THE STANDARD CYCLOPEDIA OF HORTICULTURE
CI. Well-filled mixed border, with lilacs predominating.
THE
STANDARD CYCLOPEDIA OF
HORTICULTURE


BY
L. H. BAILEY

Illustrated with Colored Plates, Four Thousand Engravings in the Text, and Ninety-six Full-page Cuts

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SABAL (possibly a native name in South America, but the author of the genus does not explain). Palmae, tribe Corypheae. 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 D.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: spadix large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spathes sheathing the branches and peduncles tubular, oblique at the throat; bracts and bractlets minute: fls. small, glabrous, white or green; fr. small, globose, black, the short style basal. Species probably 20, if Inodes is not separated. Fl. to Venezuela, and in Mex. Here belongs the palmetto or cabbage palm of the southern states. The best botanical account of the genus is Beccari's, Le Palmae Americae della tribu delle Corypheae, pp. 10-53 (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 stave conditions. S. Palmetto can be grown outdoors from Charles-ton southward. S. texana and S. exul are handsomer species, and hardy in parts of Texas.

The arborescent species of Sabal have been separated by Cook (Bull. Torr. Bot. Club, 23: 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 an 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 under 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 are 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 Phoenix and all Cocos of the australis type, while the species of Washingtonia, Erythea,
Sabal 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 they 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.

uresana, Trel. (Inódes uresana, Cook). Trunk 15-35 ft. high and upward of 1 ft. diam.: lbs. glabrous, very glaucous; petiole stout, concavo-convex, unarmed, 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 acuminate recurved: fr. of a single developed carpel, depressed globose, 1/4 in. or less in diam., edible, green, or when dry dingy brown and somewhat glossy, the mealy coat and cottony; end-seed whorl whitish, straw-color, glossy within: seed polished, dark chestnut-brown, laevinthiform-rugose, much depressed. Sonora, Mex., in the vicinity of Ures; intro. to cult. in S. Calif. R.H. 1910, p. 59. Described and figured in vol. 12 (1901) of Rept. Mo. Bot. Gard. — 'From the two arborescent mettios of the United States, S. uresana differs markedly in its pale, very glaucous foliage, and in the size of its fruit, which is of thrice the diameter of that of S. Palmetto, and usually a third larger than in S. mexicana, with the former of which species it agrees in having but one of the three carpels developed and fertile while in S. mexicana two or even all three are not infrequently developed. Considering the extent to which this section of Mexico has been visited by collectors of seeds it would be remarkable if this attractive plant should not prove to be already in cultivation in European gardens.'

bb. Foliage green or essentially so, at least above.

m auritiformis, Griseb. & Wendl.; also spelled mauritiformis. Trunk middle-sized, but occasionally attaining 60-80 ft.: lbs. finally 12 ft. across; blade suborbicular, longer than the petiole, glaucous beneath, multifid to the middle, with loose fibers between the bidual lobes: spadix very long and much branched, appearing below the lbs.: fr. globose or inverted pear-shaped, about 1 1/4 in. long. W. Indies.—The name mauritiformis does not agree with 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 lbs., though smaller, have a beautiful bluish green color.'

Palméto, Lodd. (Inódes Palméto, Cook). Cabbage Palméto. Fig. 3516. St. erect, 20-80 ft. high: lbs. 5-8 ft. long, cordate in outline, recurved at the summit, shorter than the petioles. Stem, deep, clearly defined, spreading, shorter than the lbs.: fruitle black, 1 1/2-2 in. long. N. C. to Fla. and Bahamas. S.S. 10:507. A.F. 12:628.—S. M. Co mii, Hort., is referred to S. Palméto by Voss, but Nehrling describes it as a stemless plant from Mex., more beautiful than the dwarf palméto, bearing immense lbs. on long stalks, the lbs. attaining a height of 6-8 ft. Others think S. Moc nii is the same as S. Blackburniana. S. Palméto has been confused in the European trade with S. texana. Very commonly planted as a shade and avenue tree in the southern states.


causiárum, Becc. (Inódes causiárum, Cook). Porto Rico Hat-Palm. Yaay. Trunk to 40 or 50 ft. and 2 ft. thick, columnar or nearly so, light gray or nearly white: lbs.-bases splitting into fibers and more or less remaining as long ribs: lbs. about 12 ft. long, the blade and petiole about equal in length, the latter surpassed by the infl., the petiole keeled near the end above: fr. 1 1/4-1 1/2 in. diam., grayish, with a finely rugose or nearly smooth chestnut-brown seed.

texána, Becc. (S. mexiána, Auth., not Mart. Inódes texána, Cook). Robust palm, to 50 ft. and 2 1/2 ft. diam. of trunk which is bright reddish brown: lbs. 5-7 ft. across, shining and yellowish green, the segmens often parted and filamenteous, the petioles not cut and equaling or exceeding the blade: terminal branchlets of infl. slender: seed about 1 2/3 in. broad, with a prominent micropyple. S. Texas. S.S. 10:508.
exíl, Bailey (Inódes exíl, Cook). A strong vigorous tree with large crown of vivid green lbs., and green trunk due to the color retained in the sheathing lb.: lbs. otherwise as lbs. described, with the segmens and branchlets 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.

príncipes, Hort. Large species with a stout trunk which is covered with the persistent bases of the old lbs.: lbs. very large, about 6 ft. long; blade divided into about 100 segmens., chartaceous, green; segmens. all
SACCHARUM

rather shortly cleft at the apex, about 3 ft. long by 1½ in. broad, acuminate, pointed; fruiting spadicies pendent, about 3 in. long, each bearing a spine-covered funicle, striate, obliquely truncate: fr. black, shining, globose. Habitat unknown; cult. in S. Calif.—Resembls S. Blackburniana.

AA. Trunk none or creeping.

gläbra, Sarg. (S. Aduanoni, Guerns. S. minus or minor, Pers. Corypha minor, Jacq. not Linn.). DWARF PALMETTO. BLUE PALM. Fig. 3517. St. short, buried 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; segms. slightly cleft at the apex; more than 1 ft. long: its chief advantage is that the apex and petiole of the fronds are longer than the blade, filamentose: infl. 2-2½ ft. long, ascending but becoming prostrate, branching: perianth yellowish white: fr. nearly globose, ½-¾ in. diam. Fla.

The following are mostly trade names, but at present they can be only imperfectly described: S. cariculosa, Bull. A native of Columbia in N. L. Apparently an evergreen and deciduous of the same species has been described. Lvs. elongate, linear-lanceolate, plicate, with a bluish or glaucous green margin: very marked on the under surface. Nebrilf writes that he cannot distinguish at present his specimens of S. cariculosa from S. glaucescens.—S. doliata, Hort. "This species," writes Nebrilf, "reminds one of S. Mocini, although it is smaller in all its parts. The lvs. are numerous, glaucous green and of a fine fan-shaped form. Compared with the sabals that form a trunk, these sabales having low, very little branched trees have little beauty, though they look well as foliage plants in company with Cycas revoluta and Dicon ditte. The name "dolitata" means whitened, but it appears not to be the botanical literature, a con

SABAL (from its Bengali name, Sabja-luat). Sabiaceae. A genus of about 20 species of woody vines or sarmentose shrubs native to India, China, and Japan, with alternate petioled entire deciduous lvs. and axillary, solitary, or cymose, rather small and yellowish-green, purplish, brownish, or yellow lvs. followed by small blue drupe-like frs. Fls. perfect, 5-, rarely 4-merous; petals short, semi-ornicular 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, Diels. Climbing shrub, to 10 ft., glabrous; branches green; lvs. petiolated, oblong-lanceolate, rarely elliptic, acuminate, broadly cuneate at the base, bright green, reticulate beneath, ½-4 in. long: lvs. greenish to greenish-purple, cup-shaped, ¾ in. across, in slender-stalked, nodding, usually few-fl.d. cymes; peduncle filiform, 1-½ in. long or reniform, ½-1 in. broad, 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 (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-tined and slender, each spikelet, 1-fl.d. surrounded by long silky hairs.—Species 12, in tropical regions, mostly of the Old World. Differs from Erianthus in having awnless spikelets. The most important species is the sugar-cane, which is extensively cult. 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.

OFFICINARUM, Linn. SUGAR-CANE. St. 8-20 ft. high, 1-2 in. thick. Dept. Agric., Div. Agr. Bull, 20:18. G.W. 8:261 (under the name S. officinale).—The different cult. varieties are distinguished by color and height of st.
SACCHARUM

spontâneum, Linn. Less tall and stout than sugarcane, freely blooming, found in the Medit. region, where it is sometimes cult. as a hedge-plant, and throughout the tropics of the Old World. A variety of this, S. aculeatum, is shown in Gn. 11, p. 78; 16, p. 323.

S. ciliare, Anders. Lvs. very narrow, channeled, 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. Hinchcock.

SACCÔLÁBIUM (name refers to the saccate label.) 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 channeled: infl. lateral, in the cultivated species a long, densely fld. 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; labelium united with the base of the column, spurred, the mouth of the spur open; pollinia on a filiform 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, Cochín-China, India, Java, and Philippines. They are closely allied to the genera Aerides, Phalacopsis and Vanda, and require somewhat similar treatment, but do not always acclimatize 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. amplexicaule, S. curvifolium, S. coeleste, 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 susceptible to wet-spot, a usually fatal disease. Clean chopped sphagnum, freely inter-spersed 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 saccolabiums 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, ⅜ in. across; dorsal sepals orbicular, concave, lateral ones larger, obovate-oblong; petals ob- vate; labelium a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B.M. 6222.

ampullaceum, Lindl. Fig. 5318. Dwarf: st. 6-8 in. high, with 2 rows of lvs.: lvs. strap-shaped, channeled, apex truncate and dentate; racemes nearly erect, 4-6 in. high; fls. deep rose-color; sepals and petals ovate, veined, spreading out flat; labelium linear-falcate, one-half as long as the petals; spur slender, straight. May, June. N. India. B.M. 5595. P.M. 13:49. J.H. III. 32:346. Var. moelleinisæ, Hort., is a geographical variety with stronger growth and larger fls.

AAA. Fls. orange or scarlet-orange.


cérimum, Reichb. f. St. short, thick: lvs. strap-shaped, obtusely 2-lobed: raceme dense, half drooping; fls. orange, with a paler spur; sepals oblong; petals ovate. Sunda Isl.

AAA. Fls. white, spotted with blue.


3518. Saccolabium amplexicaule. (×½)
SACCOLABUM (from Greek for sac and edge, referring to the indusia). Polypodiaceae. A group of tropical ferns, somewhat related to Davallia. They are pinnately divided, often of large size, and with scaly pedates, netioles and pinnae jointed to their points of attachment: indusia attached along one side at the base.

inequalle, Mett. (Davallia brasilienslis, Hook). A large strow fern with creeping rootstock: lvs. as much as 6 ft. long, twice-pinnate or more. Common in the American tropics.

R. C. BENEDICT.

SADLÉRIA (named after Joseph Sadler). Polypodiaceae. Arborescent ferns suitable only for the warm-house: about 3-4½ ft. tall: lvs. large, tufted, double-pinnate, all similar: sori continuous, close to the midrib on each side: receptacle elevated; the involucres narrow, of the form of sorus, leathery, at first wrapped over the sori, later flattened. A: About 5 species. Hawaiian Isl.: S. cyaneoides, Kaulf. About 2-4 ft. high: the stipe strong, erect, 6-18 in. long, naked except at the base and there clothed with long-linear scales: fronds 4-6 ft. long, 9-18 in. long; pinnae 8-12 in. long, ½-3½ in. broad, cut down to the rachis into many, connected, linear pinnales, ½-3½ in. long, acute or blunted. Hawaii. G.C.II. 7: 761. G.Z. 22, p. 122.

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 white flowers, followed by almost black spherical seeds borne in the open cups. The name Sage is derived from salve, to save, in reference to the plant’s supposed power to make people wise by strengthening the memory. In modern medicine it is but little used. In domestic practice, however, it is credited with tonic, sudorific, carminative, anthelmintic, and stomachic properties, and is frequently used as a gargle for the throat, and as a material in dressings of the mouth.

Its pleasant, though powerful-smelling, bitterish leaves are used for flavoring sausages and some kinds of cheese, for seasoning soups and stews, but mainly for dressings with luscious strong meats such as pork, goose, and duck. Among culinary herbs it ranks first in America, being more widely cultivated than any other except parsley, which is more largely employed for garnishing than as a flavoring agent. When possible the young leaves should be used fresh, for when dried they lose much of their aroma, which is due to a volatile oil which even with careful curing rapidly dissipates. For best results the shoots should be gathered before flower-stems develop, because they then richen and because later cuttings may be made. For drying upon a commercial scale, since this plant is thought to involve too much labor, the plants are cut in August if seed has been sown early, and the stumps, if not too short, produce again in late autumn; or if grown as a secondary crop, which is the common way, they are cut only once—namely, in autumn. Plants grown from cuttings (see below) will often produce three crops in a season. Upon a small scale, a warm airy room is best for drying, the plants being either laid loosely upon racks or the floor, or hung from the ceiling and walls. Upon a larger scale, a fruit-evaporator with a steady current of warm air at about 100° F. may be used. After drying, the leaves are rubbed to a powder and stored in air-tight vessels.

Sage does best in an open sunny aspect and a well-drained mellow loam of medium texture, rich in humus and nitrogenous matter. Stable-manure or a fertilizer containing potash, phosphoric acid, and nitrogen should be applied before the plowing, if done in the spring. Full plowing is generally preferred when sage alone is to occupy the land. In each case plowing should be as deep as the surface soil will permit. Thereon. Felling of the soil must precede, and clean cultivation follow planting, the plants being set in drills about 15 inches apart and 10 inches asunder for manual cultivation, or 18 to 21 inches apart and 10 inches asunder for power cultivation. The former method is, as a rule, more profitable though more laborious. After harvesting (see above) if the bed is to be permanent, northern plantations should be mulched with marsh-hay or other material free from weed seeds. For garden practice it is common to divide the clumps biennially, since the plants become straggling if left longer. Upon a commercial scale, however, it is better to rely upon cuttings.

Propagation may be by seed, cuttings, layers, or division. Seed, the vitality of which lasts three years, may be drilled thinly in flats in greenhouse, hotbed, or coldframe in early spring; or out-of-doors as soon as the ground becomes dry enough, in specially prepared beds of fine soil, covering them about ½ inch deep. In the former case the plants must be pricked out and hardened off to render them stocky and hardy before transplanting; in the latter, they are taken directly to the field. This operation may be performed from mid-June until late July, the plants being not less than 2 to 3 inches tall. The former method, which is considered the better, is the common commercial practice. Crops of the former are in the vicinity of New York, each of the above methods has its advocates, but practically all agree upon the plowing and harrowing of the ground in June or
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 left 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 plants 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 Holt 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.

SAGÉRTIA (after Augustin Sageret, French botanist, 1763-1851). Rhannacea. A genus of about 15 species of armed or unarmed often scented shrubs native to the warmer parts of Asia, in Amer. from N. C. to Mex., or near or native to those countries. Flowers small, rarely present on the plant, or several, with minute whitish or yellowish petals in terminal or axillary spikes or panicles, followed by small berry-like, mostly purple frs. Fls. perfect, 5-merous; the hooded petals and the stamens not exceeding the sepals; disk cup-shaped, 5-lobed; ovary superior, 2-3-celled with a short 2-3-lobed style; fr. a small globose drupe with 2-3 leathery nutlets.—These plants are little known in cult. S. theézéns has been recently intro. by the Dept. of Agric.; according to F. N. Meyer it may be useful as a hedge-plant and its fls. have a delightful fragrance which attracts numerous insects; it is apparently not hardy N., while S. pyconophylla 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 fls. of some species are sweet and edible. Prop. is by seeds and probably by cuttings like berchia which it resembles in habit and general appearance. S. theézéns, Bentz. Spinoscent shrub, to 6 ft., with slender spreading branches: lvs. persistent, or subpersistent, short-petioled, ovate or oval, obtusish, 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 ½–1 in. long or sometimes longer and forming terminal panicles leafy at the base; sepals slightly pubescent outside: fr. purplish black, about ⅛ in. across. Fls. in autumn; fr. in spring. China. S. pyconophylla, Schneid. Similar to the preceding species: lvs. smaller, ½–⅜ in. long, rarely nearly ⅝ in. long, sometimes acutish: fls. white, glabrous, in slender glabrous spikes ½–1½ in. long, usually 1–2 at the ends of the branches. W. China. S. minutiflora, Trel. (S. Michauxii, Brong.). Spinoscent, straggling or trailing shrub: lvs. short-petioled, leathery, ovate to ovate-oblong, acute, serrulate, pubescent while young, glabrous and lustrous at maturity, ½–1½ in. long: fls. ½ in. across, in terminal and axillary slender, sometimes perfect panicles; fr. ⅛ in. across, often glabrous, purple. Fls. in autumn: fr. in spring. N. C. to Fla. and Ala.

ALFRED REIDER.

SAGINA (Latin, fatness; perhaps alluding to the forage value). Caryophyllaceae. PEARLWORT. Annual or perennial tufted herbs, sometimes used for edging. Leaves awl-shaped: lvs. small, usually comparatively long-stemmed; sepals 4–5; petals 4–3, entire or slightly emarginate, minute or none; stamens equal in number to the sepals or twice as many; ovary 1-loculed, many-seeded; styles of the same number as the sepals and alternate with them.—About 50 species, natives of the temperate and colder regions of the world.


F. W. BARCLAY.

SAGITTÁRIA (sagita is Latin for arrow, referring to the arrow-shaped leaves). Alliacea. Arrowhead. Perennial hardy herbs useful for foliage effects in bog 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 tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monoeccious (staminate fls. usually in the uppermost whorls) or dioecious, with 3 white broad petals and 3 small greenish sepals, the stamens absent or numerous, the latter ripening into small achenes, in crops of successive whorls 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. 15, 1905) describes 31. Temperate and tropical regions of the world though lacking in Afr. and Austral.

Sagittárias are mostly used for colonizing in the open, but S. montenádensis—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 aphs. Propagation is by division, or 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 glanular.

montevidénsis, Cham. & Schlecht. GIANT ARROWHEAD. Very large, sometimes growing 6 ft. tall, with lf-blades 1–2 ft. long; lvs. arrow-shaped, with long, diverging, sharp basal lobes: fls. very large (2 to nearly 3 in. across), the rounded petals white with a purple blotch at the base. Argentina to Brazil, Chile, and Peru. B.M. 6755. Gn. 27:8. G. 17:273. G.W. 4, p. 68. G.Z. 30:241. I.H. 31:543.—First known as a cult. plant from seeds sent to England in 1883 from Buenos Ayres by John Ball. It is now a popular plant for aquaria
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.

**B. Bracts at base of whorls united, as if only 1.**

**Subulata,** Buch. (S. natans, in part. S. pusilla, Nutt.). Slender and simple, usually only a few inches high: lvs. linear or narrowly ob lanceolate, rigid: fls. few, usually in 1 whorl, white, \( \frac{1}{2} - \frac{3}{4} \) 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. lancifolia?), native in La., gave the form "Francis M." *S. natans*, Pall., the accepted species under this name, is native in N. Eu. and Siberia.

**Bb. Bracts 3, at base of the whorls.**

**Cc. Lvs. usually distinctly sagittate.**

**Latifolia,** Wildl. (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-fl. form known as *S. variabilis* fl.-pl., Hort., which probably belongs here. G. 29:31.

**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 nearly or quite orbicular and in this respect differing from the allied American species. Throughout Eu. and Asia.—By some authors the American S. latifolia and others are considered to be con-specific. Var. filicoides, Hort. (S. japonica, Hort. S. japonica fl.-pl., Hort.), is a form with double fls. common in cult. G.C. III. 30:171. G. 74, p. 67. G.M. 44:779. G. W. 3, p. 621. J.H. III. 43:219.—*S. chinensis* of most trade-lists is one of the many forms of this species. There appears to be another *S. chinensis* in the trade with large-sagittate lvs., the botanical position of which is undetermined.

**Dd. Filaments abruptly broadened, pubescent.**

**Graminea,** Michx. Erect and somewhat rigid, glabrous, the scape sometimes reaching 5 ft.: lvs. lanceolate to narrow-oblong to nearly linear, nerved from the thick midrib; fls. white, in several whorls. Swamps, Del. to the tropics.

**S. macrophylla** has appeared in trade-lists as "a variety with large foliage and tall lax 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-ld. var. of *S. sagittifolia*.

**F. Tracy Hubbard.†**

**SaguéruS** (East Indian name). *Palmaeae*. An old name for Arenga, but discarded by the "nomina rejiendae" of the Vienna rules. *Arenga mindorensis*, Becc. (Saguerus 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.

**Sagús Rúffia:** *Raphia.*

**St. John's-Wort:** *Hypericum.*

**Saintpaúlia** (from the discoverer of the plant, Baron Walter von Saint Paul). *Geoneraeeae*. Hairy often stemless perennial herbs, used for greenhouse flowering, the blossoms providing an attractive blue.

**3520. Saintpaúlia ionantha.—A young plant just coming into bloom. (×4)**

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, deep 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.)


**kevénosis**, C. B. Clarke. Lvs. entire, with numerous long white hairs: calyx-lobes oblong-linear: caps. 2 or 3 times as broad as the preceding and more shaggy, white-hairy. Trop. Afr. B.M. 7408. R.B. 20:109 (both as *S. ionantha*).—Very closely related to *S. ionantha* and confused with it.

**S. pusilla**, Engler, and S. Guetténi, Engler, of German East Africa, appear not to be in cult.

**F. Tracy Hubbard.**
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 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. Chicory is much like endive, as regards its treatment 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, watercress, 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 soil, in the best mechanical condition, is necessary for the same reasons.

F. A. WAUGH.

SALICORNIA (Latin, salt and horn; saline plants with horn-like branches). Chenopodioideae. Glasswort. 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 cult. and have no horticultural interest.

SALISBURY: Ginkgo.

SALIX (ancient Latin name of willow). Salicaceae. Willow. Dizygoous 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; lvs. 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 dehisc, setting free the small appended 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 Zealand 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 monocious.

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 rôle that the willow plays in the north temperate regions is to a certain extent analogous to that of the eucalyptus in subtropical 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 as well as wave-action. S. arctica and several allied species are among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of North Temperate, Tropical and South Temperate zones are large trees. The arborecent 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 Plante Wilsoniana, III, pt. 1, describing Chinese plants, Schneider admits regularly 183 species.

As ornamental trees the willows present little variety. The bright yellow catkins of some species are attractive in spring. They are considerably used as "nurse trees" 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 Populus will apply to willows. The species of willows are readily propagated by cuttings. It has been suggested that the britteness 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. It is one of the most aggressive trees in occupying such places. Willows may also be propagated by seed. The 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 as soon as the capsule opens.

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1. Bonplandiana, Kunth. A branching shrub or low tree with cioraceous 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, finely and evenly serrate: aments 1-2 in. long; scales oblong, deciduous; stamens 3-6; ovary ovate-conical, glabrous; style short but distinct. E. N. Amer. Var. falcata, Pursh. Lvs. elongated, narrow and falcate.

3. amygdoïdes, Anders. Peach-Leaf Willow. Tree, 30-40 ft. high: bark longitudinally furrowed, less inclined to be flaky: lvs. broader, glaucous beneath, on rather long, compressed petioles: aments loosely killed; ovary lanceolate-conical; style very short. Cent. and W. N. Amer.

4. Íbida, Muhl. Shrub or low bushy tree, 6-15 ft. high; branches yellow-brown and highly pubescent: buds large, flattened, and recurved at the apex: lvs. large, broadly lanceolate-acuminate, serrate, dark green, shining above: aments large, appearing with the lvs.; scale pale green, deciduous; stamens 4-5; ovary pedicelled, rather obtuse, glabrous. E. N. Amer.—A beautiful plant, deserving of more extensive cult.

5. pentandra, Linn. (S. laurifolia, Hort. S. Humboldtiana, Hort. not Willd.) Bay-Leaf or Laurel-Leaf Willow. Shrub or small tree, 8-20 ft. high: branches chestnut-color: lvs. large, elliptic to broadly ob lanceolate, acuminate, shining and dark green above, paler beneath: aments appearing after many of the lvs. are fully developed, not conspicuous. Eu. and Asia.

6. frágilis, Linn. (S. víridis, Fries. S. Russelliana, 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-oblong or oblong and slightly hairy when young, scarcely paler beneath, glandular: 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 cultivated and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hedges of this tree 50 years ago. Many of these are still growing, and 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.

7. álba, 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. 87; 61, p. 7.—Heretofore associated with the next species, from which it differs in color of twigs and appearance of lvs., as also in its general habit. It is only occasionally seen in Amer. Var. splendens, Anderss. (S. alba var. argentea, Wimm. S. répilis, Hort.). Lvs. densely silky on both sides, nearly silver-white while young. The forms of these species easily distinguishable from one another, can be readily distinguished from the following species.

8. vitellína, Linn. (S. blanda, Anderss.) 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 rounded in outline. Lvs. silvery-hairy when young, glaucous when mature, glaucous beneath, the whiteness intensified after the lvs. fall: aments appearing with the lvs. Abundant in E. N. Amer. Mn. 8, p. 25 (erroneously as S. alba).—Displaying many variations, the most obvious of which are: Var. aúrea, Salish. (var. aurantiaca, Hort.), branches golden yellow, especially just before the lvs. appear in spring. Var. briténsis, Hort., bark red. These as well as other choice varieties are grafted. Var. pénélula, Hort. (S. aúrea pénélula, Hort. S. alba var. vitellína pénélula. S. yellowíca aúrea and S. babyloníca ramúlís aúreis, Hort.). Tree of weeping habit, similar to S. babyloníca, with yellow branches. M.D.G. 1898: 58. Gn. 55, pp. 15, 22. S.H. 2: 361, 371.

9. babyloníca, Linn. (S. pénélula, Moench.) NAPOLEON’S WILLOW. Fig. 3527. A tree of weeping habit, 30-40 ft. high, with long slender olive-green or darkish branches: buds small, acute: lvs. 2-6 in. long, longate at base and apex; aments appearing with the lvs., slender, the pistillate 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. Tander. N. V. annuláris, Forbes. lvs. twisted back so as to form a sort of ring.

