus.
- *Jacobeus.
- *pelargonchus: *L. Bertholetii.

LUCUMA. *L. mammosa.
- *nervosa.

LUFFA. *L. acutangula (Cucumis).
- *cylindrica.

LUNARIA. *L. biennis: *L. annua.

LUPINUS. *L. affinis.
- *cardinalis: *L. fulgens.
- *Erinus.
- *gracilis: applies to *L. gracilis or L. Erinus gracilis.
- *heterophylla; or the stock may be L. Erinus.
- *pumila: L. Erinus pumila, not L. pumila of botanists.
- *ramosa: L. tenior.
- *scandens: *L. Erinus speciosa, not *L. speciosa of botanists.
- *syphilitica.
- *tenior.
- *Tupa.

LUMARIA. *L. ciliata: Blechnum Moorei.

LONICERA. *L. Albertii: *L. spinosa Albertii (Chamaecerasus).
- *albida: *L. bella albida.
- *aurica: *L. Periclymenum aurea, not L. aurea of botanists.
- *bicolor: *L. Periclymenum bicolor.
- *bella.
- *brachyphylla: a form of *L. japonica.
- *Browallii.
- *canadensis.
- *Caprifolium; but the plant cultivated is perhaps sometimes *L. americanana.
- *chinensis: *L. japonica chinensis.
- *chrysanthana.
- *dioica.
- *falcata.
- *flexuosa: *L. japonica flexuosa.
LYCHNIS, continued.
- grandiflora: L. coronata.
- Haageana.
- plenissima: L. Flos-cuculi plenissima.
- Sieboldii: L. coronata Sieboldii.
- splendens: L. Viscaria splendens.
- Vesperina: L. alba.
- Viscaria (Viscarias).

LYCIUM. *L. barbarum: the plants cultivated as L. barbarum and L. europaeum are usually L. halimifolium or L. chinense; the true species (L. barbarum and L. europaeum) are probably not grown in this country.
- chinense.
- europaeum.
- halimifolium.

LYCOPERSICUM. L. esculentum (Tomato).
- pimpinelliformium.

LYCOPODIUM. L. clavatum.
- complanatum.
- dendroideum: L. obscurum.
- lucidulum.

LYCORIS. L. squamigera (Amaryllis).

LYGODIUM. L. japonicum.
- japonicum: L. japonicum.
- halimifolium.
- europaeum.
- chinense.


LYONIA. L. barystachys.
- ligustrina.

LYRIS. L. barystachys.
- ligustrina.

LYSICHITUS. L. coronatus.
- purpurea.
- Sieboldii.
- Watsonii.

LYTHRUM. L. alatum.
- roseum: L. Salicaria roseum.
- Salicaria.
- virgatum.

MAACKIA. M. amurensis (Chinese).

MAEDELIA. M. ternifolia.

MAIURIA. M. aurantiaca: M. garnetii.
- pomifera: Toxylon pomiferum.

MAGNOLIA. M. grandiflora: M. grandiflora angustifolia.
- grandiflora: M. grandiflora eburneum.
- Nobertiana: *M. Soulangeana Nobertiana.
- *obovata: M. liliflora.
- parviflora.
- purpurea: M. liliflora: M. obovata.
- rustic: *M. Soulangeana rustic.
- salicifolia; sometimes missapplied to M. grandiflora angustifolia.
- Soulangeana.
- speciosa: *M. Soulangeana speciosa.
- stellata.
- stricta: *M. grandiflora exoniensis.
- Thompsoniana.
- tripetala.
- Watsonii.
- Yulan: M. denudata: *M. conspicua.

MAHONIA (Odostemon under American Code). M. Aquifolium.
- Barclaiana.
- Emeryana:
- hypericifolia.
- Hypericum.
- Lophospermum (Lophospermum).

MAHONIA. M. Aquifolium.
- Barclaiana.
- Hypericum.
- Lophospermum (Lophospermum).

MELALEUCA. M. Alternifolia.
- Emeryana:
- hypericifolia.
- Hypericum.
- Lophospermum (Lophospermum).

MELASTOMA. M. alternifolia.
- Emeryana:
- hypericifolia.
- Hypericum.
- Lophospermum (Lophospermum).

MELIA. M. azedarach: M. azedarach umbraculiformis.

MALVA. M. Alcea.
- crispa.
- miniata: Spherical cispalina.
- moschata.

MALVAVISCUS. M. arboreus (Achosan).

MAMMEEA. M. americana.

MANGIFERA. M. indica.

MANETTIA. M. bicolor: some of the stock is probably M. australis.

MANIFERA. M. indica.

MANIHOT. M. utilissima (Cassava).

MARRUBIUM. M. vulgar (Horhound).

MARTHEALLA. M. trinervia.

MARTinezia. M. Caryotafoila.

MARTYRIA. M. Craniolaria: Craniolaria ananassa.
- formosa: M. fragrans.
- lutea.
- proboscidea: M. Louisiana.

MATRICARIA. M. cana: M. Chamomilla parthenoides.
- grandiflora: M. inodoroplentisima not M. grandiflora of botanistes.
- parthenoides.

MATTEUCCIA. M. Struthiopteris (Onoclea).

MATTHIOILA. M. bicornis.
- incana.

MAURANDIA. M. antirrhiniflora: Antirrhinum maurusioides.
- Barclaiana.
- Emeryna: a color form of M. Barclaiana.
- Lophospermum (Lophospermum).

MAYTENUS. M. Boaria.

MECONOPSIS. M. integrifolia.

MEDICAGO. M. arbores.
- sativa (Alfalfa).
- scutellata.

MEDINILLA. M. ambilis: M. Teysmanniana.
- magnifica.

MELALBUSCA. M. alba: *M. armillaris.
- *decussata.
- *ereticifolia.
- *hypericifolia.
- *Vincana.
- *Leucadendron.
- *oppositifolia: *M. hypericifolia.
- *Wilsonii.