10. Salamónii, Carr. (S. babyloníca var. Salamónii, Carr.; sometimes erroneously spelled Salamonti or Salomonti). Hybrid between S. alba and S. babyloníca. Similar to S. babyloníca, but less pendulous: tree with ascending branches and pendulous branchlets: lvs. similar to those of S. babyloníca, but sparingly silky-pubescent on both sides: pistillate catkins with more pubescent
axis and long-ciliate seads. Originated in
S. sepulcralis, Simonkai, belongs here.
11. blanda, Anders. (S. Pétoldi, Hort.
S. babylonica var. dolorosa, Rowen; possibly
S. babylonica var. Wscepa, Willd.) 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 ¼-½ in. broad; stamens with lvs.; stamens 2; ovary short-stalked, glabrous, with one gland at the base, half as long as the pedicle. Of garden origin.
12. elegantisima, Koch (S. Siéboldi, Apr.
THURLOW’S WEEPING WILLOW. Tree with more spreading habit and larger crown than S. babylonica: branches long and pendent, yellowish brown; scaly leaves blanched with brown; appears to be more hardy than S. babylonica. Origin unknown. M.D.G. 1895:88. Gn. 55, p. 24. S.H. 2:363.—Said to be of Japanese origin; probably only a form of S. blanda.
13. Sásiif, 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 ½ in. wide. N. E. Afr., where it is frequently cult. along highways.—Intro. into Italy many years ago.
14. longifolia, Muhl. (S. rútea, Rich., not
Huda. S. interior, Rob.; S. fumátílis, Sarg., and other recent authors in part, not Nutt.).—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 plano-convex, with an obtuse and rounded apex, very small; lvs. nearly elliptic smooth, sparsely canescent to extremely canescent, sessile, linear-elliptical, remotely dentate, the teeth narrow, sometimes quite spinulose: stipules conspicuous, ear-shaped, obscurely dentate, deciduous: aments of late spring on short lateral peduncles, which bear 4-6 lvs., those borne later on much longer leafy branches, very loosely flsd.: fls. fascicled in clusters of 2-5 on the axis, a distinct interval between the fascicules, first appearing in May and often bearing a second set of aments in early summer; scales usually glabrous or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous after flowering; filaments crisp-hairy below, smooth above: caps. sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity; stigmas short, sessile. Cent. N. Amer.—The pistillate aments, lax at anthesis, becomes more so as the caps. mature, and by this character the species can easily be distinguished from related species.
15. argophylla, Nutt. (S. longiófolia var.
argophylla, Anders. S. fumátílis var. argophylla, Sarg. S. Hindésíana, Benth.). Tree or large shrub, 12-15 ft. high, forming dense thicket but not growing in clumps: branches nearly glabrous and exceedingly tough: bark turning from brown to dark brown at maturity, just before blooming, making a thicket of it a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely min-
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. _hummilis_, Marsh. **PRAIRIE WILLOW.** A shrub, 3–8 ft. high, varying much in stature, and in size and shape of lvs.: branches hairy. lvs. oblancoate to oblong, nearly entire, more or less revolute; amens densely and many-fld. E. N. Amer.—Grows in driest situations.

21. _tristis_, Ait. **DWARF WILLOW.** Fig. 3527. A diffuse shrub, 1–1 ½ ft., with long deep-set root. branches gray, slender. lvs. small, 1 in. long. linear-lanceolate, very short-petioled: amens small and rather few-fld.; stamens orange-red. 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: amens densely fld., appearing with the lvs.; stamens often orange-red: caps. short-petioled, ovate-oblong, nearly truncate at apex. N. E. N. Amer.

23. _petiolaris_, Smith, not Hort. Fig. 3526. A low shrub, 3–5 ft. high: branches slender, the whole plant much slimmer than _S. sericea_, with which it frequently grows: buds smaller and more pointed: lvs. only slightly silky when young, soon glabrous, more evidently toothed: amens 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: amens 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: amens sessile, appearing before the lvs.; staminate of reddish anthers: caps. densely white-woolly, with red style and stigma. 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-ovate, usually obtuse at both ends, entire and smooth, reticulate-veined: amens 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: amens 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.

28. _irrorata_, Anders. **COLORADO WILLOW.** A dense diffuse shrub, 8–12 ft. high: branches stout, covered with a white bloom; buds large: lvs. linear-lanceolate, 3–4 in. long, ½ in. wide. green above, glaucous beneath, undulate serrate: amens all appearing before the lvs., sessile, very densely fld.; staminate golden yellow: caps. glabrous, nearly sessile. Rocky Mts.

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: amens 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.

30. _purpurea_, Linn. (S. _Forbyana_, Smith. _Vètris purpurea_, Bahn.). **PURPLE OSIER.** Fig. 3526. A shrub or small tree, spreading at base with long, flexible branches: lvs. oblanceolate, serrulate, glabrous, veiny, 3–6 in. long, often appearing opposite: amens sessile, slender; pistillate recurved; scales purple; stamen 1: caps. small, ovate. Eu.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket-willow. Var. _pédula_, Dipp. ( _S. nigra_ _pédula_, Hort. _S. americana_ _pédula_, Hort.). Branches pendent. Gng. 4:243.
SALIX

31. sitchensis, Sarg. SITKA WILLOW. A shrub, 10–12 ft. high and more, its lvs. obovate, glabrous, clothed beneath with silky hairs which have a beautiful satiny luster: aments appearing with lvs., long, cylindrical and graceful, also satiny. N. W. 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 characteristic lvs. of S. is preserved in plants in cult.


33. herbacea, Linn. A very dwarf species usually not more than an inch or so in height, forming dense mats: lvs. orbicular, serrate, usually at both base and apex. Alpine regions of Amer. and Eurasia. White Mt., N. H.

34. myrinites, Linn. (S. Jaququinii, Host). An alpine shrub a foot or less high, either erect or more or less creeping: lvs. short-petioled, lanceolate, coriaceous, shining, green both sides. Arctic and alpine regions.

35. pyrenaica, Gouan. A dwarf caespitose shrub usually more or less depressed in habit, with slender brown shining twigs: lvs. membranous, about 1 in. long and half as wide, entire, ciliate on the margin. In the alpine regions of the Pyrenees.

36. repens, Linn. A shrub of variable stature and vesture: lvs. oval to linear, entire or remotely serrulate, shining above, silver-silky or glabrous beneath, stipules wanting. N. Eu. and Asia. Var. argentea has silvery-silky lvs. G.L. 22:325.

37. reticulata, Linn. A depressed shrub with few ovate or orbicular lvs. glaucous beneath, green above, rugose-reticulate: aments slender, borne on a long peduncle. Arctic regions of both hemispheres.

38. retusa, Linn. (S. sylvipilifolia, Scop.). A depressed shrub: lvs. characteristically “parallel”-veined, obtuse or slightly retuse at the apex, entire, less than \( \frac{1}{2} \) in. wide. Alpine regions of Eu. and Asia.

S. alpina, Hort.—S. daphnoides.—S. amgodilina, Linn. (S. triandra, Linn.). Usually shrubby, to 12 ft.: branches glabrous, ramentose, lvs. lanceolate, glabrous, pale green, or bluish below, to 5 in. long: fls. shortly before or with the lvs.; stamens 3; ovary long-stalked, glabrous. Eu.—S. Biokernet, Von Seemen. An ornamental dwarf species: lvs. orbilong or oval, \( \frac{1}{2}-\frac{3}{4} \) in. long, mucronate, dark green and glabrescent above, silvery with silky appressed hairs beneath: aments 1–2 in. long, produced in Oct. and Nov., before the fall of the lvs. China.—S. chrysogama, Dode, is a hybrid between S. babylonica and S. vitellina. S. daphnoides, Thun. Ten to 20 ft. high: twigs violet: lvs. narrow-oblong or linear-lanceolate, very acuminate, 3–6 in. long.—S. Hakobcnii, Dode. Apparently a natural hybrid between S. nira and one of the group of S. babylonica.—S. heterandra, Dode. Possibly hybrid between a species of S. purpurea group and one allied to S. pentandra. S. ultra大巴ar, Wett. 3–4 in. long, remotely serrate, glabrous, light green above, whitish-glaucescent beneath: male aments about \( \frac{1}{2} \) in. long; Caucasia.—S. hypolepis, De Hooge, 1 ft. high: lvs. elliptic to lanceolate, acute, glabrous at maturity, glaucous below, 1–2 in. long; aments with the lvs., 1–2 in. long. Cent. Wiss.—S. daphnoides, Thun. Shrub, to 10 ft.: lvs. elliptic to lanceolate, acute, glabrous; male aments about \( \frac{1}{2} \) in. long; Caucasia.—S. decumbens, Thun. Lvs. orbilong or oval, dark green and shining above, whitish-glaucescent beneath: male aments appearing late. Caucasus.—S. nasifrons, Hemel. Shrub, to 20 ft.: lvs. ovate to oblong, shortly and obously acuminate, glabrous, pale beneath, to 8 in. long and to 5 in. wide; petiole purplish; staminate aments to 7 in., pistillate to 11 in. long. W. China. A remarkable willow, but tender N. 1.

H.S. 39, p. 137, fig. 148.—S. Matsudiana, Koizumi (S. babylonica var. pekinensis, Henry). Tree, to 40 ft.: branches ascending or pendulous, greenish; lvs. narrowly lanceolate, serrulate, glabrous, 2–4 in. long; amorous with the lvs., about \( \frac{1}{2} \) in. long. N. E. Asia. —S. Medemeriana, Boiss., of the Armenia-Persia region is an upland species 12 ft. and more high with oblong somewhat serrate lvs. abruptly pointed.—S. Medemeriana, Dode. Shrub or small tree: lvs. very narrow, up to 4 in. long; female aments appearing late, cylindric, 1–2 in. long. Caucasus.—S. pauciflora, Dode. Lvs. large, glaucous, entire, giving the tree a bluish appearance. Cent. Asia. —S. pterica, Boiss. Similar to S. babylonica. Trunk pale sahy gray or brownish; lvs. oblong, shortly stalked, somewhat falcate, long-acuminate, serrulate, Persia.—S. Rheidotiana, Schneid. Shrub, to 10 ft.: branches sparingly hairy or glabrous; lvs. lanceolate, cuneate, whitish and glaucous, with yellow widersh, 2–5 in. long: aments precocious, about 1 in. long; authors purple at first; ovaries glaucous. W. China. —S. lasiolepis, Anders. —S. lasiolepis, var. Kengii, Hemel. S. lasiolepis, var. lasiolepis, Anders. —S. lasiolepis, var. lasiolepis, Anders. Shrub or small tree: lvs. ovate to oblong-lanceolate, entire, silky glaucous: branches: the young branches, 2–3 in. long: staminate aments 1 in. long, pistillate 3–5 in.; caps small, silvery, Himayalta, Cent. and W. China. —S. cyrostachys, Hook. I. & Thom. Probably a natural hybrid between S. purpurea and S. Medemiri. S. W. Endworthii, Hort., is described as a tall upright rapid-growing willow with bright red bark: botanists position to be determined.

W. W. ROWELEY.

SALPICHRÖA (Greek, tube and skin; in reference to the form and texture of the flower). Syn. Salpichröma, Solandaceae. Shrubs, subshrubs, or herbs, sometimes grown in the greenhouse and now used for outdoor planting in southern California.

Leaves often small, entire, long-petioled: fls. white or yellow, 2–3 in. long (Section Euasalpichröa) or only about \( \frac{1}{2} \) in. long (Section Perizasma); calyx tubular or ovate, 5-cleft or -parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, acute, often short induplicate-valvate: berry ovoid or globose, 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 climber, covering walls within one season, and forming a thick mass of foliage and will thrive in alkaline 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. If black seal secures a foothold, it is well to cut the plant down to the roots.

rhomboides, Miers (Salpichröma rhomboides, Miers). A half-hardy climber, somewhat woody, with green flexuous branches: lvs. small (blade \( \frac{2}{3}–\frac{1}{2} \) in. long), ovate - rhomboid: fls. small, usually less than \( \frac{1}{2} \) in. long, solitary, nodding, white; corolla short, constricted at the middle and at the throat, and bearing on the inside a fleshy, wooly ring: berry ovate-oblong, yellowish or white, edible, but of poor flavor. Argentina. G.C. III. 24:430. R. H. 1907:531. Gr. N. 5. p. 367. F. E. 32:448. The plant appears to be offered as Withania organifolia, although the genus Withania itself has good standing.

F. W. BACRLEY.
SALPIGLOSSIS (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 plants.

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-cleft, corolla funnel-form, usually bell-shaped at the throat; lobes 5, plicate, emarginate; stamens 4, didynamous: caps. oblong or ovoid; valves 2-cleft.—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 improved 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 require 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. Barclay.)


SALPIGLOSSIS 3532. Salsify or vegetable oyster. (X2½)

3532. Salsify or vegetable oyster. (X2½)

SALPÍNGA (Greek, trumpet, referring to the shape of the calyx). Melastomaceae. Erect glabrous branch- ing herbs, including the warmhouse foliage plant known to the trade as Bertolonia margaritacea. Leaves often unequal and lanceolate, long-petioled, under surface plum-colored: fls. spirate, 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; staminodia 10; ovary inferior; caps. 3-edged, included in the pericarp, thickened, ribbed calyx.—Four species, Guiana, Brazil, and Peru.

margaritacea, Triana (Bertolìnìa margaritacea, Hort. Bull. Gravèsia gustáta var. margaritacea, Nichols.). Tender perennial herb; st. 1½—4 in. high, erect, obtusely 4-angled, simple: lvs. long-petiolate, thin- membraneous, ovate, base rounded or frequently distantly fruited, or soon in fruit, upper surface dark dull green, white-spotted between the veins, lower surface pale green, reddish or bright rose: cymes terminal, 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 erect-spreading, acute or rather obtuse; capsule pale, obscurely 3-sided. S. longifolia, Triana (Bertolínia longìfolia, Cham.). St. short, herbaceous: lvs. oblong, rarely ovate-oblong, base rounded or slightly cordate, upper surface bright green, glabrous, lower surface paler, sparsely-pubescent: cymes terminal or at the tips of the segms. S. margaritacea, Brasil.—S. secunda, Schrank & Mart. St. subshrubby, erect: lvs. narrow-ovate or obovate, long-based, rather obtuse or short-acute, upper surface light green, lower surface paler; cymes terminal and axillary: fls. unknown: caps. pale red-brown, narrowly oblong, subcylindrical. Brazil.

F. TRACY HUBBARD.

SALSIFY (formerly sometimes spelled salsafy) is Tragopogon porrifolius, one of the Composite. Fig. 3532. A garden esculent, grown for the fleshy root. This root has the flavor of oysters, hence the plant is sometimes called vegetable oyster and oyster plant.

Salsify is perfectly hardy. The seeds (which are really fruits) are sown in early spring, about as soon as the soil can be prepared, in drills where the plants are to be grown. The drills may be 2 to 3 feet apart, if filled by light horse-tools, or half that distance if tilled only by hand. In the rows, the plants are thinned to stand 3 to 6 inches apart. The plant requires the entire season, in the North, in which to grow. The roots may be allowed to remain in the ground after harvest; this does not harm them. In fact, they are usually better for being left in the ground, because they do not shrivel and become tough as they often do in storage. If they are kept cool and moist in storage, however, the quality is as good as when the roots remain in the ground. At least a part of the crop should be stored, for the table or the market during winter and early spring.

The plant is biennial. The second spring, a strong stalk 2 to 3 feet tall is sent up from the crown of the root, and in spring or early summer an abundance of light purple flower-heads are produced. The flowers, or heads, close about noon. The leaves are long, linear, grass-like. The roots are small, well-grown specimens being about 1 foot long and unbranched, and about 2 inches in diameter at the top. The skin is grayish white. Salsify is easy to grow, and it has no serious pests. It is a vegetable of secondary importance commercially, although it should be in every home-garden, particularly in the North, where it thrives best. Eight to ten of a pound of seeds will produce many times that of the roots. There are few varieties, and these have no marked characteristics except in size. The Mammoth Sandwich Island and Improved French are probably the best varieties. Salsify is native to southern Europe. In some places it has escaped as a weed. See Tragopogon.

Black salsify is Scorzonera; Spanish salsify is Scolymus.

L. H. B.
SALSOLA (Latin, salus, salty; the plants grow in salty places). Chenopodiaceae. Weedy annual and perennial branching herbaceous plants of some 60 species of very wide distribution, mostly on seashores and in saline soils, of no horticultural interest. Lvs. narrow, usually awl-shaped or long-pointed, commonly fleshy; fls. very small, sessile in the axis (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. Kalt., Linn., var. tenuifolia, Mey. (S. pestifer, 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 pernicious; when young or growing, 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.

SÁLVIA (Latin name used as far back as Pliny, meaning to be well or healthy, or to the medicinal properties of some species). Labiatae. Sage. Herbs, subshrubs, or shrubs, of various size, 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 calune lvs.; floral whorls 2- to many-fld., variously arranged, spicate, racemose, paniculate or rarely all axillary: fls. variously colored, rarely yellow, and variously sized from large and showy to minute; calyx ovoid, turbular 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 rather compressed, smooth.—Upward of 500 species widely distributed in the temperate and warmer regions of both hemispheres. Salvia was monographed in 1848 by Bentham in DC. Prod., vol. 12, and an index to the 407 species therein described is found in Buell's Genera, Species et Synonyma, etc., pars iii. In 1876, Hemsley gave an account in The Garden (9:430-4) of 65 species which had been in cult. up to that time. See also A Synopsis of the Mexican and Central American Species of Salvia, by M. L. Fernald (Proc. Am. Acad. Arts Sci., vol. 35, 1900, and Contrib. Gray Herb. Harvard Univ. N. S. No. 19). In the work just cited 209 species are described and there is an elaborate key. Within the generic limits of Salvia the variation is astonishing. The color of the fls. ranges from scarlet through purple and violet to white and yellow, but there seems to be no good pure yellow. Fig. 3535 indicates something of the range in form of corolla and calyx. Some fls. gape wide open, others are nearly tubular. In some the upper lip is longer than the lower, in other cases the lower lip is 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 flowers, 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 Salvia 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 or of the kind by way of contrast. A well-managed mass of scarlet sage 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 aphid and red-spider. It is, therefore, important to get seed of an early-blooming variety of the kind, and to sow the seed early indoors or in a frame in time to get good plants to set outdoors in May. A good raceme is over a foot long, with 30 or more flowers in a raceme, and 2 to 6 flowers in a whorl, each flower being 2 inches or more long. Some varieties have erect racemes, others pendulous, and there are white varieties, together with some intermediate colors. A badly managed bed of scarlet sage gives a 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 sages 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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KEY TO SUBGENERA AND SECTIONS.

A. Corolla without a hairy ring inside.

B. Anterior portion of connections deflected, linear, longitudinally connate or closely approximate.

Subgenus III. JUNGLIA. Section 7. CALORPHE. Species 27-46.

Bb. Anterior portion of connections deflected, apically dilated, connected at the callos extremity.

Subgenus II. SCAIREA. C. Calyx ovoid, the upper lip concave, 2-crenated, teeth 3, very short and connivent. Section 6. PLETHROPHE. Species 18-26.

cc. Calyx tubular or campanulate.

D. Upper lip of calyx truncate, the teeth small and remote; upper lip of corolla erect and connate.

Section 4. HOMOPTHE. Species 12.

Dd. Upper lip of calyx 3-toothed, the teeth straight, scarcely connivent, the middle one very small.

Section 5. ETHIOPIA. Species 13-17.

AA. Corolla with a hairy ring inside.

B. Anterior portion of connections connected, connate or approximate.

Subgenus I. SALVIA.

c. Calyx-teeth scarcely altered in fr., the upper lip of calyx subentire, somewhat 3-toothed.

D. Upper lip of corolla erect, almost straight, connate.

Section 1. EUSPHACE. Species 1-4.

DD. Upper lip of corolla bent or falcate, compressed.

Section 3. DRYMOSPHE. Species 7-11.

CC. Calyx-teeth membranaceous-dilated in fr., the upper lip of calyx 3-toothed or 3-toothed, upper lip of corolla erect or weakly bent, not or scarcely compressed.

Section 2. HYMENOSPHE. Species 5, 6.

BB. Anterior portion of connections remote.

Subgenus IV. LEONIA.

c. Connectives very short, deflexed and subulate anteriorly.

Section 12. HEMISPHE. Species 52.

cc. Connectives directed forward, bearing fertile ather-cells anteriorly.

D. Floral lvs. deciduous; bracts minute.

E. Upper lip of calyx entire or minutely 3-toothed.

Section 11. NOTOSPHE. Species 51.

EE. Upper lip of calyx truncate, 3-toothed.

Section 10. HETEROOSPHE. Species 49, 50.

DD. Floral lvs. persistent and imbricated.

Ee. Lvs. and bracts spiny.

Section 5. PYCNOOSPHE. Species 48.

Subgenus I. SALVIA. All Old-World species.

Section 1. EUSPHACE. Shrubs or subshrubs, rarely herbs.

A. Lvs. all entire.

B. Calyx viscous-pubescent...

1. Candelabrum

BB. Calyx villous or pubescent but not viscous.

c. Base of the oblong lvs. narrow-rotundate...

2. officinallis

cc. Base of the oblong lvs. broad-rotundate or cordate or... 3. grandiflora

AA. Lvs., at least the lower, pilosu-tatise... 4. ringens


2. officinallis, Linn. SAGE. Hardy, white-woolly subshrub, 6-12 in. high: sts. shrubby, the flowering branches tomentose-pubescent: lvs. entire, 1-1½ in. long, petiolate, oblong, base narrow or rotund, the lower white-tomentose or lanate beneath or on both surfaces; the floral lvs. sessile, ovate, acuminate at the base, membranaceous, striate: racemes simple; floral whors few, many, adaxial, calyx campanulate, membranaceous-colored, striate, pubescent or villous, the teeth subulate-acuminate; corolla purple, blue or white. Medit. region. June. A common and variable species. Var. albiflora, Afel., has lvs. 3-4 times as long as broad: fs. white. Var. aborea, Hort., is a compact rather dwarf form about 1 ft. high, with golden yellow foliage; var. aborea variegata, Hort., is offered in the trade. Var. crispa, Afel., has broad, crisped and variegated lvs. Var. icterina,
Alef., has green-and-gold lvs. Var. latifolia, Alef., has lvs. twice as long as broad; one of the common cult. forms. Var. Milleri, Alef., has rather red and spotted lvs. Var. purpurascens, Alef., has somewhat reddish foliage and is said to be preferred in England for kitchen use on account of its strong and pleasant taste. Var. rubriflora, Alef., has lvs. 3–4 times as long as broad, and red fls. Var. salicifolia, Alef., has lvs. 4–7 times as long as broad. Var. sturnina, Alef., has green-and-white lvs. Var. tricolor, Vilm. (S. tricolor, Hort., not Lem.), has lvs. of three colors, gray-green, veined with yellowish white and flesh-pink, later becoming velvety rose-red or deep red.

Var. tenuior, Alef., has lvs. about 3–4 times as long as broad and blue lvs. This is the form commonly cult. as a kitchen herb.

3. grandiflora, Etingh. 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 whors 6–10-fld., distinct; calyx campanulate, colored, strap-like; corolla blue. 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, Bidwh. & Smith. Hardy shrub, 1–2 ft. high: sts. glabrous or spreading, pilose at base, viscous-pubescent above: lvs. petiolate, irregularly pin-natisect, the segms. unequil, ovate-oblong, base rotundate, both surfaces villous, scarcely crenate beneath, the petioles long-ciliolate; floral lvs. membranaceous, deciduous; raceme simple; floral whors about 6-fl., lax, remote; calyx nodding, tubular-campanulate, striate, villous; 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. HYMENOPHACE.

Shrubs or subshrubs, rarely herbs. Oriental and S. African species.

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 whors 2-fld., approximate; calyx broad-campanulate, villous, the lips membranous dilated, veined, and colored, the lobes ovate-truncate; 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 lvs. are at first sulfur-yellow turning very quickly to a rusty color.

6. canariensis, Linn. Shrub, about 6 ft. high: st. shrubby, white-lanate; lvs. petiolate, lanceolate, haste-triangular, subglabrous; floral lvs. ovate-lanceolate, membranaceous and colored: racemes branched; floral whors approximate, distichous, about 6-fl.; calyx incurved-campanulate, the lips dilated membranaceous, colored; corolla purplish, the galea somewhat falcate. Canary Isls.—Probably not in common cult.

Section 3. DRYMOSPHACE.

Herbs, usually tall and glutinous.

A. Corolla yellow.

b. Plant about 3 ft. high: lvs. ovate-oblong 7. glutinosa

bb. Plant 6–12 in. high, racemes sub-lobed or triangular 8. nipponica

aa. Corolla blue or purplish.

b. Raceme simple, spike-like: lvs. purplish beneath 9. yunnanensis

bb. Raceme more or less branched.

c. Floral whors 6-fld. 10. hians

c. Floral whors about 2-fld. 11. Przewalskii

See S. flava, G. Forest, in supplementary list, which probably belongs to this section.

7. glutinosa, Linn. (S. nubicola, Wall.). Perennial, about 3 ft. high: st. herbaceous, erect, glutinous-pilose, divaricately 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 whors distant, lady-few-fl.; calyx tubular; 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-hastate base, the basal lobes horizontal-spreadling, the middle lobe ovate, larger or equal, all short-acuminate, dentate-crenate, sparingly hirsute-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 whors frequently 4-fl.; calyx obconic- or subcampanulate-tubular, pilose, glandular-punctate; corolla whitish glandular, puncticulate when dry; tube half exserted. Japan.

9. yunnanensis, C. H. Wright. Perennial herb, about 1 ft. high, the stems creeping, bearing fusiform tubers: lvs. ½–3 x ½–1 in., the radical frequently very long and slender-petioloed, oblong, crenate, green above, purple beneath: spikes simple; floral whors 4–6-fl.; calyx glandular; corolla cobalt-blue, 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-petiolate, ovate, base broadly cordate-sagittate or truncate; floral lvs. ovate, acuminate: racemes somewhat branched; floral whors 6-fl.; calyx campanulate, striate, blunt, glutinous; corolla

3535. Types of Salvia. At the left S. carduacea; unique for its fringed flowers. Next is S. leucanthem, example of kinds in which the flower does not gaze widely. The two at the right, S. hians and S. Secsei, are interesting for the size and lobing of the middle lobe of the lower lip. (All X15)


Subgenus II. SCLAREA.

All Old-World, herbaceous species.

Section 4. HORMINUM.

Annual herbs.

12. Horminum, Linn. Annual, about 1½ ft. high: st. herbaceous, erect, villous: lvs. petiolate, oval-oblong, base rotund or cuneate, obtuse, crenate, villous; floral lvs. very broad, acute, persistent, the upper ones variously colored: racemes simple; floral whors distant, about 6-fl.d.; calyx tubular, pubescent; corolla light lilac or pale violet to reddish violet or purple. June-Aug. Eu. Var. filiformis, Hort., has white floral lvs. Var. purpurea, Hort., misspelled purpurum (S. Horminum var. rubra, Hort.), has bright carmine-red to brilliant purple-red floral lvs. darker veined. Var. violacea, Hort. (S. Bluebard, Hort.), has light violet-blue floral lvs. somewhat larger and darker veined. Var. vulgaris, Hort., has violet-blue floral lvs., with darker veins.

Section 5. ETHIOPIS.

A. Lvs. or lobes of the lvs. oblong-lanceolate or linear ............................................. 17. Montbretii
AA. Lvs. or lobes of the lvs. broad-orate.

B. The lvs. hoary-tomentose ............................................. 13. Sclarea
BB. The lvs. green, the white wool lax.

cc. Floral lvs. all floriferous ............................................. 14. ethiopis

cc. Floral lvs. the uppermost, sterile.

d. Plant about 2 ft. high: panicle strongly branched ............................................. 15. argentea
dd. Plant scarcely 1 ft. high, paniculate, slightly branched ............................................. 16. verbascifolia

13. Sclarea, Linn. (S. bracteata, Sims, not Soland., in Russ. & S. Simesiana, R. & S.). Clar. v. Biennial, 2-3 ft. high: st. herbaceous, stout, erect, villous; lvs. often 8-9 x 4-5 in., petiolate, broad-ovate, erosive-crenate, base cordate, hoary, the uppermost clasping; floral lvs. very broad, acuminate, concave, membranaceous, colored, their base white, their tips rose: racemes paniculate; floral whors distant, about 6-fl.d.; calyx campanulate, striate, petiolate-bipartite; the teeth rather spiny-acuminate; corolla whitish blue, the tube included. Aug. S. Eu. B.M. 2320. B.R. 1903. G.C. III. 44:268. Gnl. 64, p. 249. G.M. 57:173. Var. turkestanica, Hort. (S. turkestanica, Hort. S. turkestaniana, Hort.), grows 3 ft. high, has quadrangular sts. tinged with pink, basal lvs. on long petioles and long spikes, 2½ ft. high, of large white fts., tinged with pink. There is a form offered in the trade under the name of S. turkestanica superba, Hort., which has “dense branched pyramids of silky foliage and conspicuous rosy bracts, and white fts.” S. bracteata, Soland., in Russ., is a valid species belonging to Section 1. It is a subshrub about 1½ ft. high, with purplish fts. and a native of Asia Minor and Syria. Probably not valid.

14. ethiopis, Linn. Perennial, 6-12 in. or more high: st. herbaceous, erect, white-lanate; lower lvs. petiolate, narrow at base; cauline lvs. cordate-clasping; all incised-dentate, densely white-lanate on both sur-

faces; floral lvs. very broad, acuminate, persistent, con cave, lanate: racemes paniculate; floral whors distinct, 6-10-fl.d.; calyx campanulate, leathery, lanate, plicate-striate, the teeth all subulate-spinose; corolla white, the upper lip often reddish, tube contracted at the middle; connectives not toothed. S. Eu., N. Afr., and the Orient.—Probably not a species. S. athiopis, Brot., not Linn., equals S. argentea, which see.

15. argentea, Linn. (S. pátula, Desf.). Biennial, 2-4 ft. high: sts. herbaceous, erect, villous: lvs. radical and lower caudine, 6-8 x 4-6 in., broad-ovate, sinuate-lobate, the lobes erose-crenate, lanate; floral lvs. very broad, acuminate, con cave, persistent: panicles divaricate-branched; floral whors remote, 6-10-fl.d., the uppermost abortive; calyx campanulate, striate, the teeth all subspinose; 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. Gnl. 75, p. 517.—For some reason this species is considered a hardy perennial by American seedsmen. The foliage is white-woolly, making it a very decorative plant.

16. verbascifolia, Bieb. (S. microstégia, Boiss. & Bal.). Perennial: st. herbaceous, erect, viscosous-villous: lower lvs. petiolate, broadly ovate, base cordate, sinuate-lobate, erose, thick, very wrinkled, scarcely lanate above, white tomentose-lanate beneath; floral lvs. very broad, acuminate, con cave, persistent, villous: panicles twiggy-branched; floral whors 2-6-fl.d., approximate, distinct, the uppermost abortive; calyx campanulate, striate, viscosous-villous; corolla white, beset with blue hairs, galea very large and falcate. Caucasian region. Var. kúrdica, Hort., is offered in the trade.

17. Montbretii, Benth. Perennial subshrub, low: sts. erect, the base white-lanate, the top viscous-villous: lvs. lanceolate, the lower petiole, the upper clasping, crenulate or obscurely pinnatifid-dentate, laxly white-lanate above, densely so beneath; floral lvs. very broad, lanate beneath: racemes simple; floral whors 6-10-fl.d.; calyx oblong-tubular, viscosous-pubescent; corolla blue. Asia Minor and Syria.

Section 6. PLETHIOSPACHE.

A. Corolla 1 in. or more long.

B. Pedicels longer than the calyx.

B. Pedicels shorter than the calyx.

BB. Pedicels longer than the calyx.

CC. Lower lvs. oblong-orate or ovate.

CC. Lower lvs. incise-palmatifid ............................................. 18. bicolor

cc. Lower lvs. oblong-orate or ovate.

d. Pedicels longer than the calyx.

cc. Lower lvs. incise-palmatifid ............................................. 19. dicrhoa

cc. Lower lvs. oblong-orate or ovate.

d. Lower lvs. incise-palmatifid ............................................. 20. pratenesis

cc. Lower lvs. oblong-orate or ovate.

d. Lower lvs. incise-palmatifid ............................................. 21. virgata

AA. Corolla ½ in. or less long, rarely as much as ¾ in.

BB. Lower lvs. incise-palmatifid ............................................. 26. controversa

BB. Lower lvs. oblong-lanceolate or narrowly oblong.

CC. Racemes erect and strict.

D. The lvs. oblong-lanceolate or narrowly oblong.

D. Under surface of lvs. crenate-cent.

E. Under surface of lvs. crenate-cent.
18. **bicolor**, Lam. Biennial, sometimes perennial (?), hardy; st. herbaceous, erect, 2-3 ft. high, scarcely branched; lvs., the lowest petiole, broad-ovate, incise-dentate, pinnatifid or palmate-lobate; the upper sessile, lanceolate, all cordate at base and glaucescent-pubescent; floral lvs. ovate-lanceolate, acuminate, reflexed; racemes 1½-2½ ft. long, many-fl.; floral whorls distinct, about 6-fl.; calyx campanulate, glandulate, glaucescent-hispid, the teeth subulate-acuminate; upper lip of corolla hooded, blunt violet dotted with yellow, the lower one white, but said to fade quickly to a rusty brown. May—July. Spain and N. Afr. B.M. 1774. G.M. 40:487. P.M. 9:271.

19. **dichros**, Hook. f. Half-hardy perennial; staa 2-3 ft. or more high, quadrangular with obtuse thickened yellowish angles, which are retrorsely ciliate: radical lvs. petioloed, 6-8 in. long, oblong-ovate or ovate-lanceolate, obtusely and very irregularly sinuate-serrate, pubescent; upper cauline lvs. sessile-oblone or elliptic-oblone; floral lvs. ovate, long-acuminate, reflexed or more long, many-fl.; floral whorls 2-3-3½ ft.; calyx subcampanulate, glandulate, pubescent, strongly ribbed, green; corolla 1½-2½ in. long, upper lip bright blue, arcuate, pubescent, lower lip 3-lobed, the lateral lobes pale blue, the midlobe orbicular, pendulous, white. Aug. Atlas Mts. of N. Afr. B.M. 6004. G.C. III. 40:177. Gn. 72, p. 78. — Similar species: This variety is also the same as **S. bicolor**.

20. **pratensis**, Linn. Fig. 3536. Hardy perennial, 2 ft. or more high: root sometimes tuberous; st. herbaceous, erect, subsimple, pubescent; lvs.: especially in the southern varieties, more or less blood-red maculate; radical lvs. petioloed, oblong-ovate, obtuse, crenate or incised, base cordate, bullate-rugose, glabrous above, pubescent beneath and along the petiole basal nerves; cauline lvs. few, sessile; floral lvs. ovate-cordate; racemes viscid, viscid-subsessile; floral whors 6-fl., distal; calyx subsessile, campanulate, viscos-villos; corolla bright blue, rarely reddish or white, large, 1 in. long. June—Aug. Eu. Var. **alba**, Hort., has pure white fls. Var. **albiflora**, Hort., is a white-flowered form: perhaps this is the one previously mentioned. The following are nearly similar: The **atroviolacea**, the **atroviolacea**, has dark yellow fls. Var. **Baumgartenii**, Hort. (S. Baumgartenii, Heuff.), has violet fls. Var. **lupinoides**, Hort. (S. lupinoides, Hort.), is said to grow 2½ ft. high and to have bluish purple and white fls. Var. **rosea**, Hort. (S. salvatori, Hort.), has rosy purple fls. Var. **rubicunda**, Hort. (S. rubicunda, Wender.), has rose-red fls. Var. **superba**, Hort., is offered in the trade. Var. **Tentoria**, Hort. (S. Tentoria, Spreng.), is said to grow 2 ft. high and to have deep blue fls. Var. **variegata**, Hort. (S. variegata, Waldst. & Kit.), has light blue fls. with the midlobe of the lower lip white.

21. **virgata**, Ait. (S. gigantea, Desf.). Hardy perennial, 2 ft. or more high: st. herbaceous, erect, branched, pubescent-villos; lvs. petioloed, broad-ovate, base cordate; lower cauline lvs. short-petioled, broad ovate-oblong, base rotund or cordate, upper ones sessile and smaller, the uppermost cordate, clasping; all the lvs. erose-cordate, rather glabrous above, pubescent or hispid on the nerves beneath; floral lvs. ovate-acuminate somewhat reflexed; racemes branched, elongated, few-fl.; floral whors 6-fl., distal; calyx short-peduncelled, campanulate, striate, villous-viscous; 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; st. herbaceous,paniculate above; lvs. often small, scarcely 2 in., sometimes 3-4 in. or more long, the lower petiole, the upper sessile, all oblong-lanceolate, creenate, base rounded or frequently cordate, glabrous above, paler, pubescent or crenate beneath; floral lvs. orbiculate, acuminate, colored: racemes abrupt, somewhat branched; floral whors 6-10-fl., distinct; calyx ovate-tubular; corolla purple-violet. Aug. Eu. and Asia. Var. **alba**, Hort. (S. sylvestris var. floribondo, Hort.), is a white-flowered form.

23. **nemorosa**, Crantz (S. virgata, Hort., not Ait. S. virgata nemorosa, Hort.). Fig. 5537. Perennial, 2-3 ft. high, much branched; radical lvs. short-petioled, conical sessile, lanceolate, 2½-3½ in. long, many-fl.; floral whors 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 whors 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 bronze purple. Var. **alba**, Hort., is said to grow 18 in. high and to have short spikes of white fls. This may be the same as **S. sylvestris** var. **alba**, as **S. nemorosa**, Linn., is a synonym of **S. sylvestris**.

24. **nuttans**, Linn. Hardy perennial, 2-3 ft. high; st. herbaceous, subsimple, pubescent to nearly naked; lvs. few, the lower long-petioled, ovate-oblong, 4-5 in. long, double-crenate, the upper lvs. ovate, elongated, acuminate, villous, persistent: racemes elongated, simple or somewhat branched; floral whors remote, about 6-fl.; calyx ovate, hirsute; corolla long, the upper lvs. oval, the galea straight or somewhat falcate. June—Sept. Eu. and Oriental. Var. **clausitana**, Briquet (S. claudita, Linn.), is a smaller and more slender form than the type, with narrower lvs. and more purple fls. and the upper lip of the corolla is longer arched. Eu.—S. speliomis, Hort., is a name appearing in American trade-lists for a plant which grows 2 ft. high and with deep blue fls. in July. Presumably an error for **Spelmannii**.

25. **Verbenaca**, Linn., also spelled *verbena*. (S. Spelmannii, Willd.). Hardy perennial, 1-2 ft. high: st. herbaceous, erect, pubescent or villous or villose, often 3-4 in. long, broad-ovate or oblong, crenate, glabrous; the lower long-petioled, base narrow; the upper broader, sessile, base cordate, floral lvs. ovate, acuminate, villous, persistent: racemes elongated, simple or somewhat branched; floral whors remote, about 6-fl.; calyx ovate, hirsute; corolla long, the upper lvs. oval, the galea straight or somewhat falcate. June—Sept. Eu. and Oriental. Var. **clauditana**, Briquet (S. clauditana, Linn.), is a smaller and more slender form than the type, with narrower lvs. and more purple fls. and the upper lip of the corolla is longer arched. Eu.—S. speliomis, Hort., is a name appearing in American trade-lists for a plant which grows 2 ft. high and with deep blue fls. in July. Presumably an error for **Spelmannii**.

26. **contravera**, Ten. St. herbaceous, pubescent or villous: lvs. oblong, incisely pinnatifid, the lobes oblong-linear, very obtuse, incise-crenate, bullate-rugose, the margin revolute, both surfaces sometimes finely wavy-pubescent; lvs. ovate-rotundate acuminate: racemes branched, long, white-villous; floral whors 6-10-fl., the lower remote, the upper approximate; calyx ovate, very long
hirate-lanate, the teeth minute; corolla small, sometimes minute. Medit. region.—Not common in cult.

Subgenus III. JUNGLA.

All American species.

Section 7. CALOSPACE.

Herbs, subshrubs or shrubs.

A. Lvs. rugose; corolla-tube slightly exserted, straight, xentico or broadened above, the lips subepigial or the upper longer.

Subsection ERIANTHE.

(See also Nos. 39, 43 and 44.)

AA. Lvs. seldom rugose (rugose in Nos. 39, 39, 43, and 44).

BB. Corolla about $\frac{1}{2}$ in., occasionally a little longer.

Subsection BRACHYANTHE.

C. The lvs. cordiform to ovate-lanceolate.

D. Calyx densely white or violet-lanate.

E. Floral lvs. lanceolate-linear; floral whorls about 9-fld....27. aurea

EE. Floral lvs. broad-ovate; floral whorls 10-20-fld....29. uliginosa

BB. Corolla $\frac{1}{2}$-3 in. long.

Subsection LONGIFLORA.

C. Base of some or all the lvs. hastate or angulate-cordate.

D. Under surface of lf. hispid or pubescent.

EE. Lvs. more or less coriaceous.

F. Tube of corolla not ventricose.

G. Base of lvs. narrowed...

H. Calyx glabrous, the teeth acute...

I. Under surface of lf. glabrous...

J. Under surface of lf. pubescent...

K. Blade of lf. ovate or broad-oblong...

L. Blade of lf. narrow-oblong to linear-lanceolate...

BB. Lvs. less than 1 in. long.

1. Lower surface of lf. pubescent...

2. Lower surface of lf. glabrous...

Subsection BRACHYANTHE.

27. aurea, 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 serratate, both surfaces green and glabrous; floral lvs. lanceolate-linear, deciduous; racemes simple, elongated; floral whorls distant, about 6-fld.; calyx green or bluish, subsessile, tubular, 3 teeth broad, rather acute, oriflora blue. Aug. S. C. to Fla. and Texas. B.M. 1728. Var. grandiflora, Benth. (S. Pitcheri, Torr.), which differs in being cinereous-puberulent, in its denser infl. and tomentulose-sericeous calyx, G.C. II. 14:685. Gn. 19:600; 61, p. 309. G.Z. 26:121.—Probably the plant formerly offered as S. Pitcheri var. angustifolia, Hert., belongs here. It is quite probable that some of the material in the trade as S. aurea var. grandiflora is in reality S. farinacea. Var. grandiflora alba, Hert. (S. aurea var. alba grandiflora, Hert.), 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 canescent; floral lvs. small, deciduous; racemes elongated, simple; floral whors many-fld., subsecund, remote or the uppermost approximate; calyx subsessile, tubular, purplish colored, densely white-lanata; corolla purple or violet, the tube scarcely exserted. Summer, Texas, where it is reported as growing in rich soil. Gn. 9:179, p. 59; 78, p. 236. Aug. 1873:90.—Rather a commonly cultivated species, the fls. quite attractive, the darker corollas being set off by the mealy lighter violet-white calices. Var. alba, Hert., 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, acumen subsecund, base narrow, glabrous or pubescent; floral lvs. membranaceous, broad-ovate, acuminate, deciduous; racemes dense, long-peduncled, somewhat branched; floral whors many-fld.; calyx campanulate, variable, sometimes colored; corolla blue or white, tube somewhat or nearly included. Brazil, Argentina, and Uruguay. B.M. 8544. Gn. 47, p. 484. C.M. 50:711. R.H. 1912, p. 469.


Subsection ERIANTHE.

31. leucanthã, Cav. Fig. 3555. Shrub, about $\frac{1}{2}$-2 ft. high; st. shrubby, with elongated branches which are suberete, and white-lanate, the wool finally caducous; lvs. short-petioled, 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 whors many-fld., the lower remote; calyx subsessile, ovate, densely lavender- or violet-lanata; corolla white, white-lanate outside. June. Mex. B.M. 4318. Gn. 21:328.—Probably not very common in cultivation, at least in N. Amer.

Tender shrub or subshrub, treated as an annual, about 3 ft. high: st. shrubby with glabrous branches: lvs. petiolate, ovate, acuminate, crenate-serrate, base cuneate or cordate, both surfaces glabrous; floral lvs. ovate, acuminate, colored: racemes terminal, spikelike, 6 in. or more long; floral whales about 2-4 fl.; (2- rarely 6-fl.), about 30 fls. in a raceme; calyx campanulate, membranaceous, scarlet, glabrous or villos. teeth 3, broad-ovate, acute; corolla scarlet, glabrous. **Autumn**.


33. **Sessei**, Benth. (S. **Roetzi**, Scheidw.). Fig. 3355.

Subshrub, about 1 1/2 ft. high: st. shrubby with rather glabrous branches: lvs. 2-3 in. long, somewhat leathery, petiolate, broad-ovate or ovate-oblong, acuminate, base rounded cuneate or narrow, both surfaces glabrous or pubescent; floral lvs. smaller, the uppermost minute, deciduous: panicle short, lax; floral whors few-fl.; calyx inflated-campanulate, scarlet, glabrous; corolla scarlet, almost 2 in. long, pubescent. Summer. Mex. F.S. 14:1407.

34. **Grhamii**, Benth. Shrubs, 2-3 ft. high: st. shrubby with glabrous or very slightly pubescent branches: lvs. petiolate, oval, pellucid base rounded or cuneate, irregularly crenate in the center, subglabrous; floral lvs. ovate, acuminate, ciliate, deciduous: racemes elongated, more than 1 ft. long; floral whors 2-fl.; calyx tubular, striate-nerved, pubescent, frequently colored; corolla deep crimson or when older purple, the midlobe of the lower lip, which is large and obcordate, has two small white spots. Summer. Mex. B.R. 1370. L.B.C. 18:1798. G.W. 15, p. 48.

35. **Graggi**, Gray. Shrubs, 1-3 ft. high: st. glabrous or obscurely farinaceous; the branches slender: lvs. coriaceous, 1-ribbed, almost veinless, oblong, entire, base narrowed to a short pediole: racemes 2-3 in. long; 6-8 fl.; calyx narrowly campanulate, slightly pubescent or glansed; corolla red or purplish red, about 1 1/2 in. long, the tube strongly ventricose-gibbous, the throat abruptly contracted, the lower lip large and showy. **Autumn**. Texas and Mex. B.M. 6812. Var. **alba**, Hort., is a white-fl. form.

36. **fulgens**, Cav. (S. **cardinalis**, HBK.). **CARDINAL SAGE**. **MEXICAN RED SAGE**. Perennial shrub, 2 ft. high. The flowers of the branches almost glabrous or pilose-hirsute: 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 whors 6-fl., rather distant; calyx pedicelled, calyx tube longer than the corolla; corolla showy scarlet, about 2 in. long, villos. July. Mex. B.R. 1356. L.B.C. 20: 1910.—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.


**Cyanea.**

39. *álbo-caerulea*, Lind. Subshrub, about 3 ft. high: sts. erect: lvs. petiolate, oblong-lanceolate, long-acuminat, 4-6 in. long, crenate-serrate, decurrent into the petiole, nearly glabrous above, softly pubescent beneath: racemes simple, 6-12 in. long; floral whorls 4-5 to many-fld.; calyx green, campanulate-tubular, glandular-pubescent; corolla-tube and upper lip cream-colored, lower lip rich indigo-blue sometimes tinged with violet or purple. Summer. Mex. F.S. 13:1340. Gt. 7:96.—Rare in cult.


41. *cyánea*, Benth. St. subshrub: branches 4-angled, hoary-pubescent or glabrous: lvs. petiolate, ovate, acuminate, crenate-cordate, pubescent, or frequently canescent beneath; floral lvs. ovate, acuminate, membranaceous, deciduous: racemes simple; floral whorls laxly 6-10-fl., subsecund; calyx tubular, bluish, glandular-villos; corolla blue, the tube exserted and ventricose. Mex. and Cent. Amer.

**Tubulifloră.**

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-cordate, 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. *coccínea*, Linn. (S. *rósea*, 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, crenate, deciduous: racemes simple; floral whorls remote, 6-10-fl.; calyx tubular-campanulate, the teeth often purplish, the teeth acute; corolla scarlet, glabrous. July. S. C. to Fl. and Texas. Mex., W. Indies, Trop. 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. *látceae*, Hort., has white fls. Var. *majóris*, Regel (S. *flamentosæ*, 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 fls. June to late autumn. Gt. 7:232. Var. *nánæ*, Hort., is a dwarf much-branched form. Var. *nánæ carminæ*, Hort., is offered in the trade. Var. *nánæ compactæ*, Hort., is a dwarfer and more bushy form than the variety proper.

Var. *pséudo-coccínea*, Gray (S. *pséudo-coccínea*, 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.


44. *longástyla*, Benth. (S. *aristuláta*, Mart. & Gal.). Plants reaching a height of 14-15 ft.: sts. herbaceous (?), erect, tomentose-villos: lvs. petiolate, broad-ovate, 3-5½ x 2-4½ in., acuminate, the base broad-cordate, pubescent, both surfaces soft pubescent-villos; floral lvs. ovate, long-acuminat, ciliate, deciduous: racemes 15-25 in. long; floral whorls 6-16-fl.; calyx elongate-tubular, base striate, soft-pubescent, the teeth long setaceous-acuminat; corolla red-pink, long-exserted, rather more than 1 in. long. Mex. B.M. 8590.

**Hastatæ.**

45. *páten*, Cav. Half-hardy perennial, 1-2½ ft. high: sts. herbaceous, erect, pilose: lvs. petiolate, ovate-
SALVIA

51. japonica, Thunb. Perennial subshrub, about 1 1/4 ft. high; sts. herbaceous, erect, branched, glabrous; lvs. 3-4 in. or more long, petiolate, pinnatisect, the segms. ovate, acuminate, the base narrowed, incised-dentate or pinnatifid, glabrous; floral lvs. lanceolate: racemes 4-5 in. long, many-fld.; submarginal; floral whors distinct, about 6-fld.; calyx tubular-campanulata, glabrous, with remote, calyx deep blue, pubescent, the tube very broad. June. Mex. B.M. 5274. F.S. 22:2318. G. 21:328.

Subgenus IV. LEONIA

Section 8. ECHINOSPACE


Section 9. PYCNOSPACE

48. columbiana, Benth. Half-hardy annual; st. erect, slightly branched, 6-12 in. high; lvs. deeply pinnatifid, wrinkled, rather glabrous, the lobes oblong-lanceolate, obtuse, crenate-dentate or incised; floral lvs. bract-like: floral whors solitary or 2, capitate, far remote from the caulescent lvs., densely many-fld., hemispherical; bracts broad-ovate, membranaceous, acuminate; calyx ovate, pubescent; corolla blue, the middle of the lower lip crimson. Southwest Calif. and adjacent Mex. B.M. 6595 (fls. lilac).—Not showy and apparently not common in cult.

Section 10. HETEROOSPACE

49. lirya, Linn. Hardy perennial with a thickened root; sts. herbaceous, erect, 8-24 in. high, submarginal, pilose: radial lvs. 2-3 in. long, lirya, crenate-dentate, both surfaces hispidulous; cauline lvs. few, oblong-lanceolate; floral lvs. bract-like: floral whors sublanceolate, interrupted; floral whors 2-flid., lax, distant; calyx tubular-campanulata, nodding, pilose; corolla blue-purple, about 1 in. long. May and June. Conn. to Ill., south to Fla. and Tex. —Not frequent in cult.


Section 11. NOTIOOSPACE

52. verticillata, Linn. Perennial, 2-3 ft. high; sts. herbaceous, erect, pilose-hispid: lvs. the base cordate, lyrate, the upperpubescent, the lower, sinuate-crenate, both surfaces hispid or lanate; floral lvs. deflexed and bract-like: racemes branched, often a foot or more long; floral whors 20-40-flid. remote; calyx villous, corolla lilac-blue, the tube included. July and Aug. Eu., Asia Minor and Caucasus region.