MELIA. M. Azedarach.
- umbraculiformis: *M. Azedarach umbraculiformis.
MELIANTHUS. M. major.
MELICOCCA. M. bijuga (Genip).
MELILOTUS. M. alba.
MELISSA. M. officinalis (Balm).
MELOTHRIA. M. punctata (Piloryce).
— scabra.
MENISPERMUM. *M. canadense.
— dauricum.
MENTHA. M. piperita.
— rotundifolia.
— viridis: M. spicata.
MENZELIA. M. aurea. Baill. (M. Lindleyi not tenable under the rules). (Bartonia).
MENYANTHES. M. trifoliata.
MENZIESIA. *M. pilosa.
MERATIA. *M. precox (Chimonanthus).
MERTENSIA. M. ciliata.
MESMBRYANTHEMUM. M. cordifolium.
— crystallinum.
— roseum.
— tricolor: M. luteus alpinus.
— *Callistemon lanceolatus.
MEXICANUS. M. jalapa.
— M. cupreus.
— M. luteus alpinus.
— M. major.
— M. mollis.
— M. Pottsii.
— M. Pottsii.
— M. rosea.
— M. Tiatorinus.
— M. semperflorens.
MIRABILIS. M. Jalapa.
— *M. semperflorens.
MOLINIA. M. crerulea (Aira).
MOLUCCELLA. M. lathyrsoides.
MIMUS. M. fistulosa mollis.
— T. Jonquilla.
— T. incomparabilis.
— T. orientalis.
— T. orientalis.
— T. Pottsii.
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FINDING-LIST OF BINOMIALS

ODONTOSORIA. O. chinensis (Davallia).

GENOTHERA. Ge. acaulis.
- biennis.
- historta.
- brachycarpa.
- caespitosa.
- Drummondii.
- Fraseri: Ge. glauca Fraseri.
- fruticosa.
- glauca.
- Lamarkiana.
- macrocarpa: Ge. missouriensis.
- Pilgrimii.
- rosea.
- serratula.
- speciosa.
- tetraptera.
- Whitneyi: Godetia grandiflora.
- Youngii: Ge. fruticosa Youngii.

OLEA. *O. europa (Olive).
- fragrans: *Osmanthus fragrans.

OMPHALODES. O. linifolia (Cycno-

OINOCLEA. O. sensibilis.
- Struthiopteris: Matteuccia Struthiopteris.

ONOPORDON. O. tauricum.

ONYCHIUM. O. japonicum.

OPIOGLOSSUM. O. vulgatum.

- platorus: *P. glabratus.
- intermediate: *P. intermedius.
- monogynus: *P. monogynus.
- opulifolius: *P. opulifolius.
- pubescens: *P. malvaceus.
- Ramaleyi: P. bracteatus or P. intermedius.

OPUNTIA. O. chilensis.

ORLEAUS. O. rubra: but O. enneaphylla rosea Is probably N. flavo-virens.
- Zalus, Z. selaginoides.

OROBUS. O. salmonensis.

ORNITHOGALUM. O. arabicum.
- Ficus-indica.
- vulgaris.
- polyantha.

ORIGANUM. O. Majorana (Sweet
Marjoram).

ORCHIS. O. spectabilis: Galeorchis spectabilis (doubtfully separable from the genus Orchis; under that genus it is O. spectabilis).

OREDOXOA. O. regia (Roystonea regia).

ORIGANUM. O. Majorana (Sweet
Marjoram).

ORNITHOGALUM. O. arabicum.
- pyramidal: O. narbonense pyramidal.
- umbellatum.

OROBUS. O. lathyroides: Vicia orbo-
boidea.
- niger: Lathyrus niger.
- verus: Lathyrus vernus.

ORONTIUM. O. aquaticum.

ORYZA. O. sativa (Rice).

OSMANTHUS. *O. Aquifolium.
- *Delavayi.
- *fragrans (Olea).

OSMUNDA. O. cinnamomea.
- Claytoniana.
- gracilis; probably a form of O. regalis.
- palustris: O. regalis.
- regalis.

OSTREA. O. virginica: *O. virginiana.

OTHONNA. O. crassifolia.

OUVIRANDA. O. fenestralis: Aponogeton fenestralis.

OXALIS. O. Acetosella.
- alba: a white form of either O. lasiandra or O. variabilis.
- albiflora: O. variabilis.
- Bowiei.
- cernua.
- Deppei.
- lasiandra.
- rosea; but O. enneaphyta rosea Is perhaps sometimes meant.
- tropoletteta: O. corniculata atro-purpurea.
- validiensis.
- violacea.

OXYDENDRUM. *O. arboreum (Andromeda).

PACHYSTIMA. *P. Canbyi.

PACHYSANDRA. *P. terminalis.

PÆONIA. P. alba: probably P. decora alba.
- albiflora.
- anemonalis: P. officinalis albiflora.
- albo-plena.
- arborea: P. suffruticosa.
- chinensis: P. albo-plena.
- edulis: P. alboflora.
- festiva: either P. albiflora festiva or P. officinalis festiva.
- Humei: P. suffruticosa Humei.
- jutea.
- Moutan: P. suffruticosa.
- officinalis.
- rosea: Probably P. suffruticosa rosea, but possibly P. officinalis albo-plena.
- suffruticosa.
- tenuifolia.

There are many Latin names in the garden forms of Peonv, as P. amabilis, atorubra, bicolour, candidissima, chrysanthemum, Delachii, delicatissima, elegantissima, formosa, fragrantissima, gigantea, grandiflora, nigricans, papaveriflora, Pottata, prolifer, pulcherrima, purpurea, rosea, Thorbeckii, triplum, umbellata, and others.

PALAFOXIA. P. Hookeriana: Polyple-
teris Hookeriana.

PALIURUS. *P. Spinna-Christi.

PANAX. P. ginseng: Dizygotea Veitchii gracilis.
- ornatum: Polyscias Guifoyei monstrosa.
PASSIFLORA, continued.
- mississippi (Tasmania).
- Porrifolii: P. alato-caruca.
- princeps: P. racemosa.
- quadrangularis.
- Van Volzemii.
- violaceum.
PASTINACA. P. sativa (Parasip).
PAULINIA. P. thalictrifolia.
PAULOWNIA. P. imperialis: *P. montemotosa.