Known species have been in cult. or are not sufficiently known to be classified: S. amanda, Sims.—S. angustifolia, Cav. (Sec. 7). Perennial herb, about 2 ft. high, with submarginal linear lvs.: calyx often 6-fl., corolla blue or lilacine. B.M. 1554.—S. arborea, Hort., is offered in the American trade, as the scarlet sage, but growing in a tree-like form. Possibly only a form of S. splendens.—S. corymbosa, Cav. (Sec. 5). Perennial, about 2 ft. high, with broad subcoradate-ovate lvs.: corolla yellowish white. Himalaya. B.M. 4544.—S. austroafricana, Linn. (Sec. 4). Perennial, about 2-3 ft. high, with subcoradate ovate lvs.: corolla yellowish, the upper lip spotted red. S. Eu. B. R. 1019.—S. boliviensis, Planck (Sec. 7). Subshrub about 4 ft. high, with ovate-cordate lvs.: corolla yellow, bright scarlet, 3 in. long. Bolivia. B.M. 6714. F.S. 11:1148.—S. caumetorum, Regel (Sec. 7). Subshrub, or 3-4 ft. high, with ovate or ovate-cordate lvs.: corolla brownish purple, 1 in. long. Probably Mex. Gt. 4:180. Considered by some as probably the same as S. elegans.—S. campestris, Hort., is offered in the trade.—S. candida, Hort. (Sec. 5). Subshrub or herb, about 3 ft. high, with ovoid or ovoid-cordate lvs.: corolla white. Peru, Bolivia. B.M. 25:589.—S. compacta, Hort. (Sec. 5). Subshrub, about 2 ft. high, white-lanate at base; lvs. lanceolate-oblanceolate, entire or sinuate-lorate; corolla purple. Caucasus. B.B. 24:36.—S. colombariae, Hort. Subshrub, with dark bronze-green foliage: corolla reddish violet. Hardy in S.W. England and Ireland. Botanically unknown.—S. corymbosa, Cav. (Sec. 5). Subshrub, or 3-4 ft. high, with ovate or ovate-cordate lvs.: corolla brownish purple, 1 in. long. Probably Mex. Gt. 4:180. Considered by some as probably the same as S. elegans.—S. compacta, Hort., is offered in the trade.—S. candida, Hort. (Sec. 5). Subshrub or herb, about 3 ft. high, with ovoid or ovate-cordate lvs.: corolla white. Peru, Bolivia. B.M. 25:589.—S. compacta, Hort. Subshrub, about 1 ft. high, with ovate-lanceolate lvs.: spikes 8-9 in. long; corolla shining violet. Mountains of Peru. B.M. 6772. G.C. II. 19:341.—S. elegans, Vahl (Sec. 7). Perennial herb, 3-4 ft. high with ovate acuminate serrat lvs.: hispidulous pubescent or tomentose above, glabrous beneath: corolla blood-red, more than 1 in. long. Mex. and Guatemala. B.M. 6448.—S. erioloba, Benth. (Sec. 7). Subshrub, with divergent lanceolate leaves: floral lvs. linear: racemes simple and short: calyx densely lanate, frequently reflexed; corolla white. Jap. R.H. 1854:1.—S. fusa, G. Don. (Sec. 7). Subshrub, 3-20 in. high; floral lvs. crenate-dentate: lvs. lanceolate; racemes short and simple: corolla white. Jap. B.M. 11:540.—S. globosa, Hort., is offered in the trade.—S. globosa, Hort. Biennial: lvs. in a flattened rosette 16-18 in. long, 10-12 in. broad, deep lime clothed with a silky pubescent white rami. 8-30 ft. or more high, much branched, branches forming a sphere: fls. large, white. Asia Minor. R.H. 37:28.—S. grandiflora, Hort., is offered in the trade in a blued form—3 1/2 ft. high; a soft shadowy dull summer. G.M. 57:713.—S. hebrica, Regel (Sec. 7, probably). Subshrub, 2-5 ft. high, with coradate-ovate ovate lvs.: corolla white. Sect. 1. Subshrub, 2-5 ft. high, with coradate-cordate lvs.: corolla white. Sect. 5. Subshrub, about 3 ft. high, with broad or oblong-ovate lvs., the floral ones ovate-cordate, the corolla yellow or crimson, the lower ovate-lanceolate. S. interrupta, Schousb. (Sec. 7). Subshrub, 3-4 ft. high, with...
irregularly pinnatisect lvs., the extreme segm. much larger than the others: corolla showy, dark violet-purple with a white throat. Morocco. B.M. 3.850.—S. lamiifolia, Jacq. (S. amena, Sims) (Sec. 7). Shrub, about 2 ft. high, with ovate, entire-crenate lvs.; corolla blue, the upper lip covered with whitish blue velvet. W. Indies. B.M. 1894. B.R. 446. L.B.C. 4:377.—S. lavanduloides, HBK. (S. lavanduliformis, Mirb.). Shrub, about 4 ft. high, with pinnatisect, oblong-lanceolate lvs.; spikes 2–3 ft. long; corolla pale blue, small. Mex. R.H. 1845:443.—S. lavanduloides, Gouan. (S. formos, HBK.) (Sec. 7). Shrub, about 4 ft. high, with ovate or oblong, serrate-crenate, deep bluish lvs.; the floral whorl in the axils of the lateral lvs. not racemose; calyx long, nearly 1 in. long. Peru and Brazil. B.M. 376.—S. macrostachys, HBK. (Sec. 7). Shrub, about 6 ft. high, with subrotund-ovate lvs.; base deeply cordate, the auricles rounded; the floral lvs. large, green; corolla bluish, the lower lip longer than the galea. Peru. B.M. 3732.—S. ozacchina, Fern. (Sec. 7). Shrub, much branched; lvs. ovate green and strongly rugose above, white-tomentose beneath; floral bracts 2–3 ft. long; corolla cardinal-red, nearly 1 in. long. Mex.—S. oppositiflora, Ruiz & Pav. (Sec. 7). Half-hardy subshrub, about 2 ft. high, with ovate, pubescent lvs.; floral whorls 2–3 ft. long, small, calyx serrate; corolla scarlet. F.S. 3:495. P.M. 15:85. Gt. 4:218.—S. princeps, Hort. (Sec. 7). Subshrub, 3–6 ft. high; lvs. large, ovate-serrate, with the principal veins prominent; spikes large, terminating the branches; calyx colored; corolla brilliant carmine-rose, slightly ventricose, ½ in. long. Mex. R.B. 33:257. Resembling S. splendidus.—S. prunifolius, HBK. (S. brunnelliana, Voss) (Sec. 7). Several herbaceous sts. from a perennial base; lvs. ovate-oblong, both surfaces green; corolla blue. Mex. P.M. 11:175. Var. purpureus, Hort., has the lvs. purplish red.—S. striata, Carr. (Sec. 7). A plant with a small green calyx and usually 2–3-lld, floral whors. Probably a herbaceous form of S. splendidus. R.H. 1873:230. G.C. II. 15:117(?).—S. sarmentosa, Lam. (S. Habbartiana, Willd.) (Sec. 1). Perennial herb, 1–1½ ft. high, with pinnatisect lvs.; segms. 3–5-jugate, frequently in pairs or 3s; corolla white. Tauria. R.M. 1829 and by E. H. Hance (Sec. 11). Shrubs, 3–5 ft. high, with ovate, pubescent, glandular lvs.; calyx yellowish green, slightly pubescent; corolla white, 2–3 ft. high, with ovate, pubescent lvs.; flowering late in the autumn. B.M. 6950.—S. stoechasia, Hort., is described as perennial, and having large light lilac lvs.—S. Souklet, Duthie. Perennial, about 2 ft. high: stst. pubescent; lvs. ovate to ovate-lanceolate, triangular; rugose; trilobed; yellowish green; 3–5 lld.; tepals tubular-lipped, delicate shade of blue. China.—S. strictiflora, Hook. (Sec. 7). Shrub, about 2½ ft. high, with ovate, pale green, slightly hairy lvs.; the flowers have a tubular corolla and golden red bracts. F.S. 3135. P.M. 11:247.—S. tarazonensis, Flores & Bas. (Sec. 1). Subshrub, 5–6 in. high, with lvs. 2–4 in. long, pinnatisect, terminal lobe 1–½ in. long, ovate and irregularly sinuate-toothed, all white-tomentose beneath; corolla pale pink with a yellowish disk to the lower lip, and a purple-pink-edged palate. Mexico. P.M. 5891.—S. tricolor, Lem. (Sec. 7). Half-hardy shrub, about 2 ft. high, with small ovate lvs. rounded-obtuse at the apex, with a terminal tooth; corolla white, the large lower lip red. Mex. I.H. 4:120. F.S. 12:1237.

F. TRACY HUBBARD.

3540. Salvia natans. (Xabout 1)

Leaves several- or rarely many-pinnate; lfts. 1- to many-pinnate: lfs. in globose heads; pods straight or somewhat curved, rigid, more or less constricted, flat, thickened or subterete, leathery or fleshy, indehiscent or rarely but slightly so; septate between the seeds. Distinquished from Enterolobium by the nearly straight pods and from Pithecolobium by its indehiscent septate pods.—About 30 species.

AA. Lvs. 2–4-pinnate; lfts. 2–5-pinnate.

Salván, Merrill (Mimosa Samán, Jacq. Pithecolobium Samán, Benth. Enterolobium Samán, Prain). Rain Tree. Zaman. Schum. Figs. 3541, 3542. A large tree, reaching a height of 60–80 ft., with wide-spreading branches; branchlets velvety pubescent: lvs. 2–4-pinnate; lfts. 2–8-pinnate, oblique, ovate-oblong or subobtus, up to 1½ in. long, shining above, pubescent beneath; peduncle 4–5 in. long: lfs. in heads, in short pedicles; calyx ½ in. long, pubescent; corolla about 3 in. long; yellowish, silky, villous; stamens 20, stigma minute, shortly connected: pod sessile, straight, thick-marginated, feathery-fleshy, glabrous, indehiscent, 6–8 in. long, ¾–1 in. broad, flattened or subterete. A native of Central Amer. and the W. Indies, but now widely distributed in the tropics as an ornamental shade tree. Blanco, Fl. Filip. 309. Jacq. Fragm. 9. G.C. III. 11:557.—The lfs. fold together on the approach of rain. A rapid grower. The pods contain a rich sugar-pulp and are eagerly eaten by cattle and horses. The seeds are of little food value as they are not digested and often cause slight digestive troubles. The pods when eaten by cows are said to increase the quality of their milk.

AA. Lvs. 5–12-pinnate; lfts. 20–30-pinnate.

arboreum, Ricker (Mimosa arborea, Linn. Mimosa filicifolia, Lam. Pithecolobium filicifolium, Benth. Pithecolobium arboreum, Urban). A magnificent tree, 50–75 ft. tall, ferruginous-tomentose: lvs. 8–12-pinnate; lfts. 20–30-pinnate, oblique, falcate-oblong, obtuse, ½–¾ in. long, glabrescent: peduncles axillary or above the axils, 2–3 in. long: lfs. white, sessile in globose heads, often pubescent; calyx 1 line long, corolla 3½ in. long: pod red, tomentose when young, becoming glabrous, terec, fleshy, constricted between the seed, slightly curved or twisted, 2–3 in. long, ¾ in. broad, finely somewhat dehiscent; seeds black. Trop. Amer.

P. L. RICKER.
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 oblong-lanceolate lobes; stamens with short filaments; ovary inferior, 3-5-lobed; 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 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 perennial spreading by suckers, with pinnate foliage and large flat or paniced 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 and are very effective as well in bloom as in fruit in their proper places. They prefer rich and humid soil and most species are hardy North; S. cerulea and its var. neo-mexicana are hardy at least as far north as Massachusetts. Propagation is by seeds which germinate readily and by hardwood and greenwood cuttings, also by root-cuttings; the perennial species and also S. canadensis by suckers.

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3. cerulea, Raf. (S. glauca, Nutt.). Large shrub or small tree, occasionally to 50 ft.: branches rather slender, bloomy when young: Lfts. 5-7, oblong, long- acuminate, coarsely serrate, the lower lfts. often 3-parted or pinnate, bright green, glabrous, 2–6 in. long: lfts. yellowish white, in flat cymes 4–6 in. wide: fr. subglobose, 1/8 in. thick, blue-black, whitened by a thick bloom. June, July; fr. in Aug. and Sept. Brit. Col. to Calif. Least to Mont. May, Utah. S.S. 222:8. 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, Rehd. (S. glauca var. neo-mexicana, A. Nels. S. intermedia, Carr.). Lfts. 3-5, narrow-lanceolate, grayish green, slightly pubescent beneath. New Mex., Ariz. M.D. 1900:8, fig. 1.—This species is similar to S. canadensis, but habit looser and taller, very striking with its large clusters of bluish white frs.; the typical
form and var. neo-mexicana have proved hardy as far north as Mass.

BB. Berries red, rarely yellow: pith light brown: cymes connex or paniculate.


AA. St. herbaceous: plant stoloniferous: cymes flat: fr. red.

6. *Schweriniana*, Rehd. Herbaceous or suffruticose, 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, ½ in. long: cymes flat: ovate-lanceolate, 5-rays, pubescent: fr. salmon-red, 3-seeded, ½ 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:


**SAMPHERE** (Crithium maritimum, which see) is the name corrupted from *sampler*, itself a corruption of the French *Saint Pierre*, a shrub, given to a ship as a safe and reliable half-hardy perennial, well known as sea-fennel, parsley-fern, and St. Peter's herb upon rocky coasts above high tide in Great Britain. It belongs to the family Umbelliferae. The plants, which attain a height of 1 to 2 feet, have somewhat linear glaucous-green fleshy leaves, ⅜ inch long, small white or yellowish flowers, which appear during the summer, oblong yellowish fennel-like smallish seeds of light weight, which ripen in early autumn and lose their germinating power within a year. For more than three centuries the crisp and aromatic leaves and young stems gathered in August or September have been used in salads and vinegar pickles. Sampphere rarely reaches perfection in gardens far from the seacoast, unless
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Bloodroot.-Sanguinaria canadensis. (X+9)

SANDERSÔNIA (named after John Sanderson). Liliaceæ. Herb, suitable for the greenhouse: sts. sub-erect, simple, leafy; lvs. linear-lanceolate; fls. showy, orange, solitary in the axis, without bracts; perianth persistent, urn-shaped to globose, somewhat inflated; stamens 6; ovary sessile: fr. unknown.—One species, S. Afr. Treatment the same as for gloriosa.


SANGUINÁRIA (Latin, blood; referring to the yellowish red juice of the plant). Papaveracæ. Bloodroot. Low spring-blooming perennial used for borders and for rock-gardens.

SANDERSÔNIA

3069

The rootstock of Sanguinaria canadensis is often used in landscaping and rock gardens due to its attractive flowers and vibrant color. The plants are known for their showy blooms and are often used in perennial gardens. The species is native to North America and is easily grown in a variety of soil conditions. The rootstock is a hardy plant that can thrive in both shade and sun, making it a versatile addition to any garden. The roots are often harvested in the fall, after the leaves have died back, and are used in traditional medicine for their supposed blood-cleansing properties. The flowers are also used in floral arrangements for their attractive color and form. Overall, Sanguinaria canadensis is a popular choice for gardeners looking for a hardy, showy addition to their landscape.
SANIGUIRBA (Latin, blood and drink up, from reputed stypic properties in folk-medicine). *Rosaceae.* Commonly grown, ground-covering plants and also sometimes used in the hardy border.

Leaves unequally pinnate; stipules adherent to the petiole: fls. small, often polygamous or dioecious, crowded in a dense head or spike at the summit of a long, naked peduncle; calyx-tube persistent, with 4 broadly ovate, deeply lobed, petals; stamens 4--12: achene (commonly solitary) inclosed in the 4-angled dry and thickish calyx-tube.—About 33 species, natives of the North Temperate Zone. See *Poterium.*

**minor**, Scop. (Poterium Sanguisorba, Linn.). *BURNET.* Perennial, growing in clumps, glabrous or sparsely hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6--10 pairs and orbicular to oblong and deep-toothed: sts. 1--2½ ft. tall, terminating in small globular or oblong heads: lower fls. in the head staminate, the others perfect, the stigmas purple, tufted and exerted. Eu., Asia, and naturalized in this country.—Sometimes grown in the herb-garden for the fresh young lvs., which are used in salads. It is also an interesting plant for the herb-garden, and is recommended as a flower plant, particularly for sheep. It thrives in dry soils.

**canadensis**, Linn. Taller, larger in every way than the above: lfts. oblong to almost triangular-oblong, truncate or cordate at the base, long-stalked, obtuse, sharp-toothed: fls. heads cylindrical, 2--6 in. long, the fls. all perfect, whitish. Low grounds, Mich., east and south. An interesting plant, worthy a place in the hardy border, and sometimes sold for that purpose. It produces much foliage. Grows 5--8 ft. tall.

*S. aveneae*, Hort., is a form listed in the trade as having wiry sts. 3 ft. high bearing heads of rich crimson fls. Possibly the European S. officinalis, Linn. F. TRACY HUBBARD.

SANICULA (name said to be from sanare, to heal; or perhaps from San Nicolas). *Umbrelliferae.* 

**Black Snakeroot.** Perennial rather tall glabrous herbs, useful sometimes as a ground-cover.

Leaves few, palely lobed or parted, those from the base long-petioled: umbels irregular or compound; fls. greenish or yellowish, capitate in the umbels, perfect and with stamens one intermixed; involucre and involucels few-lvd.: fl. globular, carpels not separating spontaneously, ribless, thickly clothed with hooked prickles.—About 39 species (Wolff, Das Pflanzenreich, hft. 61), temperate regions of the world. The sanicles have no particular horticultural merit, being rather weedy in habit; but they are useful in wild-gardens and for colonizing in woods.

**A. Fls. yellow.**

**Ménziesii, Hook. & Arn. St. solitary, 1--2½ ft. high, branch-ling; lvs. round-cordate, 2--3 in. across, very deeply 3--5-lobed: fl. about 1 in long, becoming distinctly pedicellate. Calif. and northward.**

**AA. Fls. purple (rarely yellowish).**

*binpaniculafa,* Douglass. About 1 ft. high, with a pair of opposite lvs. at the base and 3--above, long-petioled, triangular to oblong in outline, 2--3 in. long, pinnately 3--5-lobed: fr. sessile. Calif. to Brit. Col.

**AAA. Fls. greenish white.**

**mariandica,** Linn. St. stout, 1½--4 ft. high: lvs. bluish green, the basal long-petioled, the upper sessile, 5--7-pet. fr. sessile. Atlantic to Brit. Col. Common in woods.

F. TRACY HUBBARD.

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 lvs., which are usually variegated.

There are some short, the plants and also sometimes stoloniferous: lvs. in a basal rosette, thick cartilaginous, frequently elongated, rather flat or terecete; secape simple, tall, stout: lvs. 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 M. B. R. Brown in New Brit. Flora, 1895, though other forms 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 suited to house decoration, since they do not require much sunlight. A rather heavy soil suits them best.

**A. Lvs. flat or nearly so.**

*thysiflora,* Thunb. (S. guineensis, Willds). Lvs. 2--4 to a growth, from a stout creeping rootstock, erect and smooth, to 1½ ft. long and 3½ in. broad, lanceolate, acute or obtuse, on both sides marked with pale green transverse bands which become obscure with age, tapering into a channel down the midvein: fls. greenish white, fragrant. Trop. Afr. B.M. 1179 (properly 1180).

**AA. Lvs. concave.**

*cyldinricha,* Bojer. Lvs. often 3--4 ft. long, 8--10 in. in a tuft, terete, solid within, dark green, often banded with paler lines, acuminate, occasionally furrowed: scape with infl. shorter than the lvs.: raceme about 1 ft. long; fls. creamy white, tinged with pink. Trop. Afr. B.M. 5093. G.C. III. 16:222. R.H. 1861, p. 448, 450.

The following species have been grown in various botanical gardens but are not known in the trade under any specific name.

*S. aschiptch, Thunb. Suculent, stemless subshrubs: lvs. somewhat rosetulate, suberect or erect-spreading, 5--16 in. long, thick, linear-lanceolate, acute, rounded, or cut into variously shaped lobes; fls. long, concave-channeled, back strongly convex, sometimes transversely dark green-banded, margins red or white, somewhat glaucous. 16--30 in. long; fls. 0.847. --S. arbo-fecnra, Cornu, has sts. 1 ft. high, bearing a height of 4 fl., furnished entirely with short spreading lvs. --Trop. Afr. --S. conpacta, N. E. Br., is a stemless herb: lvs. 3--5, lanceolate, 9--24 in. long, green on both surfaces, with dark lines above and rusty brown margins: fls. white, E. Trop. Afr. --S. cornut, Gér. & Labr., is stemless, the lvs. not bordered and only a little striated at the base and on the outside. Senegaemia; properly S. senegaemia, Baker. --S. Criagia, Hort., is offered in the American trade as a form with variegated lvs. --S. fuscita, Cornu, is stemless: lvs. flat, leathery, 2½--5 ft. long, 5 in. broad in the middle, bright green, striped and bordered with brown. Congo.—S. gladius, Hort., not Haw, resembles S. zeylanica, but the lvs. are somewhat shorter and not striate. Cochinn-China.—S. grunia, Hook. f. Stemless: lvs. few, rosetulate, obovate-oblong, the largest 3--4 ft. long, 6 in. broad, dull green with broad bands of much darker green; scape 2 ft. high, bearing a densely fl. terminal spike-like panicle 2--3 ft. long. Trop. Afr. B.M. 7877. It produces a very strong, silky fiber.—S. intermedia, N. E. Br., is very similar to S. cylindrica, but the lvs. are channelled, the edges of the sepatae below and above being rounded above. E. Trop. Afr. --S. libérica, Gér. & Labr. Lvs. more than 3 ft. long, bordered with ivory-white, not striped. W. Trop. Afr. --S. mettalic, Gér. & Labr. Lvs. more than 3 ft. long, elliptic, flattened, variegated, the midrib marked with many short reflexed bracteoles: fl. small. Italian Somalia.—S. stizka, Godefr., is stemless: lvs. quite cylindric except a small furrow on the upper surface, at the summit of the lvs. in the same situation, not short-stemmed; fls. in a distichous rosette, subterete, without furrows, very rigid, up to 5--6 ft. long. Zanzibar.

F. TRACY HUBBARD.
SANVITALIA (after a noble Italian family). Commonly, usually, much-branched herbs grown for their attractive yellow flowers.

Leaves opposite, petioled, mostly entire: heads of fls. small, solitary, with yellow or sometimes white rays; involucre 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 known 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.

procumbens, Lam. A hardy florigerous annual, growing about 6 in. high, trailing in habit: lvs. ovate, about 1 in. long: fl.-heads dark purple disk and yellow rays; tubular rays less than 1 in. long: achenes numerous: achenes of the disk flattened and often winged and 1-2 aristate. Summer to very late autumn. Mex. B. R. 707. R. H. 1860, p. 127. Var. flore-pleno, Hort. A double-flowered variety coming true from seed, and as vigorous as the type. R. H. 1866, p. 70.—Worthy of more extended use as a low border annual.

F. W. Barclay.

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 living cells. The water taken from the soil by the roots or other absorbing organs may contain potassium, sodium, magnesium, calcium, iron, and nitrates, phosphates, sugars, 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 note 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 about 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 activities of the 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 daytime, bubbles of air in the xylem-tissue 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 stems 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 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 Betula papyracea 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 pulpe 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 chemical properties varies widely. Cacti and other succulents have a sap which would set up a pressure of only three to twelve atmospheres. Spinose desert shrubs may have a sap which would set up a pressure of over a
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 pinnate or simple, 1-ovate, in one species; the leaflets, rarely serrate: racemes or panicles terminal or axillary: ffs. polygamous, regular; sepals 4-5, in 2 rows; petals 4-5; naked or bearing 1 or 2 glabrous or villous scales above the claw; disk annular; stamens 8-10; berry fleshy or leathery; seeds frequently globose, with a boxy 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 used for that purpose.

Cultivation. The fruit is not properly suited for the vegetable garden. For the purpose of cleansing delicate fabrics like silk. The seeds are used for making rosaries, necklaces, and the like.

Saponaria, Linn. A small tree, to 30 ft., with rough gray bark: ffs. oblong-lanceolate and acute to elliptic-ovate and somewhat obvolute, opposite or alternate, entire, glabrous, veiny and lustrous above, tomento-lose beneath, 3-4 in. long; racis usually winged: panicle 7-10 in. long; sepals rounded, petals ovate, hairly: fr. 2½-3½ in. across, globose, keeled, orange-brown, translucent. Fls. in Nov.; fr. in spring. S. Fla., W. India, and S. Amer. Cult. in S. Fla. and S. Calif. S.S. 2:74, 75.

AA. Ffs. acuminata, 7-10; racis with narrow margin or marginless: petals with 2 scales.

B. Trees evergreen.

marginatus, Wild. A tree reaching ultimately 60 ft. in height: ffs. very short-stalked or nearly sessile, 7-13, lance-oblong, acuminate, glabrous above, paler beneath and somewhat pubescent on the midnerves, 2-5 in. long, the upper nearly opposite, the lower alternate; racis narrowly margined or marginless: frs. white, sometimes tinged with red, in pyramidal panicles; petals ciliate, ovate to ovate-lanceolate; filaments villous: fr. yellow, translucent, globose, keeled, 3½ in. across. May, June. S. C. to Fla. S.S. 13:623.—Cult. for ornament in S. Fla.

Mukoróssi, Gaertn. Tree, to 60 ft.: ffs. 8-13, stalked, the stalk ½-3½ in. long, oblong-ovate to oblong-lanceolate, obtuse, cuneate at the base, glabrous, reticulate beneath, 3-6 in. long; sepals subulate; ovulate to ovate-lanceolate, acute, ciliate; filaments villous: 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. tithlis, Trabut). Fr. more fleshy, strongly keeled. —According to Trabut this variety is cult. 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.

BB. Trees deciduous.


Alfred Rehder.
SAPIUM

Sapodilla, the fruit of Achras Sapota. (X about 1/2)

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-uneate at the base and commonly obtuse at the apex, 2 to 5 inches long, glabrous, of rich green color, the midrib prominent below. The small inconspicuous flowers are produced upon short stalks, pubescent pedicels in the leaf-axils toward the ends of the branchlets; the calyx is composed of six small ovate-acuminate hairy sepals, the corolla white, tubular or urceolate, lobulate at the top, the stamens six, opposite the lobules, with short flattened attenuate filaments and lanceolate-acuminate extrose and linear-ovate anthers; the stigmas six, petaloid, style elevate, hairy at the tip, the ovary ten- to twelve-celled, each cell containing one ovule.

The fruit is very variable in form, commonly round, oval, globose-depressed, or conical, and 2 to 3½ inches in diameter. The skin is thin, rusty brown, somewhat scurfy, giving the fruit a striking resemblance to an Irish potato. The flesh is yellowish brown, translucent, soft and melting when fully ripe, sweet and delicious, but when green containing tannin and a milky latex, so that it must not be eaten until it has become quite mellow. The seeds vary from none to ten or twelve, and are hard, black and shining, obovate, flattened, about 3½ inch long, easily separated from the pulp.

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 Desmoulins 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 Tehuantepe, 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 of chicle gum. The common name is derived from the Nahualt word zapotl, the latter name, the "chicle fruit" and "chicle" being common names for a tree of the genus Malpighia. The sapodilla 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 name nasberry is common. In Brazil one form of the fruit is called sapoté, another sapota. The German name for the tree is Breieipfelbaum, the French sapotillier, 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 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 unjured 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 practicable.

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 suitable 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 closer together than 25 to 30 feet, and require very little pruning, because of their close compact growth. As a general
SAPODILLA

The trees bear heavily, and two crops a year are frequently produced; this, with the natural variation in season among seedling trees, results in ripe fruit being found in the markets of tropical America at nearly all times of the year.

Experiments have shown that the sapodilla can be shipped very successfully and without excessive care in packing; notwithstanding the delicate texture of the skin it keeps well, and if picked while still hard can be kept in good condition for ten days or more. Shipments have been made from the Florida Keys to New York, the fruit being placed in small baskets which hold half a dozen good-sized fruits, six of these baskets being packed in a tomato-crate. For local consumption or for shipping to short distances, the common procedure in Florida is to pull the fruits from the tree and throw them into boxes or baskets, in which they are carried to market, where the ripe ones are picked out and sold from day to day. The sapodilla is used almost exclusively as a fresh fruit, usually eaten out of hand, but is sometimes utilized in Brazil and Cuba to prepare a delicious sherbet. Little is known of its culinary possibilities. Due to its lack of acidity it is doubtful whether it will lend itself to many different uses.

The sapodilla is generally propagated by seed, but the variation among seedlings in productiveness as well as in quality, size, and shape of fruit necessitates some asexual means of propagation, if the most desirable seedling forms are to be perpetuated. Horticulitists have been as dilatory in applying vegetative propagation to 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 in rows 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 cut slightly more than an inch in length, and the wood removed if it comes out readily. After making the incision in the stock, the bud should be inserted and tied as promptly as possible, as the latex soon collects around the incision and renders it difficult to do the work properly. Wax tape should be used for wrapping. After three or four weeks the stock may be headed back, and the wrap loosened, leaving the eye exposed so that it may start into growth.

Occasional seedlings produce fruits which are nearly or quite seedless; some produce fruits weighing more than a pound, while others do not weigh over two or three ounces; some are unusually prolific, or ripen their fruit at especially desirable times of the year. From such seedlings one should select the best for propagation, having in mind the characteristics which it is most desirable to perpetuate.

The tree seems to be remarkably free from insect pests and fungous diseases, and in Florida requires very little attention. While fertilizers are not commonly employed, their judicious use will doubtless improve the size of the fruit and have a beneficial effect in those frequent instances where the tree brings to maturity so many fruits that some remain very small.