PAVIA. *E. flavus: *E. scoulaycha: *E. parvi flora.
- nana: *E. Pavia humilis.
- rubra: *E. Pavia.
PAVONIA. P. hastata. (page 3570).
PHELLEPHERON. P. acerifolium
- nana: *E. Pavia: *E. aculeata.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.

PAPAVER. P. acerifolium
- nana: *E. Pavia: *E. aculeata.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.
PARKINSONIA. *P. acuminatus.
PAPAVER. P. alpinum.

PAPAVER. P. acerifolium
- nana: *E. Pavia: *E. aculeata.
PAPAVER. P. alpinum.
PHILADELPHUS, continued.
— pubescens; sometimes perhaps means P. laxus.
—sericatus.
—spectabilis: *P. coronarius
—speciosissimus.
—speciosus: *P. laxus.
—Zeyheri.

PHILLYREA. *P. angustifolia (Filariap).—*decora (Filaria).
—*latifolia.

PHILLODENDRON. P. giganteum.
—spectabile.

PHLEBODIUM. P. aureum (Polyodium).

PHILLYREA. *P. angustifolia (Filariap).
—*Zeyheri.
—*speciosus:
—*speciosissimus:

PHLOX. P. amena.
—*decora (Filaria).
—*spectabile.

PHLOMIS. P. tuberosa.

PHLOX. continued.
—*Zeyheri.
—*speciosus:
—*speciosissimus:

PHOSPHATURIA. P. densiflorum.
—bracteatum: *O. bracteatum.
—intermedius: *O. intermedius.
—*monogynus: *O. monogynus.
—*opulifolius (Spira): *O. opulifolius.
—*malvaceus: *O. malvaceus: *O. pubescens.

PHYSOSTEGIA. P. gregilis.

PHYSOSTEGIA. *P. angustifolia (Filariap).
—*speciosa:
—*punctata.
—*maculata.
—*paniculata.

PHYSOSTEGIA. *P. angustifolia (Filariap).
—*punctata:
—*maculata.
—*paniculata.

PHYSOSTEGIA. *P. angustifolia (Filariap).
—*punctata:
—*maculata.
—*paniculata.

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—*paniculata.

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—*maculata.
—*paniculata.

PHYSOSTEGIA. *P. angustifolia (Filariap).
—*punctata:
—*maculata.
—*paniculata.

PHYSOSTEGIA. *P. angustifolia (Filariap).
—*punctata:
—*maculata.
—*paniculata.
PLATANUS. *P. acerifolia (this is the tree usually planted as P. orientalis).
— occidentalis.
— orientalis.
— Sieboldii.
PLATYCYRUM. P. alpicerne.
— Stenaria: P. æthiopicum.
— Willinkii.
PLATYCODON. P. album: P. grandiflorum album.
— grandiflorum (Campanula).
— japonicum: P. grandiflorum japonicum.
— Mariesii: P. grandiflorum Mariesii.
PLATYSTEEMON. P. californicus.
PLUMBAGO. *P. capensis.
— Dalmaisiana.
— reptans.
— suaveolens; but the plant in culture is *P. amplexicaule.
— suaveolens.
— Falcatum.
— oleracea (cultivated form).
— Senega.
— Sieboldii.
— sericeum.
POLYGALA. *P. brachypoda.
— monilifera.
— pyramidalis; perhaps a group of hybrids in need of further study.
— deltoides.
— Eugenei (Carolina P., in part)
— fastigiata: *P. nigra italica.
— fortissima.
— Fremontii.
— greja: P. grandidentata; perhaps sometimes P. tremuloides.
— grandidentata.
— italica: *P. nigra italica.
— Maximowiczii.
— monilifera: P. deltoides monilifera.
— nigra.
— pyramidalis: usually means *P. nigra italica (Lombardy Poplar), but name likely to be used for other pyramidal forms, as P. alba pyramidalis and P. tremula pyramidalis.
— Sargentii.
— Simonii.
— 'tremula'.
— tremuloides.
— suaveolens; but the plant in cultivation is *P. Maximowiczii.
PORTERANTHUS (name under American Code). P. stipulacoas: Gilliesia stipulata.
PORTULACA. P. albi flora: P. grandiflora albiflora.
— aurea: P. oleracea.
— grandiflora.
— oleracea (cultivated form).
— Thelassoni: P. grandiflora Thelassoni.
— Thorburnii: P. grandiflora Thorburnii.
POLYPODIUM. P. aureum: Phelebodium aureum.
— falcatum.
— glaucum: Phymatodes glaucum.
— subauriculatum (Goniophlebium).
— vulgare.
PRUNUS, continued.

- *Lusitanica*: *Laurocerasus lusitanica.*
- *Lyonii.*
- *Mallevie.*
- *Marilyma.*
- *melanocarpa*: *P. demissa melanocarpa.*
- *Mume.*
- *Munsoniana.*
- *Myrobalana*: *P. cerasifera.*
- *Nana* (Russian Dwarf Almond): *Amygdalus nana.*
- *nigra.*
- *Padus* (Bird Cherry).
- *pendula*: applied to weeping forms of several species, but oftenest to *P. subhirtella pendula,* one of the Japanese flowering cherries.
- *pennsylvaniaica.*
- *Persica* (Peach): *A. Persica.*
- *Pissardi*: *P. cerasifera Pissardi.*
- *platyrrhynchos*: *P. Persica platyrrhynchos* (Flat Peach): *A. Persica platyrrhynchos.*
- *Pseudo-Cerasus*: *P. serrulata,* also incorrectly used as a general name for other Japanese flowering cherries, as *P. Lannesiana,* probably *P. glandulosa.*
- *Pterocarya.*
- *Pyrus.*
- *Quadripli.*
- *Quadrumagne.*
- *Quercus.*
- *Rhexii*: *P. eretica Rhexii.*
- *Rhus*: *P. Cerasus Rhus.*
- *sachalinensis*: *P. serrulata sachseninensis.*
- *Sargentii*: *P. serrulata sargentii.*
- *semperflorens*: *P. Cerasus semperflorens.*
- *serotina.*
- *serrulata.*
- *sibérica*: *P. Armeniaca sibirica.*
- *Sieboldii* (Japanese Flowering Cherry).
- *Simpsonii.*
- *sitka*: probably *P. glauclosa* and *P. japonica* (Cherry-Almond).
- *spinosa.*
- *subhirtella* (Japanese Flowering Cherry).
- *tomentosa.*
- *triflora*: *P. cerasifera.*
- *triophora*: *P. cerasifera.*
- *virginiana* (Choke-Cherry).
- Watsonii: *P. angustifolia Watsonii* (Sand Plum).

FSIDUM. *P. Cattleyanum.*
- *Friedrichsthalianum.*
- *Gujava.*

PETLEA. *P. aurea*: *P. trifoliata aurea.*
- *trifoliata.*

PTERIDION (doubtfully separable from Pteris). *P. aquilinum* (Pteris).

PTERIS. *P. adiantoides*: not known botanically.
- *aquilinum*: Pteridion aquilinum.
- *argyraea*: P. quadiuira argyraea.
- *Childii*: a form of *P. cretica.*
- *cretica.*
- *hastata*: *Pellina virdis.*
- *intermedia*: Pt. heterophylla intermediata.
- *Mayii*: Pt. cretica Mayii.
- *nobilis*: Pt. cretica nobilis.
- *Ouwardii*: Pt. cerasifera Ouwardii.
- *Rivertoniana*: a form of Pt. cretica serrulata.
- *Sieboldii*: a form of Pt. cretica.
- *tremula.*
- *Wilsonii*: Pt. cretica Wilsonii.
- *P. fraxinifolia.*
- *stenopectera.*

PETROSTYRAK. *P. corymbosa.*
- *hisipida.*

PYCHAGRAPHIS. *P. singaporensis.*

PYCHOSPERMA. *P. Alexandrre: Archontophexicus Alexandrre.*
- Cunninghamam: A. Cunninghamam.
- *elegans*: A. Alexandrre and A. Cunninghamam; the palm cultivated in California under this name is recently named Loroma amethystina (see Seefordth, page 1323).
- *singaporensis*: Pychag aphris singaporensis (page 3571).

PUERARIA. *P. Thunbergiana: P. hirsuta* (Dolichos).

PULMONARIA. *P. angustifolia.*
- *azuera*: *P. angustifolia azurea.*
- *maculata*: *P. officinalis.*
- *saccharata.*

PUNICA. *P. Granatum.*
- *Logei*: a form of *P. Granatum.*
- *nana*: *P. Granatum nana.*

PYRACANTHA. *P. angustifolia* (Cotoneaster).
- *coccinea.*
- *crenulata* (Cotoneaster).
- *Lalandii*: *P. coccinea Lalandii.*

PYRTHRUM. *P. argens: P. argens aureum.*
- *aureum*: C. Parthenium aureum.
- *corymbosum*: C. corymbosum.
- *hybrida*: C. coccineum.
- *parthenifolium*: C. Parthenium.
- *roseum*: C. coccineum.
- *scleroides*: C. Parthenium scleroides.
- *uliginosum*: C. uliginosum.

PYROSTEGIA. *P. venusta*: *Bigonia venusta.*

PYRUS. *P. americana*: *Sorbus americana.*
- *angustifolia*: *Malus angustifolia.*
- *arbifolia*: *Aronia arbifolia.*
- *Arnoldiana*: P. pulcherrima Arnoldiana.
- *Atrosanguinea*: *Malus atrosanguinea.*
- *Aucuparia*: *Sorbus Aucuparia.*
- *baccata*: *Malus baccata.*
- *cerasifera*: *M. cerasifera.*
- *communis* (Pear).
- *coronaria*: *M. coronaria.*
- *florentina*: *P. eretica florentina.*
- *floribunda*: *P. pulcherrima.*
- *fusa*: *M. fusa.*
- *Halliana*: *M. Halliana.*
- *ioensis*: *M. ioensis.*
- *Niedzwetzkyana*: *M. Niedzwetzkyana.*
- *nigra*: *Aronia melanocarpa.*
- *Parkmanii*: P. Halliana Parkmanii.
- *prunifolia*: *M. prunifolia.*
- *pulcherrima*: *M. floribunda.*
- *quercifolia*: Sorbus hybrid: *S. quercifolia.*
- *Ringo*: *P. prunifolia Rinki.*
- *Sargentii*: *M. Sargentii.*
- *Scheideckeri*: P. pulcherrima Scheideckeri.
- *Scheideckeri*: *M. Scheideckeri.*
- *serotina* (Japan Pearl).
- *Sieboldii*: *Malus Toringo.*
- *Sorbus*: *Sorbus domestica.*
- *Soulardii*: *Malus Soulardii.*
- *spectabilis*: *Malus spectabilis.*
- *Zumi*: *M. Zumi.*

QUAMOCLIT. *C. coccinea* (Ipomoea Minia).
- *Ipomea* (Ipomoea).

QUERCUS. *Q. acuta.*
- *afrigola.*
- *alba.*
- *aquatica*: *Q. nigra.*
- *Bartii*: *Q. ilicifolia.*
- *bicolor.*
- *Cerris.*
- *coccinea.*
- *Concordia*: *Q. Robur Concordia.*
- *cuspidata*: *C. cuspidata* (see Vd. V, page 2891).
- *dentata*: but sometimes applied to *Q. glandulifera.*
- *Douglasii.*
- *Duvaucellier*: *Q. Robur Duvaucellier.*
- *falcata.*
- *ferruginea*: *Q. marilandica.*
- *Garryana.*
- *glauca.*
- *Flex.*
- *ilicifolia.*
- *limicola.*
- *Koellogi.*
- *Laurelia.*
- *lobata.*
- *lyrata.*
- *macrocarpa.*
FINDING-LIST OF BINOMIALS 3603

QUERCUS, continued.

—*marilandica.