F. W. POPENOE.

SAPONARIA (Latin, soap, the mucilaginous juice forming a lather with water). CARYOPHYLLACEÆ. SOAPWORT. Hardy often coarse annual or biennial herb with or decumbent herbs, used for borders and rockeries. Habit either annual and resembling that of gypsophila or perennial and similar to that of silene: lvs. flat: lvs. in dichotomous cymes; calyx ovoid or oblong-tubular, 5-toothed, nerves obscure; petals 5, narrow- clawed, blade entire or emarginate, the base with scales or naked; stamens 10; ovary 3-valved; caps. ovoid or oblong, very rarely subglobose.—About 40 species, Eu., principally the Mediterr. region and extra-Trop. Asia. Saponarias are readily established in any soil and require but little care. S. ocymoides is an attractive plant for the rockery or for edging. Prop. by seed or division.

a. Plants annual.

b. Calyx 5-angled.


bb. Calyx not 5-angled.

calibra, Guss. (S. multiflora, Hort.).—Annual, divaricate-branched, pilose-viscous above: lvs. opposite, oblong-lanceolate, obtuse, attenuate to the petiole, glabrous, ciliate at base: fls. in a dichotomous corymbose panicle, solitary in the axis, pale rose; calyx cylindrical, segments obtuse; petals entire, top orbiculate, throat naked. Spring, Italy and Greece. Gn. 71, p. 78. Ct. 1: 100. R.H. 1851:281. Var. alba, Hort., (S. multiflora alba, Hort.), is a form with white fls. There are horticultural forms of this species offered in the trade under the names of S. multiflora compacta and S. multiflora compacta alba.—Seed should be sown in autumn for spring bloom or in April for summer-flowering.

AA. Plants perennial.

b. Fls. yellow.

c. Lvs. linear: stamens linear: stigmas linear.


bellidifolia, Smith. Cespitose, glabrous: sts. 8–10 in. high: lvs. spatulate-oblong, attenuate to the petiole; calamine lvs. few, linear-spatulate: fls. yellow, sessile, congested in a small head at the top of the long cylindric, teeth triangular; petals oblong-linear; stamens yellow: caps. oblong. S. Eu. to Greece.
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. álbo-pléna, Hort., is a double white-fl. form growing 2½ ft. high. June-Sept. Var. caucásica, Hort. (S. caucásica, Hort.), is a double-fl. form, the fls. described as white tinted rose by some, as deeper colored than the type by others, grows 15 in. high. All summer and fall. Var. caucásica flore-pléno, Hort. (S. caucásica flore-pléno, Hort.), is said to have double reddish purple fls. July-Sept. Var. flore-pléno, Hort., is quite double-fl., the fls. paler than the type. Var. pléna, Hort., grows 1-3 ft. high and lilac, rose, or white fls. July-Oct. Probably includes some of the other double varieties. Var. róseo-pléna, Hort., grows 2½-3 ft. high and rose-colored fls. July-Sept.

dd. St. slender, decumbent.

ocymoides, Linn. Sts. much-branched, 0-9 in. high, half-trailing: lvs. ovate-lanceolate, about 1-nerved, small, acute: fls. bright pink, in loose, broad cymes. Summer. Eu. B.M. 154. G. N. 60, p. 245; 73, pp. 319, 593. G 35:841. G.M. 50:433; 57:651. G.W.S, p. 1; 15, pp. 8, 647. Var. álba, Hort., is a form with pure white fls., in reality a hybrid between two forms of the species. Var. floribunda, Hort., is a form more profusely fl. than the type, with lvs. small and lanceolate and fls. soft pink. G.W. 25:67. Var. spléndens, Hort., has large fls. which are a more intense rose than the type. Var. spléndidissima, 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. spléndens. R.H. 1913, p. 305.

cc. The plants cespitose.

d. Lvs. obovate-elliptic.

dépressa, Biv. Cespitose: radical lvs. tufted, obovate-elliptic, depressed: fls. subumbellate, large, rose, pedunculate; calyx very long, 5-angled, viscos-pubescent; petals lilac. Sicily.

dd. Lvs. linear.

cespitosa, DC. Cespitose: sts. 2-3 in. high, nearly naked, fl-bearing at the top: lvs. linear, glabrous, mostly radical, hardly denticulate: fls. rather umbracellate, rose; calyx cylindrical, villous, deeply lobed, lobes

3547. White sapote.—Casimiroa edulis. (X4)

SAPOTE, WHITE. A tropical fruit (Fig. 3547). The sapote blanco of the Mexicans (Casimiroa edulis), known in California and Florida as white sapote, is a fruit little cultivated outside of Mexico, but occasionally seen in the southernmost parts of the United States, in the West Indies, and even in the Orient, where it is probably of recent introduction. Horticulturally, it has been given more attention in southern California than in any other region. (P. 680.)

The tree reaches an ultimate height of 50 feet or more, with a short stout trunk, often covered with warty excrescences around the base, and a broad erect crown, sometimes spreading and dome-shaped, under favorable conditions densely foliaged and of very attractive and ornamental appearance. The bark is somewhat rough, ashen gray when mature, and dotted with numerous warty light gray lenticels. The leaves are alternate, digitate, borne upon long slender petioles and composed of three to seven, commonly five, elliptical to lanceolate, acuminate leaflets, coppery when young but eventually of glossy bright green color. The small greenish flowers, less than ½ inch in diameter, are produced in spring on short axillary panicles, and are composed of a four- or five-parted calyx, with short

acute; petals emarginate at the top, the blade very narrow. Pyrenees. G.C. II. 15:501.

S. japonia, Hort. John Saul, is botanically unknown.—S. pulvinaria, Bories. (S. ibanetica, Hort., S. Pulvillo, Bories.) Densely cespitose-pulvinate: sts. low, 3-7-fl.: lvs. small, linear, subarinate: infl. hirsute-villos; fls. bright rose.—S. Sandermannii, Hort., closely resembles S. bellifolia, but has rather larger fls. and more of them. June.—S. Weinmanni, Hort., is closely allied to S. cespitosa, possibly only a form of it, but has paler 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, valuate in the bud, with small oblong-elliptic acute 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, globose, bearing at its apex a three- to five-lobed sessile stigma.

The fruit, when of a choice quality, is as large as a good-sized orange, and somewhat resembles a quince in general appearance. The tender yellow or yellowish green skin, scarcely as thick as that of an apple, 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 heat. 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 for many days before it is soft 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, yet if taken while still hard, and carefully packed, it can be sent considerable distances. It is commonly used while fresh, and an over-indulgence in it is thought by many to induce Meuse. But it is a weed, and 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 at 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 unrecorded 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 and 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 has not been cultivated many years, but has come into bearing in the vicinity of Miami and seems to be at home. It has also thrived in Cuba.

Seeds should be planted as soon as possible after their removal from the fruit, in flats of light, porous soil, or singly in 3- or 4-inch pots, covering them to the depth of 1 inch. If the weather is warm, or artificial heat is provided, germination will take place within three or four weeks. The young plants should be grown in pots 8 inches high, when they may be set out in the open ground. While young, the white sapote should be watered liberally to encourage growth, though it can get along with little water if necessary. The terminal bud should be pinched out to force the tree to branch when about 3 feet high; otherwise it is likely to make a growth of 10 to 12 feet before branching. Being liable to be broken off by a severe wind.

Seedlings do not come into bearing until seven or eight years old, and are undependable at best, many producing fruit of inferior quality. For this reason the 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 3 inch in diameter at the base. Buds are taken from the ends of the branches, using fairly well-matured wood which has assumed the ashen-gray color. The buds are cut about 1½ inches long, leaving any wood that may adhere to them, and are inserted in T-incisions, after which they are bound firmly in place with waxed tape. At the end of two to four weeks, depending upon the climate, the buds may be unwrapped, and if the leaves are only just beginning to show, the old 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 most favorable.

Three named varieties have been established in California—Harvey, Parroqui, and Gillespie. Of these Harvey is the largest and probably the best; the tree is very prolific, and individual fruits sometimes measure 3½ inches in diameter. F. W. POPNOE.

SAPIROCYTE (Greek, rotten, and plant, i.e. living on dead organic matter). A dependent, or heterotrophic, plant (whether a saprophyte or higher plant) subsisting upon the humus of the soil, or dead or decaying 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 saprotrophic 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 autophytes on the other that the distinction of them is often difficult. For example, it is supposed that the chestnut blight (Endothria 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 substrate. 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 inata, Epipogium aphylhum, snow-plant, Sarcoce sanguinea and Thasimia Aseroe) are also classed as saprophytes. A few algae are saprophytic. A cavel growing form of Gloeohoe rupestris, known as var. cavernarum, utilizes organic food and is colorless. JOHN W. HARSHBERGER.

SARACA (from Sarac, the name of the genus in India). Leguminosae. Unarmed trees (or tall climbing shrubs?), grown in the warmhouse. Bushes about 1805—native, the lifs, leathery, often few-paired; stipules small, caducous: fts. yellow, rose, or scarlet, racemose, the racemes in short very branched panicles which are often lateral; calyx-tube elongated, segms. 4, petal-like, ovate, strongly imbricated; petals none; stamens 3-9, free; ovary stipitate, ovals many; legume oblong or elongated, flat compressed or truncate, leathery to somewhat woody, 2-valved—About 6 species, Trop. Asia.
SARACA

Indica, Linn. A medium-sized tree: lfs. 6-12, oblong or oblong-lanceolate, acute or obtuse; 3-9 in. long, entire, adnate to petioles; fls. orange-red, fragrant, collected in compact, roundish panicles which are shorter than the lvs.; stamens usually 6 or 7, inserted on the fleshy annular ring at the summit of the calyx-tube; style long, curved: bracts red, appearing as a calyx: pod 4-10 in. long, 4-5-seeded; seeds oblong, compressed, 1/4 in. long. India and Malay. B.M. 3815 (as Jovestia Aceoa).

It hasflowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Intro. into S. Fla.

SARCOFILIA, Baker. A shrubby tree: lfs. 10-12, rigidly subcoriaceous, the upper oblanco-oblanceolate-oblong, acute, 1 ft. or more long, the lower shorter, more oblong: corymbis solitary or in pairs, nearly sessile, dense, 4-6 in. broad: fls. scarlet; stamens 7. India. —Intro. into S. Fla.

P. 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 fls. seldom cult. Some are shrubs of a low, slender, slenderly tuberculate nature, united with the base of the column, spurred, with 2 small lateral lobes and a longer concave middle lobe: foliage 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 55°. When at rest, give very little water and reduce the temperature to 55°. Cult. practically as for vanda.

S. teretifolius, Lindl. (Luisia teres, Lindl.). St. ft. high, with cylindrical lvs. 2-4 in. long; raceme bearing 7-8 inconspicuous fls.; sepals and petals oblong, dull green, with red disk; labellum slipper-shaped, white, lateral lobes edged with red. Sept. China. B.M. 3571.

S. indicus, Rolfe. Distinguished by its inflated spur, which is much broader than long; the lip and petals green, with 2 dark brown stripes; front lobe of lip yellow, side lobes white. Annam.—S. robustus, O'Brien. Lvs. narrowly oblong, about 6 in. long; spike few-fl.; fls. cream- to bluish-white, marked with claret-purple. Borneo. G.C. III. 55:21.

HEINRICH HASSELBERG.

SARCOCÉPHALUS (Greek, flesh and head, alluding to the fleshy heads of fruit). Rubiaceae. Shrubs or trees sometimes grown as house plants in cultivation or hardy in the extreme southern United States. Branches suberect or obtusely quadrangular: lvs. opposite, rarely in whorls of 3, subcoriaceous: heads terminal and axillary; fls. whitish, pale pink or yellowish and crowded; calyx-tubes cohering, teeth 5-6, hairy; corolla narrowly funnel-form, rather fleshy, 5-lobed; stamens 8, subsessile; disk inconspicuous; ovary 4-celled; syncarpium fleshy.—About 30 species. S. esculentus, Afxel. A tree with long branches or often a scendent shrub 10-25 ft. or more high; lvs. elliptical, short-acute: fls. in terminal heads, white, pale pink or yellowish, fragrant; calyx-teeth furnished with alternating filiform-clavate appendages: fruiting head 21/2-3 in. diam. with brown granulated surface. Trop. Afr.—Edible, the peach or country fig of the natives of Sierra Leone. S. ovatus, Elmer. Tree, 18 ft. high, with rigid branches; lvs. glabrous, leathery, ovate or elliptic, acute at the base, obtuse at the apex, 7 x 3 3/4 in.: infl. capitate, peduncled; fls. reddish; calyx with clavate, pubescent and deciduous appendages; corolla glabrous, nearly 3/4 in. long. Philippines. Said to be intro. into Calif.

SARCOCILUS: Plzicpermum.

SARCOCÓCCA (Greek, flesh and berry, alluding to the fleshy fruit). Buxaceae. Ornamental woody plants grown chiefly for the handsome fleshy foliage.

Evergreen glossy shrubs: lvs. petiolate, alternate, coriaceous, entire, without stipules: fls. unisexual, apetalous, in short axillary racemes with the pistillate

SARCODES

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fls. at the base; sepals 4 or 6; disk wanting; staminate fls. with 4-6 stamens opposite the sepals; pistillate fls. with a 2-3-celled ovary with 2-3 short erect or recurved styles: fr. indehiscent, globose to ellipsoid, coriaceous or fleshy, 1-2-seeded.—Five species distributed from Cent. and W. China to the Malay Archipelago.

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. Hookeri ana var. humidis has proved hardy in sheltered positions at the Arnold Arboretum, while S. saligna 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-acute.


A.A. Lvs. obscurely veined.


Var. kihmits, Reid & Wilson. Shrub, 1-5 ft.: lvs. lanceolate to oblong-lanceolate, 1 1/2-2 in. long. W. China.—Only the varieties seem to be in cult.

Ruscifolia, Stapf. Shrub, to 6 ft.: lvs. ovate to elliptic-ovate, acuminate, rounded or broadly cuneate at the base, dark green and lustrous above, 1 1/2-2 in. long; petioles 1 1/2-2 in. long: fls. in few, usually 4-fl. racemes: fr. subglobose, dark scarlet. Oct.—Feb. Cent. and W. China.

Var. chinensis, Reid & Wilson (S. saligna var. chinensis, French.). Lvs. elliptic-ovate to elliptic-lanceolate, cuneate or broadly cuneate at the base, 1 1/2-2 1/2 in. long. W. China.

ALFRED REIDER.

SARCÔDES (Greek, flesh-like). Monotropaceae.

S. sanguinea, Torr. (Fig. 3548), 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

3548. Snow-plant.—Sarcodes sanguinea. (X about 1)
spring. The specific name sanguinea refers to the blood-
red color of the entire plant. The snow-plant grows at an
altitude of 4,000-9,000 ft. It is the only species of the
genus, and is not known to be in cult.

SARCOCODIUM (Greek for flesh and foot). Orchidae-
cea. Warmhouse orchids, by some referred to Bulbo-
phyllum and Dendrobium. The sepals, the 2-lvd. pseudobulbs usually
distant on infl. terminal, the fls. single or in
racemes; sepals and petals similar, the former usually
forming a manifest chin; lip much smaller. Related
to Dendrobium, and much like it in fl-structure.—Species
related to 20, in the Malay Penins. and adjacent islands,
and in the Trop. Himalayas.

Amphium, Lindl. (Dendrobium anthum, Lindl. Bulbo-
phyllum antherum, Reichb. f.). Habit, much like a bulbo-
phyllum: pseudobulbs oblong, ovate, or fusiform, up to
2 in. long; lvs. oblong, acute, 4-6 in. long, 2 in. broad:
fls. greenish white, suffused purplish; raceme few-fl.;
sepal dorsal lanceolate, the lateral triangular; petals
linear-lanceolate, long-acuminate; lip with round lateral
lobes erect, the middle lobe rhomboid, acute. Trop.
Himalayas. P. M. 7:121.

S. acuminatum, Kränzl. (Dendrobium acuminatum; Rolfe).
Raceme few- to many-fl., lax; sepals triangular, long-acuminate,
about ½ in. long; petals of same length but narrower, yellowish
white; lip with lateral lobes obvate, rounded; 3-lobed middle-
lobe-ovate-triangular, acute, the apex reflexed. G.C. III.
(Dendrobium Gorgonense, Reichb. f.). Fls. usually solitary,
2-2½ in. across, fleshy, yellow or straw-color, purplish-lined, the
lip deep purple; dorsal sepal lanceolate, the lateral broader
and fleshy, two-angled oblong; petals narrowly linear-
lanceolate: lip with the ovate-acute flt. separate by a narrow
interval. C.A. Deed. 32. Q. 1910, p. 122; J.H. III. 57:585.—S. cymbi-
odioides, Kränzl. (Dendrobium cymbioides, Lindl. D. trifurcum, Lindl.).
Raceme few-fl.; fls. pale yellow; straw-color, the lip yellow, suffused
with rose or purple, with 3 orange spots at base of middle lobe;
sepalis and petals similar, acute, oblong-lanceolate, the sepals forming a very short round
chamber; lip with middle lobe ovate, obtuse, obtuse, with
the 5 lobes, the 3 outer more acute, and the 2 inner
with 3 orange spots at base of middle lobe; sepals and petals similar,
acute, oblong-lanceolate, the sepals forming a very short round
chamber; lip with middle lobe ovate, obtuse, obtuse, with
the 5 lobes, the 3 outer more acute, and the 2 inner
S. rosei, the front part of lip yellow; dorsal sepal and petals linear-
lanceolate, the lateral sepals triangular, forming a round chin, all
the parts acuminate; lip with middle lobe linear-oblong, acuminate,

GEORGE V. NASH.

SARCOSTEMMA (name refers to the fleshy corona).
Astelepiadeae. A few small-fl., more or less succulent
leaves, in a tuft at the top of the stem or terminal
of tropical and subtropical regions of the Old World, to
which N. E. Brown refers a plant long known as
a Euphorbia. Fls. greenish, yellowish, or white, in sessile
terminal or lateral umbels; corona double, the outer
part ring-like or cup-shaped and truncate or shortly
lobed, the inner part of 5 fleshy erect lobes; pollen-
masse, solitary in each anther-cell, pendulous.
S. viminalis, R. Br. (Tithymalum pendulum, Haw. Euphór-
bia pendula, Link), grows in Trop. Afr.: trailing, twi-
nning, or bush-like, woody below, the lvs. sometimes
represented by minute ovate bracts; corolla rotate or
somewhat campanulate, greenish white or sulfur-color.
B. H. Woodford. Willd. of India, 1789, with yellow
fls. The sarcostemmias require the treatment
given cerapeutas and similar succulents.

SARGENTODÓXÁ (after C. S. Sargent, director of the
Arnold Arboretum of Harvard University; and
Greek, doxe, glory). Lardizabalaceae. A woody vine,
with deciduous 5-foliolate lvs. and dicyclic,
campanulate flowers, large, solitary, with frs.
consisting of berry-like bluish black ovoid carps.
Stamineate fls. 6-merous; sepalis petaloid; petals want-
ing; nectaries minute, subcircular; stamens with short filaments and oblong anthers: fr. consisting of
ovoid stipitate carps each with 1 ovoid, glossy black
seed. Differs from all members of the family by
its numerous 1-ovuled carps. One species in Cent.

China. A handsome vigorous-growing vine with rather
large foliages and fragrant yellow fls. appearing with
the leaves. Probably not hardy N. Prop. is by seed and by
layers or cuttings. S. cuneata, Rehrl & Wilson (Holotidilla
cuneata, Oliver, partly). Climbing, to 20 ft., glabrous:
Ivs. long-petioled; flts. 3, the middle one stalked,
rhombic to rhombic-ovabale, 5-5 in. long, the lateral
ovarietate, very unequal, slightly larger than the
terminal one: stamineate flc. 4-5 in. long; fls. nearly
½ in. long, slender-stalked, yellow, fragrant;
sepalis narrow-oblong; stamen much shorter; ripe car-
ps ½ in. long on a stalk of equal about 2 in. length.
H. I. 19:1817 (excluding the fruits, which belong to Sinofran-
chetta).

ALFRED REHDER.

SARMIÉNTA (named after Mart. Sarmiento, a
Spanish botanist). Gesneriaceae. A glabrous shrub, creeping
or draping over trees or rocks, to be grown in a
moist greenhouse: stts. slender: lvs. opposite, rather
fleshy, entire or few-toothed: fls. red, peduncled at the
axis, solitary: calyx free, 5-parted, segments; narrow;
corolla-tube elongate, ventricose, limb slightly oblique,
lobes 5, rounded, spreading; stamens 2, posterior
perfect, 2 anterior staminodes; disk obsolete; ovary
superior. One species, Chile, S. répena, Ruiz & Pav.
scarlet, axillary and solitary; calyx 5-parted, segments
narrow, slightly revolute; corolla-tube longer; ovary
that it does not always thrive very well in cult. and
that it should be planted in soft peat mixed with sphagnum
and charcoal and either in a small pan or orchid-basket.
It likes plenty of water, shade from bright sunshine
and a position near the glass in a moist house.

SAROTHÁNÁM SPÓCARÁS: Cyrtostachys scoparius.

SARRACÉNIA (Dr. D. Sarrasin, of Quebec, a well-
known physician and naturalist of his day, who sent S.
purpurea to Tournefort nearly two centuries ago). Sar-
racénia. Pitcher-Plant. Indian Pitcher-Plant.
SIDE-SADDLE PLANT. Devil's Boots. Forefather's
Cup. Huntsman's Cup. Trumpets. Watches.
Pitcher-plants of swamps and savannas of the eastern
United States, grown for their great oddity.
Acacalaneous perennial herbs, with hollow radical lvs.
usually provided with a lid or expanded blade, with a
slender stalk or none, growing in dry, damp parts of
tropical and subtropical regions of the Old World,
mostly in the savannas of the countries in the
regions of S. purpurea, that extends from Florida and
Alabama to Labrador and Minnesota. The others
occur from southern Virginia to Florida and eastern
Texas. All grow in moist or even in swampy savanna
lands, in black sandy humus soil. The striking and
beautiful pitchered leaves, as well as the large hand-
some flowers, early attention, are so well-known so
long ago even as three centuries. But the apparent
difficulty of cultivation long prevented their becoming
popular objects. The careful observations of Macbride
and Mellichamp in the southern states, and later of J.
Hooker in England, clearly proved that the pitchered
leaves are carnivorous, and that they should be given
a microscopic structure in connection with this habit.
Such has caused them to become popular objects of
study in the past three decades. All are perennial rhizomatous plants, that produce three to eight pitcher-leaved leaves in spring, and in some species (S. Drummondii, S. psittacina) another set of these, or of flat green leaves (S. flavi, S. Sledgei), in autumn. When grown in sunny situations, the pitcher-leaved leaves are often richly mottled with crimson or white; sometimes 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 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 effectually prevent upward passage of insects, and so has been called the "detentive surface." The seven species vary in their carnivorous capacity, S. flavi, S. Sledgei, and S. Drummondii being best; S. minor (S. sarioria), S. purpurea, and S. rubra being rather poor; while S. psittacina, with its small flat pitchers, catches relatively few. The insect prey is not digested, but its dissolved material is either absorbed by the pitcher walls, or rotting inside the decaying leaves, affords valuable nitrogenous food for the roots. But an over-abundant animal diet often causes browning and decay of the leaves, so that some gardeners have advised plugging with cotton wadding.

The pendent flowers vary in size from an inch to 3 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 more or less petaloid; the petals are large pendent banners, the stamens are numerous and discharge abundant pollen which early falls into the umbrelloid cavity of the style. The pistil consists of five-celled ovary that is covered outside by crystalline nectar-secreting warts, and within bears many ovoids; a style that expands above into a large umbrelloid structure with five marginal notches, at the base of each of which is a minute deep peg-like stigma. The entire pistil after pollination matures in about three months into a many-seeded capsule. Cross-pollination always is 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 ovarian surface be 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. flavi, 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, can give rise to second hybrids in which the characters of at least three parents may be blended, also testify to ease 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 pitchered 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 another type. Careful detection and destruction of the infested leaves or pieces of rhizome are recommended. Mosquitoes 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, and 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 Tankard, hollow, tough, and always full of Water, the Root being covered with 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 Flowers 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."
SARRACENIA

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I. Species.

A. Pitchers erect: fls. yellow or whitish yellow.


2. Slégéi, Macfar. (?S. Gronoëti var. alidza and S. flava var. crispóla of authors). Pitchers erect, 12–30 in. long, trumpet-shaped, green with purple veins above, or greenish purple throughout; lid vertical or often slightly incurved, ovate-cordate; wing as in last: fls. 1½–2½ in. wide; petals white, yellow to yellow, often fading to white, odor agreeable. Savanna swamps 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 claret in the pitchers; often conformed in the past with S. flava, which does not occupy the same area. Frequently hybridizes with S. Drummondii in nature to form S. areolata.


AA. Pitchers erect to decumbent: fls. crimson to purple-red.

4. rubra, Walt. (S. Swezzeri, DC. S. Gronoëti var. rubra, Wood. S. minor, Sweet). Pitchers erect, 6–20 in. long, slender, enlarging upward, tubular above, green to purplish 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. 3½–4 in. wide, petals crimson, scent of sweet violets. Moist to dry savanna lands, usually in shade, from N. C. to N. W. Fl.; the most delicate and graceful species of the genus. B. M. 5315. L. B. C. 12: 11. Var. purpurea, Codr.; DC. LD ovate, apex acuminate. All transitions occur between this and the type species.


6. purpurea, Linn. The common pitcher-plant of the N. and that on which the genus was founded. Fig. 3551. Pitchers ascending, in rosettes of 3–6, 2–10 in. long, widest toward middle, narrowed below and upward, green to dark purple; lid upright or slightly inclined outward with fine hispid hairs over inner lid or attractive surface; wing broad, prominent: fls. 1½–2½ in. wide; sepals and petals greenish purple to purplish purple. In wet sandy meadow or by swamp margins from Labrador and Minn. to N. Fl. and Ala.; flowering from fourth week in March in N. Fl. to second week of Aug. in Lab. B. M. 849. L. B. C. 4: 308. F. S. 10: 1076. G. C. II. 15: 821. M. 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 1823, this species was "cultivated before the year 1640 by Tradescant, who was gardener.

3550. Pitcher of Sarracenia minor. (x16)

3551. Pitcher of Sarracenia purpurea. (x16)
SARRACENIA


9. areolata, Macfar., (S. Sledge × S. Drummondii). Pitcher elongate-tubular, green below, purple-veined and red above. The plant is very rare and very few specimens have been observed.


11. Catesbei, Ell. A hybrid between S. flavus 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 many as 117 specimens in a former greenhouse in New York, and it is easily cult., and produces pitchers and fls. 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 vivous purple at the summit, shading to crimson." 1912.

14. Cookiana, Hort. Parentage unknown, said to be one parent of S. Drummondii.

15. Courtii, Hort. One of Court's hybrids between S. purpurea and S. petiolaris, and combining in exact and striking manner the details of both parents. The writer has collected a single specimen, a few days below, long, white-areolate, and combining deep crimson upward. Orifices and incurved rim wider than in S. petiolaris. S.H. 1:177.

16. crispata, Andréc. A name of doubtful value, that seems to have been used by different authors. Probably either S. Sledge or a hybrid of S. flavus and S. minor, the writer has gathered undoubted examples of the last-named cross between Summerville, S.C. Pitchers erect, green with whitish areoles above, lid broadly ovate, somewhat constricted over orifice, fls. bright yellow. I.H. 27:387. G.C. II. 13:633; 16:199.

17. decora, Hort. A probable cross between S. petiolaris and S. minor, and so of like but more recent parentage with S. formosa.

18. exciliana, Nichols. A probable hybrid between S. minor and the unknown S. Drummondii.

19. excilis, Nichols. A hybrid of like parentage as S. Moorei, which see.

20. exornata, Nichols. Said to be a hybrid of S. purpurea with S. crispa.

21. Farnhami, 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 fls. The writer has collected a single wild example near Milligan, Fla., where the former parent is common and the latter is sparse.

22. flaveae, Hort. A hybrid of doubtful origin and parentage, cult in Kentucky. Possibly a hybrid of S. purpurea with S. minor, and so of like origin as S. Sarracenia.


24. Illustrata, Nichols. Lvs. elongate-tubular, veins becoming deep crimson upward, lid coriaceous, slightly acuminate, with crimson veins. Between S. flavus var. picta and the hybrid S. Stevensii, so with 3 parts of S. flava "blood" and 1 of S. purpurea.

23. Maddisoniana, Nichols. A hybrid with the same parentage as S. formosa, but in reversed manner, short, with dull purple veins and fine whitish areoles upward, cutulate end of tube and fused lid richly white and purple-veined.

24. Mandalina, Hort. A natural hybrid with like parentage to S. crispa. Over wide area in E. Ala., near to the Alabama River it is nearly always to be found wherever both parents are common. A tall, handsome type with white margins of S. flavo var. Bugelii, and the crimson and white areolations of S. Drummondii. It grows well under cult. First sent out by Pitcher & Nichols.

25. melanorhoda, Veitch. A cross between S. Stevensii and S. purpurea, so with 1 part parentage of S. flavus and 3 parts S. purpurea. Pitchers ascending, long, widening from base to mouth, lid erect or slightly incurved with undulate margins and within showing short hairs, top of pitcher and lid crimson with well dark crimson hispid veins, wing prominent, in broad middle.

26. Mitchelliana, Nichols. (S. Drummondii var. rubra crossed by S. purpurea). Pitchers almost erect, funnel-shaped, pale green with red veins and whitish areoles above, lid coriaceous with undulate margins, and deep crimson veins around white areoles. The artificial hybrids were sent out by Bull. The writer has got a few like plants growing wild near Bay Minette, Ala., where both parent are common.

27. Moorei, Hort. This artificial hybrid produced, was raised by Moore of Glasnevin, as a cross of S. flavus with S. Drummondii. Pitchers tall, erect, tubular, with strong, rigid green below, crimson margins, and usually with rich crimson posterior throat area; lid crimson, and white-areolate with slightly undulate margin and hispid hairs within. One of S. floridana. Said to be a hybrid of S. Drummondii and S. smithiana. A natural hybrid of similar parentage. G.C. II. 1:702, decr.: 16:44.

28. Patersonii, Hort. A hybrid raised by Patterson, orchidologist of Bridge of Allan, Scotland, and with parents like No. 28.

29. Pöpelii, Hort. Pitchers narrow, erect, with crimson veining around mouth and ovate-acuminate lid; fls. yellowish crimson with crimson bands running between the veins. It seems rarely to be produced in nature, since the former flowers about 3 weeks later.

30. porphyreneus, Hort. Probably a synonym of, and of like parentage with S. Catesbiana, and first exhibited about 1882.

31. Sânders, Nichols. An artificial cross of S. Drummondii var. alb. with S. Cordisana of the former


34. Swainiana, Nichols. Pitchers ascending to suberect, greenish crimson above with crimson veins and whitish areoles, lid coriaceous with slightly biloled apex, similarly colored as extremity of pipe, wing broad in middle tapered toward extremities. According to Nicholson, It is a "handsome and well-marked hybrid between S. variorum (minor) and S. purpurea." 1882.

35. Tolliana, Nichols. Stated to be a hybrid of S. Drummondii var. alb. and S. flavas, but the writer considers it rather to be S. flavus crossed by S. purpurea. So like S. Catesbiana and S. Stevensii.


37. Williamsii, Mast. Of same hybrid origin and aspect as S. Stevensii.

38. Willsii, Nichols. A beautiful but complex cross of S. Courtii (S. purpurea × S. petiolaris) with S. melanorhoda, that is a hybrid of S. Stevensii (S. purpurea × S. flavus) with S. purpurea. It more or less combines characters from all of the 3 species-parents, and is deftly colored of pale green, white, and crimson.

39. Wilsonii, Nichols. Of same hybrid origin as S. Stevensii and others.

40. Wrigleyana, Veitch. Reputed to be a garden cross between S. petiolaris and S. Drummondii or the converse.

J. M. MACPARLANE.

SARSARAPILLA of commerce comes from various species of Smilax. Wild sarasarilla of America is Aralia nudicaulis.

SASKATOON. Fruit of a bush-like species of Amelanchier.

SÁSSAFRAS (Spanish, Salsoafra, Saxifraga; medicinal properties similar to those of Saxifraga were attributed to it by Spanish discoverers). Lauraceae. SÁSSAFRAS. Ornamental trees grown for their handsome foliage assuming beautiful tints in autumn and for their bright-colored fruit.
SASAFAFRAS

Deciduous; lvs. alternate, entire or 3-lobed, slender-petioled; fls. diecious, rarely perfect, spetalous; 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 brown drupe surrounded at the base by the thickened scarlet calyx.—Two species, one in E. N. Amer. and one in China.

The sasafras are handsome trees, with 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 sasafras usually affects 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 sown as soon as ripe; also by suckers, which are often freely produced, and by root-cuttings.


Tzumu, HemsI. (Pseudosasafras Tzumu, Lecomte). Tree, to 100 ft.: lvs. similar in shape to those of the preceding species, 4-8 in. long: fls. perfect, smaller, pubescent inside, with 3 staminodes alternating with the 3 glandular stamens; the staminate fls. with rudimentary pistil: otherwise like the preceding species. Cent. China. H. I. 29:2833.

ALFRED REIDER.

SATUREIA (the old Latin name used by Pliny), also spelled Satureja. Syn., Calamintha. Labiatae. 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 whorls either axillar or in terminal spike-like racemes; calyx campanulate-tubular or tubular, rarely campanulate, 10-13- rarely 15-nerved, 5-toothed, sometimes 2-lipped; corolla-tube short or long, exerted, upper lip flat, entire or emarginate, lower lip expanded, 3-cleft, with flat lobes, the midlobe usually larger and emarginate; stamens 4: nutlets 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: st. suberect, branched, pubescent or villous; lvs. ovate, rather obtuse, rarely narrowed, subterrate, green on both sides; floral lvs. similar, exceeding the fls.: floral whors about 6-fl.d., distant; calyx 3-4 lines long, deeply 13-13triate, hispid; corolla purple-blue, scarcely exceeding the calyx. Eu. Caucasus.—Escaped from cult. in N. Amer.

horténisis, Linn. (Calamintha horténisis, Hort.). Annual, herbaceous, about 6 in. high: st. suberect, branched, pubescent or villous; lvs. ovate, rarely narrowed, subterrate, green on both sides; floral lvs. similar: floral whors laxy somewhat 6-fl.d., in dense interrupted spikes; calyx scabrous-hispid on the nerves; corolla sparsely pubescent outside, scarcely exceeding the calyx. Eu., and widely escaped from cult.

AA. Plants perennial.

b. Les., at least some of them, subrotund.

alpína, Scheele (Calamintha alpína, Lam.). Perennial, diffuse, pubescent or villous: st. much branched and somewhat woody at base, about 6 in. high: lvs. petioled, suberect or ovate, scarcely serratet; floral lvs. sometimes narrower, about equaling the calyx: floral whors 4-6-fl.d.; calyx 4-5-liner, purple, larger, purple, throat strongly dilated. Medit. region.

córísca, Caruel (Thýmus córísca, Pers. Calamintha córísca, Benth.). Subshrub, perennial, small, much-branched, rather glabrous: lvs. scarcely 2 lines long, petioled, suberect, entire, usually glabrous, sometimes pilose; floral lvs. similar: floral whors on flowering branches, 1 or 2; calyx subsessile; corolla light purple. Corsica.

bb. Les. ovate, oblong-linear or spatulate.

montáná, Linn. (Calamintha montáná, Lam. C. officínalis, Moench). Winter Savory. Subshrub, glabrous or slightly scabrous-pubescent: st. 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.d., laxy secund, approximate in a spike or raceme; calyx campanulate, 10-nerved or rarely obscurely 13-nerved; corolla white or purplish. Eu., N. Afr., and widely cult.


S. grandiFlóra, Scheele (S. grandiFlóra, Munch.). Herbaceous perennial: lvs. ovate, serrated; st. decumbent, branching from the base: fls. in axillary whors, quite large, 1½ in. long, with a straight tube; upper lip flattened, purple. June, July.

F. TRACY HUBBARD.
SATYRIUM (Greek, saty; Satyrion was the name given by Dioscorides to one of the orchids). Syn., Diploéthrum. Orchidaceæ. Terrestrial orchids with tuberous roots, some of the species adapted to the warmhouse, others to the coldframe. Tuber undivided: lvs. few, on the lower part of the st., rare in S. saxatile, of the tall st.: lvs. medium, slightly larger, in, often densely fl. crowded; bracts membranaceous or somewhat leafy, 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-concave, galeate or cucullate undivided: caps. erect, oblong, not beaked.—About 125 species. India, Mascarenne Isl., 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, fibrous loam and sand with plenty of drainage. Prop. by division of roots, made as fresh growth is commencing.

cárneum, R. Br. One to 2 ft. high: sts. stout: lvs. 2, radical, subsessile, ovate or orbicular-ovate: scape with pedately parted sepals oblong; fls. 3-8 in. long, dense, many-fl.; fls. large, pink or rose-colored; sepals and petals united at base, oval sepals lanceolate-oblong, obtuse, lateral sepals larger; petals elliptic-oblong; lip eellate. S. Afr. B.M. 1512. G.C. III. 4:697. G.W. 2, pp. 349, 350.

nepalénse, Don. St. 6-30 in. high, usually very stout: 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, concave and strongly keeled on the back. Himalayas to Ceylon and Burma. B.M. 6625. Var. ciliátum, Hook. f. (S. ciliatum, Lindl.), is a small plant with the spurs hardly longer than the sepals. Himalayas.—This species and its variety require greenhouse heat.

sphérocárum, Lindl. About 12-18 in. high: sts. stout: lvs. 2-4, suberect, ovate-oblong or elliptic-oblong, somewhat fleshy: scapes with a few large spathaceous sheaths; spikes 2-8 in. long, dense and many-fl.; bracts oblong or lanceolate; fls. large, white, variously blotched and sometimes suffused with red; sepals and petals united nearly to the middle, lanceolate-oblong, more or less recurved, lateral sepals broader than the other segms., lip eellate, broadly elliptic-oblong. S. Afr. B.M. 7295.

S. aurantiacum, T. & G. Ware, is a species with broad lvs., long and compact fl.-spike and rich orange fls. Probably of garden origin. F. TRACY HUBBARD.

SAUROMATUM (saur, lizard; referring to the spotted flower). Aráceæ. Perennial herbs, with unisexual naked flowers, grown for ornament. Tubers bearing a single petale if. one year, the next year lvs. and fls.: petioles cylindrical, spotted below; blade lanceolate, pedalious, obtuse at the base, short-petioled, pinnately divided: spathes green, at first united, then parted adaxially. Trop. Afr. The following are hardy bulbous-plants, with large and curious fls. The fls. are produced from Jan. until June, and the bulbs have kept well in a dry state for a year. There is little danger of the bulbs shrivelling or rotting. Plant them 6 in. deep in pots or in the garden. Easily managed by the amateur.

guttátmum, Schott. Petioles 3 ft. long, not spotted; fl.-segms. 6-8 in. long, 2-3 in. wide, the lateral smaller: spathe-tube green on the back, 4 in. long, the upper third narrowed; blade 12 in. long, 2 in. wide below, gradually narrowing above, olive-green on the back, yellowish or orange within, with dense, irregular black-purple spots. Himalayas. J.F. 1:12. B.R. 1017 (as Arum venosum).

venésímum, Schott (S. similénum, Schott.). Petioles spotted, 3½ ft. long; fl.-segms. 8-10 in. long, 4 in. wide, the 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 F.S. 13:1354 (both erroneously as S. guttatum).

S. brévispépa, N. E. Br. Petiole up to 15 in. long, rose, the segms. of blade 5-6, 4-6 in. long, narrowly linear-lanceolate, caudate-acminate; spathe shortly stalked, the tube swollen, 1½ in. long, pale yellowish green, faintly rose-spotted, the limb narrow, convolute, twisted, arching, 4-6 in. long, pale greenish, rose red, bright red at the root, adnate to the mouth. In the Himalayas it is 2 ft. high. F.S. 13:1354 (both erroneously as S. guttatum). S. brevipes, N. E. Br. Petiole up to 15 in. long, rose, the segms. of blade 5-6 or 4-6 in. long, narrowly linear-lanceolate, acuminate; spathe shortly stalked, the tube swollen, 1½ in. long, pale yellowish green, faintly rose-spotted, the limb narrow, convolute, twisted, arching, 4-6 in. long, pale greenish, rose red, bright red at the root, adnate to the mouth. In the Himalayas it is 2 ft. high. F.S. 13:1354 (both erroneously as S. guttatum).

JARED G. SMITH.

GEORGE V. NASH.

SAUROPOS (Greek for lizard foot). Euphorbiáceæ. 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 from Africa, Ceylon and the Moluccas. Related to Phyllanthus. S. dibicos, Blume, occurring in many varieties from Ceylon to the Philippines, has edible fr. and has been in cult. in Eu.

J. B. S. NORTON.

SAURÚRUS (Greek, lizard's tail, referring to the curve of the spike of fls.). Saururáceæ. Lizard's Tail. Perennial marsh herbs, suitable for the bog-garden.

Erect: lvs. heart-shaped, converging, ribbed, petioled, without distinct stipules; fls. crowded in a slender-naked pedunculated terminal spike or capitate inflorescence; perianth none; stamens mostly 6 or 7, hypogynous: fr. somewhat fleshy, wrinkled, of 3-4 carpels united at base, indehiscent; seed usually solitary.—Two species, one in N. Amer., the other in Asia.

cérnus, Linn. Lizard's Tail. Fig. 3554. Height 2-3 ft.: lvs. cordate, acuminate: fls. white, fragrant, in a spike which is nodding at the end; bract lanceolate or ovate, standing long, acute, ribbed, as long as the spathe; capsule with 3 seeds; seed papery, involute, indehiscent; plant with tubers. In swamps and shallow water, Conn. to Ont., Minn., Mo., and southward. June-Aug. B.B. 1:1482.

Lourèrî, Deene. (S. chinensis, Hort.). Perennial, from a strong rhizome: sts. stout, 12-16 in. high, round below, angled above: lvs. alternate, petioled, cordate-based, ovate, acute, 4-5 in. long, bright green: spikes cylindrical, 4-5 in. long, axillary in the uppermost lvs., turn yellowish white at the time of flowering; filaments very short. China and Japan. R.H. 1908, p. 395.

F. TRACY HUBBARD.

SAUSSUÈRA (named after Theodor de Saussure, 1767-1845, or for his father, Horace Benoît de Saussure, 1740-1790). Compositæ. Annual, biennial, or perennial, glabrous or tormentose herbs of various habit, sometimes planted in the garden for ornament.
SAVORY. Sweet herbs.

Summer savory (Satureia hortensis of the Labiatae. Cultivated in kitchen-gardens for its aromatic green parts, which are gathered in midsummer for flavoring meat, dressings, and other culinary preparations. The slender, erect, branching, herbaceous stems, 10 to 12 inches tall, bear soft, narrow green leaves and in summer, pink, purplish, white, or crimson flowers, which are followed by brown, ovoid seeds whose vitality lasts three years. Propagation is by means of seed, which is sown in drills 12 to 18 inches apart in April or May in light, mellow, well-drained loam of moderate richness. When 2 to 3 inches tall the plants are thinned to 5 or 6 inches asunder, or for early crop they may be transplanted from seed sown in March.

Winter savory (S. montana) is a hardy European perennial species, having much the qualities of the annual, but with wooly, slender, very branching stems 12 to 16 inches tall, narrow, very acute leaves, white, pink or lilac flowers and brown seeds, whose average vitality is three years. It may be managed like thyme.

M. G. KAINS.

SAXEGÓTLEA (in honor of Prince Albert of Saxony-Coburg-Gotha, consort of Queen Victoria). Tazoea. An evergreen tree, native of Chile, similar in habit and foliage to the yew: monocious, staminate fls. in cylindrical spikes clustered at the end of the branches; pistillate fls. solitary at the end of branchlets: fr. a small stalked irregularly subglabrous cone with the scales terminating in spiny flattened points; seeds ovate, keeled, lustrous, brown. The plant is not hardy in the North and it is doubtful whether it is in cult. in this country; it is of slow growth and has no particular ornamental merit, but botanically it is very interesting. Prop. is by intro. seeds or by cuttings treated like those of taxus; it also may be grafted on taxus or podocarpus. S. congolensis, fr. 60 ft., with drooping branchlets. Lvs. linear or linear-lanceolate, spiny-pedate; at the base abruptly contracted into a short, slender stalk, dark green above, with 2 broad white lines beneath, 1/2 in. long: staminate spikes 1/2 in. long; fr. about 1/2 in. across. J. H. S. 1851, pp. 260, 261. F. S. 7, p. 84. J. C. L., pp. 65, 71. B. H. 6, p. 309 (pl. 75). I. H. 1, pt. 1. G. C. 1884, p. 779. S. gracile, Hort.—Podocarpus nubigena.

ALFRED REHDER.

SAUSSUREA

SAXIFRAGA

SAUSSUREA

SAXIFRAGA (Latin, rock and to break; said by some to refer to the fact that many of the species grow in clfts. of rock, by others to the supposition that certain species would cure stone in the bladder). Including Bergeinia and Peltiphyllum, genera which are maintained as distinct by Engler in his last treatment of the group. Saxifraga is a genus of herbs, mostly perennials, 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 cactiules which are either above or below ground: lvs. commonly clustered at the base. Flowers generally corymbose, free, or nearly so, with the stamens 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 white or yellowish matted woolly: st. 6-12 in. high, hollow, clately, often 4 in. broad at top: lvs. sessile, linear, remote to toothed or runcinate-pinnatifid: heads very many, cylindric; involucre-bracts linear-oblong, shining: achenes narrowly ovoid. Himalayas and China. G.C. III. 51: 85. S. leucodora, Dids. 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. diam. China. G.C. III. 51: suppl. Feb. 10. S. Veitchiana, Drumm. & Hutchins. Herb, 2-3 ft. high, with about 2-5 leafy scapes from a tufted crown: fl.-st. rigid, floccose upward: lvs., the lowest, 10 x 2 in, oblong-linear, green above, loosely hairy below; the upper ovato-lanceolate; bracts blush-pink or purplish: heads nearly ovoid, over 1 in.; florets deep purple. China. B. M. 8381. G.C. III. 40: 55.

F. TRACY HUBBARD.
tions of them. The following account has attempted to include those species which are in more general cultivation, although there are numerous others which occur in some of the collections, and it includes the better known hybrids and certain seedlings. A large part of these species are either very rare or lacking in American gardens.

They have been modified to any extent under domestication.

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INDEX.
Section I. BERGENIA (Megasia).

A. Margin of f. not ciliate; but more or less undulate or crenate: lvs. not pubescent.
B. Scope and infl. glabrous.
C. Lvs. orbiculate-cordate.
   1. cordifolia
   2. crassifolia
   3. purpurascens

AA. Margin of f. ciliate; lvs. sometimes pubescent.
   A. Base of f. distinctly cordate although narrow; calyx glabrous.
   B. Base of f. usually narrowed to the petiole; calyx pubescent or at least pubescent.

5. Strachyi

1. cordifolia, Haw. (Megasia cordifolia, Haw. Bergenia cordifolia, Sternb.). Twelve to 20 in. high, robust: lvs. orbiculate-cordate, broad and fleshy, margin undulate-serrate, glabrous, shining; petioles long and thick; infl. a short, thick, angled, shiny scape; fls. clear rose, in dense nodding cymes partly hidden in the lvs.; pedicels short and thick; calyx-lobes short and broad; petals roundish. March–May. Siberia. Gn.M.3:136.—Closely allied to S. crassifolia but differing in the broader cordate-based lvs. and in the rounder petals. Var. álba, Hort. (Megasia cordifolia var. álba, Hort.). Fls. delicate blush-pink, not true white. Var. grandiflóra, Hort. Said to be usually handsome in lf. and fl. Var. purpurea, Hort. (S. purpurea, Megasia cordifolia var. purpurea, Hort.). Lvs. smooth and coarsely serrate, the panicles larger than the type and carried well above the lvs.; petals broad, rounded, and deep reddish purple. Var. rósea, Hort. (Megasia cordifolia var. rósea, Hort.) has been offered.

2. crassifolia, Linn. (S. cuneafolia, Hort., not Linn. S. sibirica, Hort., not Linn. Megasia crassifolia, Haw. Bergenia crassifolia, Fritsch). Fig. 3555. Six to 16 in. high, stout: rhizomes woody: lvs. oblong to long-oblanceolate, large and thick, narrowed at the base and decurrent on the petiole, margin serrate to nearly entire, apex obtuse, glabrous, shining; infl. a fairly tall, angled, reddish or purplish scape: fls. deep rose, lilac or purplish, in dense panicles, elevated above the lvs.; calyx-lobes oblong, obtuse; petals elliptic-oblong. March–May. Altai to Mongolia. 196. G. M. 34:67. Mn. 10, p. 74.—S. Van Houtt., Hort. is only a variation of this species, with lighter pink fls. Var. orbiculáris, Hort. (S. orbiculáris, Hort. Bergenia orbiculáris, Stein. Megasia orbiculáris, Hort.). A small-growing form with broad rather rounded lvs., a branching habit and an abundance of light rosy fls. which are born well above the foliage.


Not perfectly hardy at Boston. Sometimes erroneously written S. ligulátá which is a very different species (No. 67). —S. órrúla, Decne. (Bergenia órrúla, Stein), is said to have large coriaceous, persistent lvs., fleshy sts., and large rose fls. in cymes. Apparently does not possess any character to distinguish it from S. ligulátá except the 3 fls. in a shade lighter in color. Var. ciliátá, Hook. (S. ciliátá, Royle. S. thysanódés, Lindl. S. Strachýi var. thysanódés, Hort. Megasia ciliátá, Haw. M. ligulátá var. ciliátá, Hort. Bergenia ciliátá, Stein). Lvs. hirsute on both surfaces, margins strongly ciliolate. B.M. 4915. B.R. 32:33 (as S. thysanódés). G.C. III. 5:365. F.E. 16:472. Var. Leichtlinii, Hort. (S. Leichtlinii, Hort. Megasia Leichtlinii, Hort.). Grows about 1 ft. high and has large crimson, rose-colored fls. Var. rósea, Hort., is a form with rose-colored fls. Var. rúbra, Hort., is an early-flowering, low form with red or red-purple fls. Var. spéciósá, Hort. (S. spéciósá, Hort., not Doerfl. & Hâyek. Megasia spéciósá, Hort.). Lvs. broadly ovate, leathery; fls. crimson or deep rose. Glob. 71 p. 250. J.H. III. 60:393.—By some this is thought to be a garden hybrid S. ligulátá x S. crassifolia.


Section II. Cymbalária.

A. Lower lvs. 7–11-lobed; the lobes acute...
B. Lower lvs. 6–7-lobed; the lobes obtuse or very shortly apiculate...

6. Cymbalária, Linn. Annual or biennial: stts. nearly erect or somewhat flexuous, branched, 3–12 in. high: lvs. tender, with age brown-striate on both surfaces; margin glandular-pilose; lower lvs. reniform, ciliate or truncate at base, 7–11-lobed, lobes broad-acuminate; upper lvs. short-petiolated, 3–7-lobed, base attenuate; infl. linear, with elongated axis; pedicels long, 1-flld., these and the calyx short glandular-pilose: fls. yellow; calyx-lobes oblong, acute; petals oblong, base cordate, distinctly clawed, 3 times the length of the calyx-lobes. May–Aug. Caucasus and Asia Minor.

The lvs. are light green, glossy and ivy-like. It sows itself
abundantly and is suitable for moist spots in rockwork or along streams. Some, possibly much of the material, as *S. Cymbalaria* is really the closely allied *S. Heyduana*.

7. *Huetiæ*, Boiss., frequently incorrectly offered as *Huetia*, *Huetiæ*, and *Huettii* (*S. Cymbalaria*, Hort., not Linn.). Annual or biennial(?): sts. weakly erect or decumbent, flaccid, 4-6 in. high; Ivs. soft, with age brown-striate below; lower Ivs. reniform-cordate, base cordate or truncate, broader across, 5-7-lobed, lobes broad, obtuse or very shortly apiculate; 3-lobed or entire, ovate: infl. in cyme with long erect pedicels; fls. small but numerous, bright yellow; calyx-lobes triangular, acute; petals oblong, obtuse, base distinctly clawed, 3 times the length of the calyx-lobes. May-Aug. Asia Minor.—Very closely allied to *S. Cymbalaria* and by some considered a variety of that species. It differs in its dwarfer less upright habit, fewer and more obtuse lobes of the lvs. and other technical floral characters and probably in its infl. being a cinnumins instead of a bostryx. A very effective plant for the rockwork.

Section III. Miscopetalum.

A. **Rhizome rather thick**: Ivs. unenely and coarsely crenate or dentate

8. *rotundifolia*, Linn. Sts. 8-12 in. high, erect from a somewhat thickened rhizome, leafy and paniculate from the middle or above: Ivs. rather thick, more or less hairy on both surfaces; basal and lower on petioles 3-4 times longer than the blades, reniform or orbicular, base cordate, unequally and coarsely crenate or dentate; cauline almost sessile, base obtuse or cuneate, with more or less incise-dentate lobes; infl. a branched panicle with long, slender glandular-hirsute peduncle and pedicels; fls. white, spotted with red or purple; calyx-tube very short, lobes triangular oblong, acute; petals oblong-lanceolate. May, June. Eu. and Asia B.M. 424.—A very satisfactory species for moist and shady parts of the rockwork. Var. **glandulosa**, GrieB. (S. glandulosa, Hort. S. laniofila, Schott. S. anguibus, Schott. S. rotundifolia var. angulosa, Hort.). Sts. tall, glandular-pubescent: basal Ivs. obtusely crenate; the cauline Ivs. incise-dentate: the panicule branches spread out and many-flowered.

9. *tagyæta*, Boiss. & Heldr. (S. rotundifolia var. tagyæta, Engl.). Sts. 3-6 in. high, erect from a slender rhizome, almost naked, pubescent: Ivs. small, firm, sparse hirsute, slightly membranaceous-margined; the radical Ivs. long-petioled, sub-cordate-reniform, broadly and obtusely 5-9-crenate; the cauline Ivs. none or 1 or 2 minute ones which are 3-parted or linear: infl. loosely, paniculate-corymbose; the branches 1-2-flowered: fls. white with purple dots; calyx-lobes oblong, rather obtuse; petals elliptical-lanceolate, obtuse. June-Aug. Greece.—Much of the material cult. under this name is really *S. cuneifolia*.

Section IV. Tridactylites.

10. *adscendens*, Linn. (Muscoria ascedens, Small). One to 6 in. high, the whole plant viscidulous and clothed with short glandular hairs: sts. erect: the basal lvs. crowded, the cauline few, cuneate, gradually attenuate all the way to the base, the apex rounded or truncate, 3-5-lobed, the lobes subequal, oblong or oval, rather obtuse or acutish: infl. corymbose, sparingly branched from the middle or base of the fl.-st. branches erect; fls. white; calyx glandular-pilose, tube campanulate, in fr. rounded at the base and twice as long as the lobes; petals cuneate, emarginate, slightly 5-nerved, double as long as the calyx-lobes. June, 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. Nepophyllum.