—*Michauxii (Basket Oak): Q. Prinus.

—montana (see Q. Prinus, below).

—*nigra.

—obtusiloba: *Q. stellata.

—*palustris.

—panonica: *Q. conferta.

—pectinata: *Q. Robur pectinata.

—pedunculata: *Q. Robur.

—*Phellos.

—platanoides: *Q. bicolor.

—Prinus (Basket Oak): applied in the trade to the *Chestnut Oak only, which is Q. montana of the Cyclopedia but for which others retain the name Q. Prinus and apply Q. Michauxii to the Basket Oak: *Q. Michauxii.

—*Prinus (*Chestnut Oak): Q. montana.

—pyramidalis: *Q. Robur fastigiata.

—Prinus: *Q. rubra.

—* sempervirens: *Q. virginiana.

—*Sunder.

—*tincctoria: *Q. velutina.

—*velutina.

—*virginiana.

RADICULA. R. Armoracia (Horseradish). Preferably Roripa Armoracia.

—Nasturtium-aquaticum (Watercress. Preferably Roripa Nasturtium).

RAJANIA. R. pleioneura.

RANUNCULUS. R. acutifolius.

—acris.

—amplexicaulis.

—asiaticus.

—bulbosus.

—gramineus.

—repens.

—spectosus: R. bulbosus.


—*bulbosus.

—*acris.

—asiaticus.

—bulbosus.

—*virginiana.

RANUNCULUS. *R. bulbosus.

—*acris.

—asiaticus.

—bulbosus.

—*virginiana.

RADICULA. R. Armoracia (Horseradish). Preferably Roripa Armoracia.

—Nasturtium-aquaticum (Watercress. Preferably Roripa Nasturtium).

RAJANIA. R. pleioneura.

RANUNCULUS. R. acutifolius.

—acris.

—amplexicaulis.

—asiaticus.

—bulbosus.

—gramineus.

—repens.

—spectosus: R. bulbosus.


—*bulbosus.

—*acris.

—asiaticus.

—bulbosus.

—*virginiana.

RANUNCULUS. *R. bulbosus.

—*acris.

—asiaticus.

—bulbosus.

—*virginiana.

RHODANTHE. R. palmatum.

RHODANTHE. R. maculata: Helipterum Manglessi maculatum.

—Manglessi: R. Manglessi.

RHODOCITON. R. volubile.

RHODODENDRON. R. arboreum.

—*azalea arboreum.

—*arbutilum.

—*calendulaceum: *A. lutea.

—canadense: *Rhodora canadensis.

—canescens: *A. canescens.

—*caroliniana.

—*cataviense.

—*cerrisum.

—*indicum: *A. indica.

—*japonicum: *A. japonica.

—*kaempferi: *A. Kaempferi.

—*ledifolium: *A. ledifolia.

—*luteum: *A. pontica.

—*maximum.

—*morteri: *A. gandavensis.

—*myrtifolium, but also R. Kotschyi.

—*nudiflorum: *A. nudiflora.

—*obtusum amoenum: *A. amena.

—*obtusum Hinodigiri: *A. Hinodigiri.

—*occidentale: *A. occidentale.

—*ponticum.

—*poukhane yodogawa: *A. yodogawa.

—*precox.

—*pubidatum: R. minus.

—*racemosum.

—*rosemum: R. maximum roseum.

—*sinense: *A. mollis.

—*Smirnovii.

—*Vaseyi: *A. Vaseyi.

—*viscosum: *A. viscosum.

—*Wilsonianum: R. leutevirens (page 2571).

RHODORA. R. canadensis: Rhododendron canadense.

—*filicoides: *G. obtusa filicoides.

—*lepidodendron: probably the trade plant is C. thyoides andoleian-sis.

—*obtusa: *C. obtusa.

—*prinsepia: *C. prinsepia.

—*plumosa: *C. prinsepia plumosa.

—*purpureum: *C. prinsepia squarrosa; probably applied also to Thujia orientalis decussata.

—*Veitchii: *C. prinsepia squarrosa.

RHAMNUS. *R. Alaternus.

—*alpina; trade plant is probably R. fallax.

—*californica.

—*catenaria; name sometimes miss-applied to R. dahurica.

—*dahurica; sometimes cultivated as R. cata viense.

—*frangula.

—*ineretina.

—*purshiana.

—*rubra.

RHAPIS. R. flabelliformis.

—*humilis.

RHEUM. R. Collinianum.

—*palustre.

—Rhaponticum (Rhubarb).

RHEXIGA. R. virginica.

 RHODANTHE. R. maculata: Helipterum Manglessi maculatum.

—Manglessi: R. Manglessi.

RHODOCITON. R. volubile.

RHODODENDRON. R. arboreum.

—*azalea arboreum.

—*arbutilum.

—*calendulaceum: *A. lutea.

—canadense: *Rhodora canadensis.

—canescens: *A. canescens.

—*caroliniana.

—*cataviense.

—*cerrisum.

—*indicum: *A. indica.

—*japonicum: *A. japonica.

—*kaempferi: *A. Kaempferi.

—*ledifolium: *A. ledifolia.

—*luteum: *A. pontica.

—*maximum.

—*morteri: *A. gandavensis.

—*myrtifolium, but also R. Kotschyi.

—*nudiflorum: *A. nudiflora.

—*obtusum amoenum: *A. amena.

—*obtusum Hinodigiri: *A. Hinodigiri.

—*occidentale: *A. occidentale.

—*ponticum.

—*poukhane yodogawa: *A. yodogawa.

—*precox.

—*pubidatum: R. minus.

—*racemosum.

—*rosemum: R. maximum roseum.

—*sinense: *A. mollis.

—*Smirnovii.

—*Vaseyi: *A. Vaseyi.

—*viscosum: *A. viscosum.

—*Wilsonianum: R. leutevirens (page 2571).

RHODORA. R. canadensis: Rhododendron canadense.

—*filicoides: *G. obtusa filicoides.

—*lepidodendron: probably the trade plant is C. thyoides andoleyan-sis.