A. **Basal lvs. cuneate or spatulate**

11. *lactea*, Turez. Cespitose, 4-6 in. high; sts. erect, glandular-pubescent below, paniculate 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-flowered, 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 as long as 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, palmately 3-7-lobed, lobes obtuse, petioles 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 obovate, 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. Dactyloloides (Muscaria).

A. **Lower lvs. undivided or short 3-5-pointed; petals mostly small** (see also *S. moschata* and *S. globulifera*, which have some of the lvs. undivided).

B. **Plants loosely cespitose, with indeterminate secondary shoots borne in the U.-axile**.

3556. Saxifraga Stracheyi, as the flowers are appearing in earliest spring. (X⅔)
SAXIFRAGA

23. saxifraga

**h. Divisions of the lvs.**

more or less acute...

31. decipiens

**III. Divisions of the lvs.**

more or less obtuse...

32. cespitosa

**ee. Axils of the lvs. of the secondary**

shoots with buds of undeveloped cataphylla.

**f. Calyx-lobes micranate.**

**g. Lvs. undivided and sex-**

side...

26. conifera

**ga. Lvs. 3-lobed and petiolate.**

27. hypnoides

**ff. Calyx-lobes obtuse.**

**a. The lvs. all undivided...**

28. spathulata

**gg. The lvs. (the lowest excepted) lobed.**

**h. Calyx-lobes ovate-triangular, about equal-**

ing the length of the tube...

29. globulifera

**ii. Calyx-lobes ligulate-lanceolate, twice the**

length of the tube...

30. Mawean

**Subsection Holophyllae.**

14. tenella, Wulf. Lax, cespitose, 2-4 in. high, with foliose, prostrate or erect caudices; sts. erect, slender, glabrous; lvs. yellow- or apple-green, shining, thin but rather stiff, lower and also cauleine, linear-subulate, cuspidate-aristate, margin setulose-ciliate or glabrous, glandelose-ciliate toward the base; infl. terminal, few-fld. panicles 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. lepophylla, Froel.). Loosely cespitose, about 1 in. high with numerous sparsely foliote caudices with rosettes at the top; sts. sparsely glandular-pilose: lvs. light green, rather thin, entire or 3-5-cuspicate, 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. Mounatins of Eu.

16. muscoïdes, All. Densely cespitose, 1-2 in. high, with short caudices; sts. columnar, densely imbricate-foliate, ashy pilose; lvs. linear, rounded-obtuse, base attenuate, when dried 3-nerved, apex cuneate-clawed. Infl. numerous, terminal, few-fl. racemes or more seldom several-fl. panicles with very short pedicels: fls. white or yellowish white (rarely citron-yellow or purple); calyx-lobes ovate, obtuse; petals round-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. 115—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. folis-varie- gata, 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 dried 5-11-nerved, margin ciliate, at the top glandulose-ciliate; cauleine lvs. oblong-lanceolate: infl. numerous, almost naked, sparsely glandular, 1-3-fl., rarely 5-fl. scapes: 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.
Subsection AXILLIFLOE

18. ajugifolia, Linn., also spelled ajugazolia. Cespite, about 3-6 in. high: st. decumbent, rooting: Ivs. sparsely glandular-pilose, light green, rather thick and fleshy, orbiculate-digitate, 3-5-parted, attenuate to the flat petiole, lobes lanceolate, acute: infl. 1-5 slender, nearly simple, few-fld. scape arising from the axis of the lower Ivs.; bracts linear, entire, acute; pedicels very short, puberulent: Ivs. 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. Cespite, 1½–3 in. high: st. procumbent: Ivs. rather thick, bright green, the lower surface striped 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, mucutious, faintly 3-nerved: infl. a solitary, axillary, sub-simple, few-fld. scape with a reddish base and one partially clasping lf.; bracts 3-parted or entire: Ivs. 1-5, 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. geranoides, Linn. (S. palmata, Hort., not Smith and others). Biennal or perennial, cespite, 2-10 in. high, with numerous frutescent subwoody, leafy caudices: st. erect, somewhat pilose: Ivs. bright green, lower rather pilose, suborbicular or reniform, palmately 5-divided, with the lateral lobes bifid, lobes lanceolate-acute or 2-3-toothed, base of the ciliate petiole dilute; cauline Ivs. cuneate-ovate with narrow lobes: infl. sub-corymbose, many-fld., with pedicels shorter than the lvs.: fl. 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.). Cespite, 2–8 in. high, with frutescent, subwoody, leafy caulices: st. erect, rather stiff, puberulent: lvs. fresh green, the lower with ovate and pedate-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 Ivs. 3-5-lobed; bracts narrowly oblong, or mucronate: infl. sub-corymbose, the peduncles much overtopping the lvs., the pedicels and calyx glandular-pilose: Ivs. 3-9 on a peduncle, campanulate, white; calyx-lobes erect, lanceolate, acute; petals obovate-oblong, 5-7-nerved, long-clawed, 2 or 3 times longer than the calyx-lobes. June. S. Eu.—Closely allied to S. pavonina 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. Wallackii, McNab. S. wallacea, Hort.). Fig. 3557. Perennial, loosely cespite, 3-6 in. high, with slightly shrubby caulices covered with old retroflex lvs.: fl.-sts. erect, reddish, entirely glabrous: lvs. stiff, dark green, shiny, those of the young shoots and the lower ones incise-3-lobed, more than double the length of the strongly broadened, termed petiole and having decidedly prominent nerves, the lateral lobes of the blade sub-3-divided, the teeth and the teeth mucronulate, the midlobe usually entire, linear and mucronate; cauline lvs. cuneate, attenuate to the petiole, more obtusely dentate; bracts spatulate-acute: infl. terminal, 6-10-fld., more or less congested corymb or panicles: lfs. large, ½ in. across, subcampanulate, white; calyx-lobes suborbicular, rounded-obovate, shortly clawed, 3-nerved. May–July. Spain. B.M. 6640. G. 35, p. 392; 75, p. 335. A.F. 4:493. G. M. 43:192; 55:276; 57:620. J. H. III. 1970:290.—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 caulices which are covered below with old, rather remote lvs., and terminate in rosettes: fl.-sts. 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 lateral ones 2-3-lobed, with the lobes burred and mucronate at their apex; cauline lvs. 3-parted; bracts linear, mucronate: infl. corymbose-paniculate: fl. 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. Compositi 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 caulices covered with old reflexed lvs.: fl.-sts. erect, glabrous: lvs. dark gray-green, viscid, twice as long as the petioles, palmately 3-parted, nerved, the lateral lobes of the blade sub-3-divided, the midlobe cuneate, 3-toothed, with the teeth mucronulate; cauline lvs. few, shorter-petioled, 3-parted; bracts linear, acute: infl. loosely paniculate; pedicels long: lfs. milk-white, numerous; calyx glabrous, the lobes lanceolate, acute; petals obovate-oblong, 3-nerved, nearly 3 times the length of the calyx-lobes: fr. ovate. May. Spain. G. C. III. 4973. F. E. 18:442.—A quick grower, very frequently cult. abroad and which is also useful for pot cult. Var. ceratophylla, Hort. (S. ceratophylly, Dry.). Lvs. rigid and more deeply parted than the type and rather glaucous: fls. white, in lax panicles. June. Spain. B.M. 1651.

25. pedemontana, All. Sparsely glandular-pubescent, cespite, 2-4 in. high, with densely leafy caulices: lvs. bright green, those of the young shoots and the lower cauline, cuneate or obliquely triangular, attenuate to the flat ciliate petiole which equals or is shorter than the 3-lobed blade, lobes horizontally spreading, the lateral ones bifid or all 3 incise-dentate, teeth obtuse or rather acute, obliquely nerved; lower bracts cuneate, sessile, 5-7-parted or linear-oblong, obtuse: infl. few-fld., rather glabrous; pedicels with slender pedicels which are glandular-pubescent as is the calyx: lfs. large, campanulate, milk-white; calyx-lobes linear, obtuse; petals obovate-cuneate, attenuate to a claw, 3-nerved, double the length of the calyx-lobes. July. Mountains of S. Eu. Gn. 78, p. 271. Var. cervicornis, Engl. (S. cervicornis, Viv.). Young lvs. longer-petioled, the blade 3-lobed; the lateral lobes bifid, less horizontally spreading, rather acute, the nerves decidedly prominent: the calyx-lobes rather acute. June. Sardinia and Corsica. Gn. 76, p. 19; 79, p. 29.
26. conifera, Coss. & Dür. Densely cespitose, 1/2–3 in. high, with numerous short, densely imbricate-foliose caulescences; fl.-sts. stiff, ascending, few-lvd., purple below, densely glandular-pubescent above: lvs., those of the caulescences, subpatent; cauleine erect-spreading; all of them undivided, sessile, oblong- or lanceolate-linear, cuspidate-aristate, leathery, margin short-ciliate: infl. 3–9-flld., coryophium-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. hibridica, Hort.). Perennial, loosely cespitose, 1 1/2–8 in. high, with herbaceous loosely foliose caulescences which are frequently reddish tinted; sts. erect, covered with very slender glands: lvs. light green, those of the caulieides rather thick, sparsely covered with slender hairs, when old rather glabrous, the subicular blade is cut all the way to the base, 3-lobed, and is borne on a rather broad, flat, 1-nerved, ciliate 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, at base to it the long petiole, the uppermost linear-lanceolate; cauline lvs. at the base are linear-lanceolate, ciliate and acute or mucronate: infl. 3–7-flld. panicles: fls. long-pedicelled, white, 1 3/4–1 in. diam.; calyx very densely glabulous, the lobes oblong-triangular, mucronate; petals obovate, 3-nerved, twice longer than calyx-lobes; fr. ovate-globose. May. July. Mich. as far north as Great Britain and Ireland. G.C. III. 43:302.—Frequently confused with S. cespitosa, Linn., and S. decipiens, Ehrl., and the varieties of the 3 species are almost hopelessly confused. Botanically speaking very probably Hooker in his Students' Flora of the British Islands, ed. 3, p. 122, 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. gemmifera, Hort. (S. Kingii, Hort., also spelled Kingiana), is a close-growing, compact form. Var. purpurea, Hort., is offered in the trade. Var. rosea, Hort., is offered in the trade. Var. Whitlevii, Hort. (S. Whitlevii, Hort.), is a form with closely packed foliage said to be sterile for edges. A variation of this is offered as S. Whitlevii compacta.

28. spatulata, Desf., also spelled spatulata. Perennial, very densely cespitose, 2 1/2–4 in. high, with short, prostrate, very densely imbricate-foliose caulieides; sts. slender, erect, few-lvd.: lower lvs. spatulate, ciliate, apex obtuse, rarely 3-toothed, 3-nerved; cauleine: infl. 3–5-flld. coryophium panicles with pedicels longer than the fls. and sparsely glabulamid as is the calyx: fls. white; calyx-lobes oblong, ciliate, obtuse; petals obovate-oblong, twice as long as the calyx-lobes: fr. subglobose. June. 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 shoots dotted through. Not very showy, as the pedicels are few-flld.

29. globulifera, Desf. Cespitose, about 3–4 in. high, with densely foliate, short caulieides: sts. prostrate, nearly glabrous or sparsely pilose, few-lvd.: lvs. bearing in their axis buds which are shorter than the lvs.; lvs. all nerved and borne on dilated rather flat petioles; the lowest spatulate-cuneate, entire; the others 3-lobed or, if the lateral lobes are bifid, 5-lobed, the midlobe oblong-lanceolate or, if all the lobes are tridentate, with the teeth rather acute; cauline lvs. oblong-linear, obtuse: bracts linear, obtuse: infl. 3–7-flld., subcoryophium-panicled; pedicels twice or more longer than the fls.: fls. white; calyx short-pilose, the lobes ovate-triangular, obtuse; petals obovate, 3-nerved, more than the length of the calyx-lobes: fr. subglobose. May, June. S. Spain and N. Afr.

30. Mavehna, 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, corolla-reinforced, terminal, or axillary, 2–3-fld.: infl. laxly coryophium, 4–9-flld., borne on densely puberulent peduncles: fls. white, large; calyx-lobes oblong-lanceolate, subacute, twice as long as the densely puberulent tube; petals ovate-cuneate. May. Morocco. G.C. 1871: 1355.

Subsection Cespitosa.

31. decipiens, Ehrl. (S. cespitosa, Hort., not Linn.). Cespitose, about 3 in. high, the caulieides herbaceous, rarely subglabrous, rather long and leafy: sts. erect, few-lvd., smooth or at first glandular-pilos above: lvs. puberulent-cuneate or spatulate, attenuate to the 1-nerved, flat petiole, the apex either 3-pointed or 5-lobed, lateral lobes 2- or 3-lobed or even the middle 3-lobed, the lobes oblong acute; cauleine lvs. deeply 3-lobed: infl. loosely panicked, few-flld. (usually 3): fls. white; sepals oblong-lanceolate, subacute; petals obovate, 3-veined. May. June. Eu. L.B.C. 16:1510. G. 78, p. 271.—Approaches S. cespitosa, Linn., from which it is most easily distinguished by the acute fl.-lobes and subacute sepals; 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. baleiensis, Hort. (S. baleiensis, Hort. S. muscoides var. baleiensis, Hort.). A rapid grower, 10–14 in. high, with stout branching sts. bearing large scarlet-crimson fls. Var. britiolacina, Hort. Fls. bright crimson. Var. Clbranii, Hort. (S. Clbranii, Hort. S. muscoides var. Clbranii, Hort.). A plant of robust constitution, increasing rapidly and flowering freely; the foliage consisting of closely set rosettes of grass-green color: fl.-sts. 5–6 in. high, bearing fls. which are variously 3-lobed as deep crimson; petals white, the middle blackish crimson, ½ in. or more diam. G.C. III. 45:301. G. 36:305. G. 73, p. 264. J. H. III 58:431. Var. grandiflora, Hort., is a free-growing plant 6–8 in. high with good-sized fls. of a rich red fading to pink. Very similar to var. baleiensis. Var. grandflora, Engl. (S. cespitosa var. grandflora, Hort.). Densely cespitose, with few-lvd., few-fl.-sts. and broadly cuneate, palately 3–5-divided lvs.; the lobes ovate-lanceolate, acute. Ireland, Scotland, Wales, Norway, Iceland, Greenland, and Lab.

Var. hybrida, Hort., is probably a strain of red-flld. hybrids. It is suggested by one author that they are the result of a cross between S. decipiens and S. granulata. Some of the trade names of these variants are S. decipiens hybrida grandiflora, Hort. (S. decipiens grandiflora hybrida, Hort. S. hybrida grandiflora, Hort.), with large rich crimson or bright red fls. S. hybrida grandiflora alba, Hort., with neat cushions of dark green foliage and large pure white fls. resembling those of S. Burseriana var. gloria. S. rosea superba, Hort., which is said to be a remarkably effective variety with rich rosy red flowers. S. hybrida splendens, Hort., with rossettes 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 red saxifrages. It is said to form compact basal tufts with bright red fls., fading to rose, nearly 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. Stérbbergii, Eng.; (S. Stérbbergii, Willd. S. kitaibeli, Haw. not Stérbh., S. hypnoides var. Stérbbergii, 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. villásba, Eng., is a form which is villous and canescent and has white fls.

92. cespitosa, Linn., more commonly spelled cespitosa (Muscari cespitosa, L.), Cespitose. 2-6 in. high, a robust grower with short, more or less densely foliose caudicles: sts. few, few-lvd., densely glandular above: lvs. of the caudicles deep green, smooth, nearly glabrous, either cuneate, attenuate to the petiole, the apex 3-toothed, or obovate-cuneate, attenuate to a petiole double the length of the blade, 3-parted (rarely 5) lobes linear and obtuse: infl. terminal, 1-3-fls.; fl.-sts. stoutish: fls. white; sepal oblong-deltoid, obtuse; petals narrowly obovate or oblong-obovate, rounded at the apex. June–Aug. N. Eu., N. Asia, and N. Amer., Scotland, and Lab., the Rocky Mts. of N. U. S. and Canada to the Pacific coast, south there to Wash. and Ore. Gn. 70, p. 283.—Probably the true S. cespitosa is rare in cult. Var. hirta, Hort. (S. hypnoides var. hirta, Hort.). A distinct form with very hairy lvs. giving it quite a white, woolly appearance. Var. incurvifolia, Groves (S. incurvifolia, D. Don), has the cauline lvs. more numerous with incurved lobes. Mountains of Scotland, Wales, and Ireland.

Subsection EXARATAE.

33. exarata, Vill. Fig. 3558. Cespitose, 3–6 in. high, with subnigroen and also herbaeous caudicles which are rosulate at their tips: fl.-sts. erect, few-lvd., soft hirsute below, mixed with slender glandular hairs above: lvs. of the caudicles cuneate, sessile or petiolate, 3-lobed, the midlobe oblong-obtuse, the lateral either undivided or 2-parted, rather acute; lvs. of the young shoots 3-divided or lanceolate undivided; cauline lvs. 3-parted; bracts lanceolate: infl. paniculate, 4–10-fl.; the pedicels and calyx short-glandular: fls. usually white or yellowish white but sometimes rose or purple; calyx-lobes obtuse or subacute; petals obovate or obovate-oblong, 3-nerved, double the length of the calyx-lobes. June, July. Alpine regions of Eu., Pyrenees to Greece. G.M. 54:555.—A variable species not commonly cult.

34. obscura, Gren. & Godr. Cespitose, 3–8 in. high, with somewhat shrubby, elongated caudicles covered with bright red fls., mixed with rather slender glandular pilose: lvs., those of the shoots and the lower, pedate-divided, with lanceolate lobes, linear, long-petioled, broadened at base, lateral lobes bifid or 2-toothed, teeth lanceolate, the midlobe 3-parted; cauline lvs. 3-5-parted: infl. 5-15-fl., 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 nervet, 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; cauline lvs. obovate-cuneate, 3-lobed; bracts oblong, obtuse: infl. corymbose-paniculate: fls. 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. iratiâna, Eng. (S. iratiâna, 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-fl., narrow panicle and also in having the white fls. veined with purple. May–July. Pyrenees.—The variety is more common in cult.

Subsection MOSCHÂTE.

36. moschâta, Wulf. (S. muscoides, Hort., not All. S. muscoides var. moschâta, Hort.) Cespitose, 1–5 in. high, the caudicles herbaceous or subnigroen, foliose: lvs. smooth, nerves not prominent, glabrous or glandular-pilose; those of the caudicles linear, entire, obtuse or cuneate, 3-, rarely 5-parted, lobes linear, obtuse, horizontally spreading; cauline lvs. few, 3-lobed or entire; bracts linear, obtuse: infl. racemose or paniculate, 1–10-fl., borne on erect, few-lvd., 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, obovate, 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. moschâta is readily separated from the true S. muscoides by the lobed lvs.; those of the latter are unlobed and linear. A very variable species; some of the varieties in cult. are: Var. Alliôni, Engl. (S. Alliôni, Gaud., not Baumg. S. muscoides var.
SAXIFRAGA

SAXIFRAGA

38. **bryophora** Gray (Spatulária bryophora, Small). Two to 8 in. high: slender: lvs. 1 in. or less long, basal rather far apart, rostrate at the top of the slender caudicles, oblong-elliptic to oblongate, obtuse, entire, ciliate: infl. solitary or tufted naked scapes, paniculately branched, the branches erect-spreading, 1-fl.d at the end of the main st.; pedicels drooping: fls. white; sepals oblong to ovate; petals unequal, the 3 upper ovate with 2 spots at their corolla base, the 2 lower ovate, with abruptly narrowed base. Sierra Nevada Mts., Calif.—At one time offered by dealers in native plants.

39. **davurica**, Pall., also spelled dahurica (Micranthes davurica, Small). Three to 8 in. high: rhizome thick: lvs. basal, rather stiff, forming a rosette, sparsely covered with very many small, hairy, obovate-cuneate, rounded at the apex, deeply and evenly dentate, teeth ovate, acute, blades cuneate-attenuate at the base to thalliotic; petals whitish, which is meaningless description, base; bracts oblong-lanceolate, the lowest of them oblong-cuneate: infl. erect naked scapes, which are solitary or several together, and are covered with very slender canescent, partly glandular hairs, many-fl.d. and corymbose-panicle branched from the middle; pedicels filiform: fls. white, numerous; sepals yellowish, ovate, rather acute, erect-spreading and not reflexed in age; petals oblong-oblong, scarcely twice as long than the sepals. E. Siberia and the islands of Bering Sea.—Much of the so-called American S. davurica and apparently more or less of the material cult., as S. dahurica is really S. Lyallii from which it differs in having the peduncles hairy instead of glabrous and many- instead of few-fl.d, smaller fls. and other characters. Somewhat similar to S. virginissima.

40. **Lyallii**, Engl. (S. davurica, Lyall. Micranthes Lyallii, Small). Four to 15 in. high: rhizome slender: lvs. fresh green, obovate ("flabellate, varying to suborbicular or reniform-flabellate"), cuneate, attenuate to a basally dilated petiole, equally serrat-dentate above, glabrous, almost nervously ciliate: infl. panicle-like, the pedicel scapes which are naked, slender, erect, almost glabrous, with very slender, erect-spreading later erect pedicels which are purple almost glabrous: fls. milky-white; calyx purple, the sepal ovate-triangular, reflexed; petals oblong-rotund, slightly clawed, 1-nerved. Rocky Mt. region, Brit. Col., Alaska, and Bering Sea region.—Has been confused with S. davurica, Pall., which see.

41. **micranthidifolia**, Steud. (S. erøea, Pursh. Micranthes micranthidifolia, Small). Up to 3 ft. high: lvs. all basal, oblong or oblongate, obtuse, attenuate to a flat petiole which is partly clasping at the base, crosse-dentate, sparsely and also very shortly pilose, margin short-ciliate: infl. panicle, loosely fl.d and elongated, borne on a tall softly pilose scape; pedicels filiform, densely covered with slender glandular hairs, viscid: fls. numerous, white; sepals linear-lanceolate, obtuse, finally reflexed; petals oval, 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.—Occasional in cult.

42. **pennsylvánica**, Linn. (Micranthes pennsylvánica, Hw.). SWAMP SAXIFRAGE. Tall and stout, up to 3 ft. or more high, viscid pubescent: rhizome thick: lvs. all narrowly dentate, upper ones nearly entire: infl. 1 or more scapes arising from the axils of the basal lvs. and branching panicle from the middle, with the branches more or less diffuse; pedicels slender: fls. white, numerous and star-like; sepals lanceolate; petals unequal, the 3 larger ones with 2 light yellow spots at their corolla base, the 3 lower ovate, the 2 lower ovate, with abruptly narrowed base. Mountains of Va. to N. C. and Ga. L.B.C. 16:1588. B.M. 2929. B.B. 2:176; (ed. 2) 2:221 (as Hydratica petiolaris).

37. **leucanéthifólia**, Michx. (S. Michauxii, Brit. Spatulária petólóris, Small). Five to 15 or more in. high: lvs. short-petioled: lvs. short-petioled: lvs. short-petioled: lvs. short-petioled: lvs. short-petioled, the basal fleshy, bright green, long-spatulate, cuneate-attenuate to the margined petiole, coarsely dentate, the teeth equal and acute; lower bracts linear-lanceolate,

Section VII. **Boraphila** (Spatulária, Micranthes).

A. Petals lanceolate, clawed, usually somewhat unlike.

B. Inf. without bubbles: fls. numerous.

BB. Inf. with bubbles: fls. solitary at the end of the main st.

CC. Petals oblongobovate-rotundate, about alike.

B. Lvs. more or less spatulate, ovate, or obovate.

C. The lvs. thin and herbaceous.

D. Lf.-blades about as broad as long.

E. Inf. many-fl.d., corymbose-pauciflor: sepals not reflexed.

F. Inf. few-fl.d., loosely paniculate: sepals reflexed.

G. Lf.-blades elongated.

H. The lvs. thick, leathery.

I. Blades of lvs. elongated or elongate-cuneate.

E. Margins of the oblong-ovate or oblong-spatulate lvs. remotely short-dentate: petals oblong-linear or linear-lanceolate.

F. Margins of the oblate-oblong or oblong-spatulate lvs. entirely or slightly sinate: petals obovate.

G. Cymules compact or closely corymbose-like at maturity: lvs. roundish ovate.

H. Cymules open and often racemose-like at maturity: lvs. ovate, oblongate or spatulate.

I. Lvs. remi-nervous, suberect-oblong.

C. Bulbs lacking in the axils of the basal lvs.

CC. Bulbs present in the axils of the basal lvs.
basal, sometimes almost 1 ft. long, oblongate or oblong-spatulate, attenuate to a short petiole which is half clasping at the base, obtuse, very shortly and also remotely dentate, margin pubescent: petioles cylin- drical, nearly as long. 8-cleft at first clustered, borne on a naked erect scape which is few-straitle, slightly pilose, toward the top glandulose-pilose: fls. numerous, small, greenish; calyx-lobes deltoid, spreading, in fr. reflex; petals oblong-linear or linear-lanceolate, 1-nerved, a little longer and narrower than the calyx-lobes. June, July. Scapose to a low mound. Maine to Ont. and Minn., south to Va. and Mo. B.B. 2: 173; (ed. 2) 2: 219.—Recommended as a bog-plant.

43. integrifolia, Hook. (Micranthes 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, submembraneous, ovate-oblong, very obtuse, entire or very slightly sinuate-crenate, base spatulate: inf. paniculate, more or less loosely so or spike-like, borne on an erect naked scape: fls. white, small; calyx rather glabrous, the lobes ovate, obtuse, spreading, at length reflex; petals obvolute, slightly emarginate, 1-nerved, a little longer than the calyx-lobes. Calif. northward and in the Rocky Mts.—Occasionally offered by dealers in native plants.

44. nivalis, Linn. Two to 6 in. high: rhizome rather terete, short and simple but thick and hard, crowned with a tuft of lvs.: lvs. rather thick and leathery, roundish-obovate, generally abruptly narrowed to the peti- oles, obtuse, sharply crenate-serrate, upper surface dark green, under surface purple or red and often pubescent; bracteoles in a large paniculate inflorescence of cymose and 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 a claw-like base or scarcely so. June, July. Circum- boreal, including N. Great Britain. B.B. 2: 174; (ed. 2) 2: 218 (as Micranthes nivalis).

45. virgininensis, Michx. (Micranthes virgininensis, Small). Low, viscid-pubescent plant, 3–12 in. high (occasionally taller): lvs. rosetulate, thickish, ovate, obvolute or spatulate, narrowed into a broad petiole, both surfaces glabrous or the upper short-pilose and the lower pubescent; fls. in a few subterminal cymes, close at first, becoming loose and paniculate, which is borne on a hirsute and glandular-soft-pilose scape: fls. white, small, few or many; sepals ovate, mostly obtuse; petals obovate-oblong, double the length of the sepals: fr. ovate, the follicles united merely at base, purplish. April–June. Common on rocks and dry hillsides. New Brunswick, Minn., south to Ga., Mo., and Tenn. B.M. 1664. L.B.C. 17: 1699. B.B. 2: 174; (ed. 2) 2: 218.—A very attractive spring-blooming plant for partially shaded spots in the wild-garden or rockery. Var. fibre-pleno, Hort., is a double-flowered form.