—*obtusa: *C. obtusa.

—*prinsepia: *C. prinsepia.

—*plumosa: *C. prinsepia plumosa.

—*purpureum: *C. prinsepia squarrosa; probably applied also to Thujia orientalis decussata.

—*Veitchii: *C. prinsepia squarrosa.

RHAMNUS. *R. Alaternus.

—*alpina; trade plant is probably R. fallax.

—*californica.

—*catenaria; name sometimes mis-
ROBINIA, continued.
- *inermis: probably *R. pseudacacia inermis or *R. pseudacacia umbraculifera, but sometimes possibly used to designate *R. hispida macrophylla.
- *Kelseyi.
- *neo-mexicana.
- *Pseudacacia.
- *semperflorens: *R. pseudacacia semperflorens.
- *viscosa.

ROCHEA. *R. coccinea (Crasula).

RODGERSIA. *P. podophylla.
- *tabularis.

ROMNEYA. *R. Coulteri.
- *tabularis.

RODGERSIA. *P. podophylla.
- *viscosa.

ROCHEA. *R. coccinea (Crassula).

ROSA. *R. arkansana; the material cultivated under this name may be R. palustris.
- *rubrifolia.
- *rubiginosa.
- *palustris: *R. carolina.
- *polyantha: *R. nutkana.
- *multiflora.
- *macrophylla.
- *revigata (Cherokee nose).
- *gymnocarpa.
- *alba; also applied to forms of Salix chinensis, possibly a form of *S. alba calva.
- *americana: *S. alba calva.
- *Capea.
- *cineria.
- *cordata.
- *sibirica.
- *color.
- *dolorosa: *S. blanda.
- *Elegans: *S. incana.
- *elegantissima (Thurlow's Weeping Willow); probably also applied otherwise.
- *Erinosa.
- *fragilis (Brittle Willow).
- *glabra.
- *glomerata: *S. nigra.
- *globosa: *S. nigra.
- *globosa: *S. nigra.
- *lutescens: probably a form of *S. nigra.
- *pallida.
- *pedunculata.
- *sororia.
- *amarilis.
- *glabra.
- *glabra.
- *sibirica.
- *sibirica.
- *S. nigra.
- *S. nigra.
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- *S. nigra.
SALVIA. S. argentea.
- azurea.
- bicolor; trade plant possibly S. splendens bicolor or S. coccinea bicolor.
- cocinea; possibly sometimes applied in the trade to S. splendens.
- færtacea.
- globosa.
- *Greggi.
- Horinum.
- involucrata.
- leucantha.
- officinalis (Sage).
- patens.
- Picheri: S. azurea grandiflora.
- pratensis.
- rubicunda: S. pratensis rubicunda.
- *S. azurea grandiflora.
- bicolor; trade plant possibly S. gJobosa.
- *farinacea.
- *Greggii.
- Leucanthemum.
- involucrata.
- patens.
- pratensis.
- Pitcheri:
- rubicunda:
- Sclarea.
- splendens.
- spelmina:
- uliginosa.
- Verbenaca.
- virgata; but may apply also to S. Sanguinaria. S. can!ldensis.
- incana:
- SANTOLINA. S. Chamrecyparissus.
- SANSUVERIA. S. zeylanica.
- SANGUISORBA. S. canadensis.
- maritima:
- SANVITALIA. S. procumbens.
- SAPONARIA. S. calabrica.
- officinalis.
- *Officinalis.
- *Vaccaria.
- SARRACENIA. S. Catesbiei.
- Drummondii.
- S. Drummondii rubra.
- *Sanvitalia rubicunda.
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- *Sanvitalia rubicunda.
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- Drummondii.
- S. Drummondii rubra.
- *Sanvitalia rubicunda.
SEMPE RIVUM, continued.
— pyrenaicum; but perhaps S. tectorum pyrenaicum.
— soboliferum; this name is com monly used for S. globiferum.
— tectorum.
— violaceum: probably S. tectorum violaceum.

SENECIO. S. Cinerea.
— eliotorum: Ligularia clivorum.
— cruen tus (Cineraria).
— elegans (Jacobaea).
— Koempferi: L. Koempferi.
— mikanoides (German Ivy).
— pulcher.
— sandens; some of the stock is perhaps S. mikanoides.
— tanguitica.
— Wilsoniana: L. Wilsoniana.

SEQUOIA (Wellingtonia). *S. gigantea (Bitter-Sweet).
— pendula.
— Schafta.
— Sarifraga.
— pennsylvanica.

SILPHIUM. S.laciniatum.

SINAPIS. See Brassica.

SILENE. S. acaulis.

SIDALCEA. S. candida.

SHEPHERDIA. (Lepargyrea in American Code). *S. argentea.

SHORTIA. *S. arguta.
— alba; an American plant usually catalogued as S. salicifolia, which is Asiatic.
— tenuous.
— Wilsoniana: S. Wilsoniana.

SHORTIA. S. californica:
— Aitchisonii.

SHORTIA. S. aruentea:
— Warendi.

SHEPHERDIA. (Lepargyrea in American Code). *S. argentea.

SHEPHERDIA. (Lepargyrea in American Code). *S. argentea.

SHORTIA. S. californica:
— Aitchisonii.

SHOREA. S. meliantha.

SHOREA. S. succina.

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SHEPHERDIA. (Lepargyrea in American Code). *S. argentea.
— coccineus: T. Serpyllum coccineus.
— Serpyllum. vulgaris.

THYRSACANTHUS. T. rutelana: Odontomena Schomburgkianum.

TIARELLA. T. cordifolia.
— purpurea: T. cordifolia purpurea.

TIBOUCHINA. T. semidecandra (Liandriandra macrantha).

TIGRIDA. T. canarium: T. Pa-vonia canariensis.
— conchiflora: T. Pavonia conchi-flora.
— grandiflora: T. Pavonia grandi-flora.
— immaculata: T. Pavonia alba im-maculata or lutea immaculata.
— lilaee: T. Pavonia lilaeae.
— Pavonia.
— rosea: T. Pavonia rosea.

TILLIA. T. alba: a confused name applying to forms of T. tomen-tosa, T. petiolaris, and T. neglecta.
—*americana.
— argentea: *T. tomentosa.
— aspleniifolia: *T. platyphyllos lacinata.
—*cordata.
—*dasyphylla: *T. eukhloira.
—*eucnboa: T. Pavonia grandiflora.
—*europea: T. vulgaris; sometimes misapplied to T. platyphyllos and T. cordata.
—*heterophylla.
— macrophylla: *T. americana mac- rophylla.
— mississippiensis: *T. americana macrophylla.
—*petiolaris.
—*platyphyllos.
—*tomentosa.
—*ulmifolia: *T. cordata.
—*vulgaria.

TILLANDSIA. T. usneoides (Span-sarella: *T. platyphylla.
— aspleniifolia: T. Pavonia lilaeae.
— argentea: T. uvaria argentea.
— grandiflora: T. uvaria grandiflora.
— Quartiliana: T. foliosa.
— Saundersi: T. uvaria Saundersii.
— sulphurea: T. sulphurea.
— tricolor: T. tricolor.
— Uvaria: T. uvaria.

TRISTANIA. T. conferta.

TRITICUM. T. restivum (Wheat).

TRITONIA (Montbretia). T. auran-tiaca.

TRITOMA. T. corallina.

TRISTANIA. T. conferta.

TRITICUM. T. restivum (Wheat).

TRITOMA. T. corallina.

TRITYLUM. T. autumnum (Wheat).

TRITOMA. T. corallina.

TRITONIA (Montbretia). T. auran-tiaca.

TRITOMA. T. corallina.

TRISTANIA. T. conferta.

TRITICUM. T. restivum (Wheat).

TRITONIA (Montbretia). T. auran-tiaca.

TRITOMA. T. corallina.

TRISTANIA. T. conferta.

TRITICUM. T. restivum (Wheat).

TRITONIA (Montbretia). T. auran-tiaca.

TRITOMA. T. corallina.

TRISTANIA. T. conferta.
VALERIANA. V. alba: probably a white form of Centranthus ruber, but perhaps V. officinalis alba.
- cocinea: unknown botanically.
- officinalis.
- rubra: Centranthus ruber.

VALERIANELLA. V. olitoria (Corn Salad).

VALLISNERIA. V. spiralis.

VALLOTTA. V. purpurea.

VEREDIVUM. V. calendulaceum: V. decursus calendulaceum.

VERATRUM. V. viride.

VERBASCUM. V. nigrum.

VALVULA. V. purpurea.

VERATRUM. V. viride.

VENIDUM.

VALLISNERIA. V. spiralis.

VERBENA. V. citriodora:
- pannosum:
- montana:
- erinoides.
- teucrioides.
- venosa.
- noveboracens.
- alpina.
- amethystina: *V. gentianoides.
- elliptica.
- ineana.
- repens.
- tosea:
- speciosn.
- rupeslris;
- spicata.
- subsessilis.
- Traversii.
- Teucrium.
- verbenaeea:
- longifolia.

VIBURNUM. *V. acerifolium.

VERSCBAFFELTIA. V. splendida.

VIOLA. continued.
- Papilio: V. cornuta Papilio.
- pedata.
- pedunculata.
- Priceana.
- pubescens.
- rotundifolia.
- septentrionalis.
- tricolor.

VIRGILIA: V. lutea: *Cladastis lutes.

VISCARIA. V. elegans: Lycmis Viscaria elegans.
- oculata: L. Costi-roses oculata.

VITEX. *V. Agnus-castus.
- incisa: *V. Negundo incisa.
- *Negundo.

VITIS (see Ampelopsis, Cissus, Parthenocissus). V. aconitifolia:
- *Ampelopsis aconitifolia.
- *amurensis.
- *Berlandieri.
- *bicolor.
- *Bourquiniana.
- brevpedunculata: *A. heterophylla amurensis.
- *californica.
- *candicans.
- capensis: *Cissus capensis (page 3482).
- *Champinii.
- *Cinerea.
- *Colgeiideae.
- cordata: *A. cordata.
- *cordifolia.
- *discolor: *C. discolor.
- *Doaniana.
- *Giriana.

HENRYANA: Parthenocissus

VIGNA. V. Catjang.

VICTORIA. V. regis.

Trickeri: V. Cruziana.

Vicia. V. Faba (Broad or Windsor Bean).
- Gerardii: V. cracca Gerardii.
- oroboides (Orobus lathyroides).
- sativa (Spring Vetch).
- villosa (Hairy Vetch).

VICTORIA.

VIGNA. V. regis.

Trickeri: V. Cruziana.

Vicia. V. Faba (Broad or Windsor Bean).
- Gerardii: V. cracca Gerardii.
- oroboides (Orobus lathyroides).
- sativa (Spring Vetch).
- villosa (Hairy Vetch).

VAMBOUS. V. alba:
- *molle; often misapplied to V. aegopodium.

VERNONIA. V. arkansana: V. crinita.
- noveboracensis.

VERONICA. V. Allionii.
- *alpina.
- *ameetephyta: *V. spuria.
- *Andersoni.
- *carnes; but may apply to a form of V. spuria.
- *dentata: *V. elliptica.
- *elliptica.
- *gentianoides.
- *imperialis.
- *incana.
- *longifolia.
- *maritima: *V. longifolia.
- *punctata.
- *repsens.
- *rosea: V. longifolia rosea, V. spicata rosea or V. pectinata rosea.
- *rupedra: a form of V. Teucrium.
- *spectosa.
- *speciosa.
- *spicata.
- *spuria.
- *subessetia: *V. longifolia subessetia.
- *Teucrium.
- *Traversi.
- *Vernoniana: unknown botanically.
- *virginica.

VERSCHAFFELTIA. V. splendidia.

VIBURNUM. *V. acerifolium.
- *alnifolium.
- *americanum (American High-bush Cranberry).
- *Carlesii.
- *cassinoides.
- *dentatum.
- *filatrum.
- *ellipticum.
- *lapponicum.

VIBURNUM, continued.
- *Lantana.
- *lantanoideae: *V. alnifolium.
- *Lentago.
- *macrocephalum.
- *macrophyllum: *V. japonicum.
- *mollis; often misapplied to V. venosum and V. venosum Canbyi.
- *nudum.
- *odoratissimum.
- *Opulus (European High-bush Cranberry).
- *Oxycoccus: *V. americanum, but sometimes misapplied to V. Opulus.
- *plicatum: V. tomentosum plenum: *V. tomentosum plicatum.
- *prunifolium.
- *pubescent.
- *pyriforme: *V. prunifolium.
- *rhodophyllum.
- *rubrum.
- *Sandankwa: *V. suspensum.
- *Sieboldii.
- *Sterile may be V. macrocephalum sterile or V. Opulus sterile.
- *suspensum.
- *Tinus.
- *Tomentosum.
- *utile.
- *venosum.
- *Wrightii.

VICIA. V. Faba (Broad or Windsor Bean).
- Gerardii: V. cracca Gerardii.
- oroboides (Orobus lathyroides).
- sativa (Spring Vetch).
- villosa (Hairy Vetch).

VIBURNUM. continued.
- Papilio: V. cornuta Papilio.
- pedata.
- pedunculata.
- Priceana.
- pubescens.
- rotundifolia.
- septentrionalis.
- tricolor.

VIRGILIA: V. lutea: *Cladastis lutes.

VISCARIA. V. elegans: Lycmis Viscaria elegans.
- oculata: L. Costi-roses oculata.

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- incisa: *V. Negundo incisa.
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- *Bourquiniana.
- brevpedunculata: *A. heterophylla amurensis.
- *californica.
- *candicans.
- capensis: *Cissus capensis (page 3482).
- *Champinii.
- *Cinerea.
- *Colgeiideae.
- cordata: *A. cordata.
- *cordifolia.
- *discolor: *C. discolor.
- *Doaniana.
- *Giriana.

HENRYANA: Parthenocissus

VIGNA. V. Catjang.

VICTORIA. V. regis.

Trickeri: V. Cruziana.

Vicia. V. Faba (Broad or Windsor Bean).
- Gerardii: V. cracca Gerardii.
- oroboides (Orobus lathyroides).
- sativa (Spring Vetch).
- villosa (Hairy Vetch).

VIBURNUM. continued.
- *lanceolata.
- *lutea.
- *pallida.
- *rubra.
- *rubrifolia.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubrifolia.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
- *rubroalba.
- *ripenum.
- *sanguinea.
WASHINGTONIA, continued.
- gracilis.
- robusta: W. filifera robusta (Brahea).
- Sirens.

WATSONIA. W. Aridemi: W. viridifolia O'Brienii.

WEIGELA (if the American and East Asian species are considered to be con-generic, the name becomes Diervilla, and this is the usual disposition; the name Weigela, however, is well established in horticultural practice).
- *amabilis: Diervilla florids, or perhaps sometimes D. coroensis.
- *arborea: D. coroensis arborea.
- *candida: D. hybrida candida.
- *Debosi: D. hybrida Debosi.
- *floribunda: D. floribunda.
- *hirtensis: D. japonica hirtensis.
- *Hybrida: D. hybrida.
- *japonica: D. japonica.
- *nana: D. hybrida nana variegata.
- *rosa: D. florida.
- *sessillolia: *D. sessillolia.
- *Steltneri: D. hybrida Steltneri.
- *venosa: D. hybrida venosa.
- *Verschaffelii: D. hybrida Verschaffelii.

WELLINGTONIA. W. gigantea: *Sequoia gigantea.

WHITLAVIA. W. glxinoioides: Phacelia Whitlavia glxinoioides.
- grandiflora: P. Whitlavia.

WIGANDIA. W. caracasana.
- imperialis.
- *macrophylla: W. caracasana macropylla.

Viageri.

WISTERIA. W. brachybotrys: *W. floribunda.
- brachybotrys alba: *W. venusta.
- rhinensis: *W. sinensis.
- floribunda.
- *frutescens.
- *magnifica: *W. frutescens magnaica.
- *multijuga: W. floribunda macrobotrys.
- *sinensis: but often it is W. floribunda.
- *speciosa: *W. frutescens.
- *venusta.

WOODSIA. W. ilvensis.
- obtusa.

WOODWARDIA. W. angustifolia: W. areolata. virginica.

XANTHISMA. X. texanum (Centaureum).

XANTHOCERAS. X. sorbifolia.

XANTHORRHIZA. X. apifolia: *Zanthorrhiza apifolia.

XANTHOSOMA. X. Lindenii (Phylotrenium).

XANTHYLOXYLUM. See Zanthoxyllum.

XERANTHEMUM. X. annuum.

XOLISMA. X. ligustrina: *Lyonia ligustrina.

YUCCA. *Y. aloifolia.
- angustifolia: *Y. glauca.
- *baccata.
- *filamentosa.
- *filicida.
- *glaucza.
- *gloriosa.
- *Treculeana.

ZALUZIANSKYA. Z. capensis (Nycterinia).

ZANTEDESCHIA (Richardia. Florists' Calla). Z. aethiopica.
- albo-maculata.
- Elliottiana.

ZANTHORYLZMA. *Z. apifolia (Xanthorrhiza).

ZANTHOCYXYLUM. *Z. americanum.
- *piperitum.

ZEA. Z. japonica: Z. Mays japonica.
- Mays (Maize. Indian Corn).

ZEBRINA. Z. pendula (Tradescantia).

ZELKOVA. Z. acuminata: *Z. serrata.

ZENOBIA. *Z. pulverulenta (Andromeda).

ZEPHYRANTHES. Z. alba.
- Atamasco (Amaryllis).
- cardidu: rosen.

ZINGIBER: Z. officinale (Ginger).

ZINNIA. Z. elegans.
- Haageana.

ZIZANIA. Z. aquatica: Z. palustris.
- Mays (Maize. Indian Corn).

ZIZYPHUS. *Z. Jujuba.

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