46. punctata, Linn. (S. arguta, Don. S. setivialis, Fassb. & Mey. Micranthes punctata, Small. M. setivialis, Small). Six to 18 in. high: rhizome rather stout and woody: lvs. forming a basal rosette, dark green, reniform to suborbicular, equally and strongly dentate or crenate, with long almost filiform, channeled petioles: infl. a terminal, many-flowered, crowded or loose pilose which is borne on the solitary, erect or ascending naked scape: fls. white, not purplish, rather acute and reflexed; petals obovate or oblong, twice as long as the sepals. Asia, W. N. Amer., and in the Rocky Mts.—A variable species, the American representatives of which have been separated as S. arguta and S. setivialis, but the differences seem too slight to be considered specific.

47. Mertensiiâna, Bangord (Heterisia Mertensiiâna, Small). Perennial, 4–13 in. high, subpubescent: lvs. basil, in a rosette, subrotund, base cordate, incisive-lobed, the lobes quadrate, 6-toothed with the teeth obtuse or acute; the petioles very slender, rather short, at the base with a long membraneous sheath: infl. a loosely diffuse panicle with erect-spaying glandular-pubescent branches borne on a slender erect almost naked green scape: fls. white with very long pedicles; sepals ovate, obtuse, reflexed; petals oblong, obtuse, double the length of the sepals: petals seen. and Calif.—Very similar to S. punctata but readily distinguished by the incised-lobed lvs.

Section VIII. DIPTÉRA.

A. Lvs. roundish, more or less deeply 7-lobed, serrate: stolons when present............. 45
B. Longer petals entire............. 48. cortusifolia
BB. Longer petals strongly serrate............. 49. Fortuniæ
AA. Lvs. roundish or ovate, remotely dentate: stolons usually long and slender............. 51. sarmentosa
BB. Margin of lvs. doubly undulate dentate; the petiole twice as long as the blade: plant usually tall............... 50. sarmentosa

48. cortusifolia, Sieb. & Zucc., also spelled cor- tusifolâ. From 6–12 in. high, not stoloniferous: lvs. basal, rather thick and fleshy, bright green, the lower part reddish, strigose-pilose, margin ciliate, roundish, 7-lobed, mid-lobes larger and simple or 3-lobed, acute or serrate, 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, striate, strigose-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 obovate-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. mädida, Maxim. (S. mädida, Makino). Lvs. thin-membraneous, deeply lobed, with the lobes 3-lobulate and incised-dentate. Oct. Japan. G.C. III. 46: 370.

49. Fortuniæ, Hook. (Beryxia Fortuniæ, Stein). Perennial, scarcely (if at all) stoloniferous, to 2 ft. lvs. dark green, one-colored, basil, thick, strigose-pilose, rounded-reniform, nerved, somewhat 7-lobed, the lobes rounded, strongly and acutely lacininate-serrate; petals longer than the blade, thick, sheathing, with the sheaths ciliolate-dentate: infl. loosely paniculate, borne on a stout, erect, strigose-pilose scape; the panicle-branches glandular, spreading, 4–7-fl.; 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. Gn. 74, p. 622; 78, 564. G.C. III. 45: 20. G. 6: 445. G. W. 14, p. 308. 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. sarmentôsa, Linn. (S. japonîca, Hort. S. chinén- sis, Lour.). STRAWBERRY GERANIUM. In England known as MOTHER OF THYE, and sometimes more correctly as LÉNARIA Cymbalaria. OLD MAN’S BEARD. Fig. 3559. Perennial, 9–24 in. high, stoloniferous, the stolons long and filiform: caudex short: lvs. basil, rather thick, strigose-pilose, reniform-rotundate, rarely 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; inf. loosely paniculate, borne on an erect, strigose-pilose scape, the panicle-branches glandulose, spreading, 4-7-ft.: fls. white, numerous; calyx short-paniculate, the lobes ovate, obtusish 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, China. B.M. 92. G.C. III. 7:237 (showing irritability of plant to light). Gn. 30, p. 333; 32, p. 37. R.H. 1876, p. 427. G. 25:365. G. W. 25:781. An old-time rock-garden 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 subsp. Hubb., Hort.), has lvs. handsomely marked with creamy white and red variegations. G.Z. 9:32. Less hardy than the type.

51. cuscutaefórmis, Lodg. Perennial. 3-6 in. high, stoloniferous, the stolons filiform, often branched and tangled in one another like the sts. of cuscuta: lvs. basal, rather thick, plano-convex, both surfaces strigose-pilose, green, white-veined, suborbicular or ovate, nerved, coarsely toothed or undulate-denticulate, toese broad-auricate, becoming obtusish with age; petioles longer than or equaling the blade, rather terete and thick: inf. laxly second-paniculate from below to the middle of the slender, ascending, strigose-pilose scape; the panicle-branches glandulose, erect-spreading, slender, 2-3-ft.: fls. white; calyx very short-glandular, the lobes ovate, obtuse, spreading; petals 1-nerved, very short-clawed, 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. 2:186. B.M. 2631. Not hardy in England unless very heavily protected.

Section IX. Hirculus.

A. Petals obovate. 52. diversifolia
B. Petals elongated, oblong or ovate-oblong.
AA. Infl. 3-12-ft., corymbose-panicled:
   the lower lvs. lanceolate. 53. turfosa
BB. Infl. 1-3- (rarely 2-) ft., racemose:
   the lower lvs. spatulate. 54. Hirculus

52. diversifolia, Wall. Eight to 18 in. high, forming tufts of basal lvs.: sts. hisbute below and glandular (becoming glabrous with age) above, erect and folios. lvs. polymorphous, the lower petioled, ovate, obtuse or cordate-based, subacute, undulate, sparsely hirsute or glabrous; cauline mostly sessile, very entire, oblong-lanceolate, obtuse and glandular: inf. corymbose-racemose or paniculate, rarely few-ft.: fls. yellow, obscurely spotted, ½-3/4 in. across; sepals ovate, spreading, at length reflexed; petals ovate, short-clawed, 5-nerved with 4 glands at their base, exceeding the sepals. July-Sept. Himalayas and China. B.M. 6603. —Said to be the handsomest of the group and very showy when massed. Var. foliátia, Hubb. (forma foliátia, Engl. & Irmscher). Sts. erect, with 1 or more lvs., 3-20-ft.: lvs. cordate-ovate, glabrous or very shortly and densely glandular-pilose on the margin: fls. golden yellow; sepals with the nerves mostly parallel. Aug.-Sept. China.

53. turfosa, Engl. & Irmscher. Sts. erect, 7-14 in. high, rather densely foliose, reddish and glabrous below, pale and short-glandular-pilose above, stoloniferous at base, the stolons about 4 in. long and laxly foliate: basal and also the lower st.-lvs. lanceolate, obtuse, narrowed to a petiole as long as the blade, glabrous; middle and upper cauline lvs. sessile, oblong-lanceolate, conaceous, glabrous; the uppermost narrower, their margin and often the upper surface densely glandular-pilose: infl. 3-12-ft., corymbose-panicled; pedicels bracteolate at base, densely short-glandular-pilose: fls. golden or orange-yellow, ovate, glandulose, reflexed; petals oval or oblong-ovate, short-clawed, 3-nerved, lateral nerves often bifid. Sept., Oct. China.

54. Hirculus, Linn. (Leptásea Hirculus, Smoll). Perennial, 4-12 in. high: basal shoots or surculi short, prostrate, filiform, fuscous-villos and remotely foliose: sts. erect, leafy: lvs. lanceolate, flat, entire and obtuse; the lower and those of the surculi spatulate, attenuate to the ciliate petiole, the middle and upper lvs. sessile: infl. terminal, 1-3- and rarely 5-ft.; the peduncles erect, 1-ft., brown-villos and glaucescent: fls. yellow, ½-¾ in. across; sepsa oblong, very obtuse, reddish-ciliate; petals oblong or ovate-oblong, spotted with red at the base, 3 times longer than the sepals: fr. ovate. 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 bug-grower. Var. grandiflóra, Hort., larger flowering than the type and has golden yellow fls. 1 in. across; more desirable than the type.

Section X. Trachyphyllum (Leptásea, Chondrosea).

A. Stolons or runners absent; the young shoots leafy and also floriferous.
B. Sts. with a basal rosette of longish-st.-lvs., but few-ner., above. 55. chrysántha
BB. Sts. equally and loosely led.
   C. Axils of the cauline lvs. with buds.
      D. Peduncles glabrous: calyx-lobes ovate-triangular. 56. aspera
      DD. Peduncles glandular: calyx-lobes lanceolate.
         E. Lvs. linear-lanceolate, gray-green; margin ciliate or spinulose. 57. brachialis
         EE. Lvs. lanceolate; under surface lineolate; margin striose, with white hairs. 58. gemmipara
   CC. Axils of cauline lvs. without buds, the lowest, however, have more or less elongated leafy shoots.
      D. Petals oblong, 1-nerved: the cauline lvs. oblong. 59. aizoides
      DD. Petals obovate, 3-nerved: the cauline lvs. lanceolate. 60. cinerascent

AA. Stolons or runners present; the young shoots sarmentose.
B. Fls. long-pedicelled. 61. Brunoniána
BB. Fls. almost sessile. 62. flagelláris

55. chrysánta, Gray (Leptásea chrysantha, Smoll). Dwarf cespitose plant, 1-2 in. high, with creeping
SAXIFRAGA

shoots: lvs. mostly basal, in a rosette (a few cauline), imbricated, oblong-ovate, glabrous and fleshy: infl. 1-3-fl., terminal on filiform, glandular-pubescent peduncles: fls. large, yellow; calyx-lobes ovate or oblong-ovate, obtuse; petals ovate to broadly obovate, much longer than the calyx-lobes. Mountains of Colo. and New Mex.—Has been offered by dealers in native plants.

56. *aspera*, DC. More or less cespitose, 4-6 in. high, with prostrate, mostly dark purple caulicules: fl.-sts. erect or ascending, remotely lvd.: lvs. pale green, shiny, lanceolate-linear, spiny-aristate and ciliate, those of the caulicules bearing buds in the axis: infl. 1-fl., or few-fl., panicles, on glabrous peduncles: fls. yellowish white; calyx sparsely glandular below; petals mostly long, many-fl., triangular-munroniate; petals oblong or obovate-oblong, 3-ovate, or ovate, double the lengths of the calyx-lobes, oblique truncate. May, June. Mountains of Eu.—A rock-loving species suitable for rockeries and alpine gardens, best grown in a moist but well-drained spot. Little known in Amer. Var. *bryoidea*, DC. (S. bryoidea, Linn. or *S. farkasioides*, Scribn. & Merr.) has lobes slightly lobed in the apex incurved; the caudicle lvs. subapprimate, erect, appressed to the sts. which are 2-3 in. high and 1-2-fl.

57. *bronchialis*, Linn. Dwarf, cespitose, 4-8 in. high: sts. ascending, densely foliose at the base; fl.-sts. few- to many-fl., slender, borne on erect spreading glandulose pedicels: fls. yellowish white with orange-red dots; calyx-lobes oblong-lanceolate, rather obtuse, glabrous; petals oblong, 3-ovate, twice as long as the calyx-lobes. May. Asia and Alaska.—The material from the Cascade Mts. of Wash. to Alberta and southern British Columbia has passed as *S. bronchialis*, which has been separated under the name of *S. austromontana*, Wiegand. (S. bronchialis, Pursh, not Linn. Lepidácea austromontana, Small). It differs from *S. bronchialis* in its more subulate, darker green lvs., more slender often purplish sts., more slender pedicels, smaller white petals with purple dots above and not clawed at the base. *S. austromontana* is probably not in cult. Var. *cherlerioides*, Engl. (S. cherlerioides, Don. S. Stelleriana, Merck., also spelled *Stellariana*. Lepidácea cherlerioides, Small). Densely cespitose, with the caulicules very densely imbricate-leafy: lvs. short, flat above, convex below, somewhat spatulate, acute-munronate: fl.-sts. shorter, 2-6 in. high, few-fl., glandulose or glabrate: fls. white; calyx-lobes rather obtuse. May. Asia and N. Amer. Unalaska, Bering Straits.

58. *gemmipara*, Franck. Sts. erect from a long rhizome, 4-5 in. high, branched, the branches rising from pockets, pellis below; the axis with buds: lvs. lanceolate, long-munronate, entire, pale, shiny and lineolate on the under surface, bark of the surfaces very dense, the margin striate with white hairs: infl. paniculate-corymbose, borne on a densely glandular fl.-st. which is naked above; pedicels bracteolate 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 sepal. July—Sept. China.

59. *aizoides*, Linn. (Lepidácea aizoides, Haw.). Loosely cespitose, 2-6 in. high, with decumbent or ascending, foliose, glabrous or sparsely very short pilose caulicules which are branched from the base: lvs. green or reddish, the lower linear or linear-oblong, munronate, flat below, above slightly convex, glabrous or more or less rigid-ciliate; the upper rather remote, smaller, oblong, rather linear-oblong: infl. 1-fl., often many-fl., 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, 1 1/2 times as long as the calyx-lobes. June—Aug. Eu., Asia, Arctic Amer., south to Gulf of St. Lawrence, mountains of N. Vt., 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. aizoides*, Small.)—Usually found in stony places where there is trickling water. Very easy to grow and may be divided almost at any time. Var. *aurantiaca*, Hort., is a form with the fls. described as of "old-gold passing off to a kind of coppery red." Var. *atrorubens*, Engl. (S. a. rubens, B. Bert.). Lvs. stiffly spinulose-ciliate: fls. rich crimson (Engler says orange-red or cinnamon-colored). Cent. Eu.

60. *cinerascens*, Engl. & Irmscher. Densely cespitose, 2-4 in. high, the caulicules prostrate, rosetulate-lvd.: lvs. of the caulicules rather stiff, linear-lanceolate, margin cartilaginous and lax-ciliate or ciliate-spinulose, apex tapering to a persistent awn, under surface shining, whitish; the caudine lvs. lanceolate, rather stiff, aristate, margin densely short, black glandular-pilose: infl. 1-fl., on fl.-sts. which are often reddish. lvs. white; petals oblong, rather short, the upper long, and black glandular-pilose as are the pedicels: fls. golden yellow; sepal ovate, subacute, not reflexed; petals obovate, narrowed to a stipitate base, 3-ovate, the lateral nerves bifid. Sept. China.—Rare.

61. *Brunoniána*, Wall. 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-munronate, setose-ciliate; the lowest imbricate, erect and appressed; the upper few and smaller: infl. 1-4-fl. 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-ovate, 3-4 times longer than the calyx-lobes. July—Aug. Temperate Himalaya. B.M. 8189.—*Spatularia Brunoniána*, Small, is not this species but a variety of *S. leucanthemifolía*, Small. *Brunoniána* spreads freely by means of its runners and looks like a moist spot. Not commonly in cult. Var. *grandiflóra*, Hort., is offered in the trade. Var. *majuscula*, Engler & Irmscher (S. *majuscula*, Hort.). Larger than the type: sts. 3-8 in. high: infl. composite, 6-9-fl.; the branches 13/4-4 in. long. Sept., Oct. China.

62. *flagellárís*, Willd. (Lepidácea flagelláris, 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-ciliate; the basal and lower lvs. close together, obovate-oblong; the upper lanceolate: infl. corymbose; 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 obvate-cuneate, the apex obtuse, 5-7-, rarely 9-nerved, 2 or 3 times longer than the calyx-lobes. May–July. Boreal and alpine Eu., Asia, and N. Amer., subalpine to alpine in the Rocky Mts. J.F. 3:237. Gn. W. 25:530.—It requires a moist boggy situation and is difficult to carry through the winter.

Section XI. *Saxifraga*.

A. *Leaves of the rosette obvate or obvate-oblong, attenuate to a flat petiole.*

B. *Blades of leaves very glabrous: petiole-branches 1-3-fld.* .......... 63. *cuneifolia*

BB. *Leaves of *saxifraga* sparsely hirsute: petiole-branches 3-6-fld.* .......... 64. *umbrosa*

AA. *Leaves of the rosette ovate or orbicular: the petiole round or ridged.* .......... 65. *Géum*

63. *cuneifolia*, Linn., sometimes misspelled *cunrifiolia*. laxly cespitose 4-6 in., with slender sublingual caudicles: 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, obvate or subrotund, very obtuse, cuneately attenuate to a long flat ciliate petiole, margin slightly crenately repand-crenulate: infl. a loose panicle with 1-3-fld. branches: lvs. white; calyx-lobes oblong-triangular, very obtuse; petioles 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. Böklandi*, Hort., which only differs in having 2 or 3 yellow spots on each petal.

Var. subintegra, Ser. (S. appensa, Bert. *S. cuneifolia* var. appenina, Koch. *S. capillipes*, Reichh.). Caudicles long, scantly lvd., forming a rosette at their tip: lvs. smaller, retuse, few- or dentate or entire, petiole equaling the blade: sts. few-fld., simple paniculate. Switzerland, Tyrol, Apenines, and Maritime Alps.

64. *umbrosa*, Linn. *London Pride*. St. Patrick’s *Cabbage*. Loosely cespitose, 6-12 in. high, with sublingual caudicles: sts. erect, naked: lvs. forming a dense rosette 6-12 in. across, rather thick, leathery, gray-green, dull shiny, lower surface tinged reddish or violet, oblong or obvate-oblong, sparsely hirsute, very obtuse, attenuate to the ciliate (rarely glabrous) petiole, margin obtusely crenate: infl. laxly paniculate with 3-6-fld., shortly glandulose-hirsute branches: lfs. white, variegated pink; calyx, rather obtuse, angulate-oblong-obvate, 3-nerved, with several red dots at their base and a yellow spot in the middle. June, July. Eu.—A very neat and attractive plant, frequent in European gardens, but rarely seen here. Var. *acanthoifolia*, Hort., is offered in the trade. Var. *beillidifolia*, Hort., is offered in the trade. Var. *crassiphila*, Hort., is offered in the trade. Var. *erénea*, Hort., is offered in the trade. Var. *follis-variegatis*, Hort., a form with the lvs. variegated. Var. *gráecalis*, Hort., is offered in the trade. Var. *marmorata*, Hort., is offered in the trade. Var. *primuloides*, Hort. (S. *primuloides*, Hort.), is described as follows: Will grow in sun, but prefers entire or partial shade. It forms dense rosettes of small oval to sub-ovate 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. *rotundifolia*, 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. *variegate*, Hort., is a form with the lvs. variegated with white.

65. *Géum*, Linn. (*Méridothes Géum*, Small). Six to 12 in. high, with sublingual caudicles: 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, petioles 3-4 times longer than the blade and channelled above: infl. paniculate, the branches 3-6-fld., pedicels slender: lfs. white; calyx-lobes oblong, obtuse; petioles ovate-oblong, twice as long as the calyx-lobes, with a yellow spot at their base and occasionally with several smaller 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. *dentata*, Hort., (S. *umbrosa* var. *dentata*, Ser.). Lvs. crenate or crenate-dentate: lfs. pink, unpotted. Pyrenees. Var. *crinum*, Hort., is said to resemble a refined form of *S. umbrosa*. Var. *dentata*, Engl. (S. *dentata*, Link. *S. hirsuta*, Linn. *S. umbrosa* var. hirsuta, Hort. *S. umbrosa* var. *dentata*, Hort.). Lvs. rather glabrous or hirsute, orbicular, acute-serrate: lfs. white with 1 yellow dot or even several purple dots on each petal (by some said to be unpotted).

Section XII. *Ecuazoozonia* (Chondrosea).

A. *Fls. white (frequently dotted with red or purple).*

B. *Margin of the lower lvs. reflexed and crenulate or almost entire.*

C. *Upper surface of lower lvs. convex.*

EE. *Upper surface of lower lvs. sulcate or flat.*

D. *Surface of l. sulcate.*

E. *Lower lvs. more or less spatulate or obtuse.*

F. *Apex of lvs. rather acute: calyx-tube glabrous.*

FF. *Apex of lvs. more or less obtuse: calyx-tube glandular.*

G. *Lvs. obovate-ligulate.*

GG. *Lvs. linear at base, spreading above into a spoon-shaped blade.*

66. *longifolia*, Lapeyr. One to 2 ft. high: st. erect, densely glandular: lvs. basal, very numerous, forming a thick rosette which is frequently 6-7 in. diam., convex, linear-lanceolate, light or gray-green edged silvery, 6 in. long, base ciliate, margin crenulate: infl. a full, pyramidal panicule, branched from the base, many-fld., everywhere glandulose-pilos: lfs. white, sometimes dotted purple toward the center; calyx-lobes ovate or oblong, obtuse; petioles ovate, 3-nerved, the midnerve usually bifid toward the apex. June, July. Pyrenees. B.M. 5880, G.C. 11704, 1402; 39:149; 52:244, 245. Gn. W. 105; 70, p. 124; 72, p. 142; 76, p. 143; 103. G.W. 10, p. 91. G. 14:347.—This species will grow in any rock crevice and is very showy in l. and in f. but it has the unfortunate habit of dying when through flowering. Prop. by seed but care must be taken as it hybridizes very readily. Var. *hybrida*, Hort., is a form which is offered in the trade: grows 18 in. high: lfs. white. Var. *magnifica*, Hort., is a form with large rosettes up to...
12-14 in. diam. and very profusely fld. panicles 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. 208; 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 sparingly glandular-pilose, leafy: basal lvs. numerous and roseate, sulcate above, usually linear-spatulate and rather acute, somewhat ciliate, margin crenose-crenulate and crustate with lime; cauline lvs. shorter, the margin cartilaginous and less crustate: infl. a thyroid panicle from the middle of the scape or above, the branches slender, corymbose-paniculate at their tip, 3-5-fl., 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 or 3 times longer than the calyx-lobes. June, July. S. Eu. B.M. 5434. Gn. 79, p. 188. G.C. III. 48:85, note.—A variable species requiring lime and good drainage. Var. Albertii, Hort. (S. Albertii, Regel & Schmalz.), is probably a hybrid: it has much larger rosettes and the infl. is more spreading: fls. white, heavily spotted. Type estan. Var. australis, Engl. (S. australis, Moric.), usually has longer and broader spatulate lvs. which are nearly flat on the top. Italy and Sicily. Var. Bellardii, Hort., equals the type. G.C. III. 54:153. L. lantoscanâ, Engl. (S. lantoscaâ, Boiss. & Reut.). Lvs. short, blunt, spatulate, more or less attenuate at the base but not so at the apex; margin narrowly crenate. Maritime Alps. G. C. II. 15:109. Gn. 64, p. 61; 73, p. 55. Minor forms of this variety are cult., as S. lantoscaâ crieta, having pure white fls., and S. lantoscaâ supérbâ, having arching plumes of creamy white fls. larger than those of the variety proper.

68. catalaûnica, Boiss. & Reut. Densely cespitose, 1-2 ft. high: lvs. of the rosette, which grows to be 3 in. diam., erect-spread. obovate-ligulate, rather obtuse, margin subentire and white-crustate, glabrous, glaucous, subcanaliculatus above; the cauline lvs. few, obovate-oblong: infl. a slender-branched cymose panicle borne on an erect few-fl. st., with erect bracteolate slender glandular-viscid pedicels, which are longer than the fls.: fls. white; sepals oblong, obtuse, glabrous, longer than the glandular tube of the calyx; petals spatulate-oblong, 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. lingulata var. cochleâria, Engl.). Six to 9 in. high, densely cespitose, with short many-branched caudicles covered below with withered lvs.: lvs. densely roseate, spreading, ½-1 in. long, linear, at base, the base broadly rounded into a rounded or spatulate blade, glaucescent, coriaceous, margin cartilaginous and crustate with lime; the cauline lvs. small, linear, acute, red-brown: infl. paniculate, erect and open, either thyroid or subcorymbose, borne on very slender bright red-brown fl.-sts.: fls. white, ½-¾ in. diam.; calyx red-brown, the lobes small, ovate, obtuse; petals obovate, apex rounded. June, July. Maritime Alps. Eu. B.M. 6068. G.C. III. 44:245; 51:174. Gn. 74, p. 326. Var. major, Hort., has much larger rosettes of lvs. than the type, and is suggested that it may be of hybrid origin. Var. minor, Hort. (S. Probyânia, Correv.), has minute rosettes of silvery lvs. and much shorter sprays of fls. which are white.—Apparently some of the material grown as S. valdensis is referable to this.

70. crustâla, Vest. (S. incrustâla, Vest.). About 1-3 ft. high with ascending branched caudicles which are covered with appressed vestiges of lvs. and form a cespitose clump up to 4 or 5 in. diam.: sts. ascending, densely glandular-pilose: basal lvs. light gray-green, the lower third pink, sulcate, linear, obtuse, minutely crenulate with the crenatures very close together, crustate with lime, ciliate toward the base; cauline lvs. more or less sericeous, glandular to base: infl. a scape, racemose from the middle or above, the branches 1-fl. or paniculate 3-6-fl.: fls. yellowish white sometimes purple-dotted toward the center; calyx sparse-glandulose at base, the lobes oblong-triangualr with membranaceous margins; petals obovate, base scarcely attenuate, almost 3 times longer than the calyx-lobes. It is a strong grower and said to produce offsets very freely and in this way spread rapidly. Var. rhâtica, Engl., also spelled râtica (S. rhâtica, Kerner). Basal lvs. linear-lingulate, apiculate rather acute; petals obovate-oblong, white with numerous purple dots above the middle. Mountains of Austria.

71. Hôstiti, Tausch (S. âlictior, Mert. & Koch. S. Aizdon var. Hôstiti, Hort.). Cespitose, 6-18 in high: sts. erect, rather stout and glandular-pilose: basal lvs. numerous, roseate, rather erect, lingulate with an obtuse apex and ciliate base, margin crenulate, the crenatures truncate; cauline lvs. oblong, rather ovate; calyx-lobes, infl. a scape, paniculate above the branches, elongated, naked and densely glandular-pilose; the pedicels densely short-glandular: fls. white, often with numerous purple spots toward the center; calyx-lobes ovate-triangualr; petals oblong or obovate-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. Var. rhâtica, Engl., also spelled râtica (S. rhâtica, Kerner). Basal lvs. linear-lingulate, apiculate rather acute; petals obovate-oblong, white with numerous purple dots above the middle. Mountains of Austria.

72. altisimâ, Kerner (S. Hôstiti var. altisimâ, Hort.). Fig. 3562. Cespitose, 1-2 ft. high: sts. erect, short, glandular-hirsute: lvs. thick, the basal spreading, broad, tongue-shaped, rather acute, base ciliate, margin serrate, serratures acute and cartilaginous; cauline lvs. oblong, rather obtuse, serrate; bracts oblong-linear or linear, obtuse and glandular-pilose ciliate: infl. a scape racemose, paniculate above, the branches about 10-fl., and densely glandular-pilose; pedicels densely short-glandular: fls. white, their base greenish and purple-dotted toward the center; calyx-lobes ovate, obtuse, cartilaginous margined; petals elliptic, 3-nerved, twice as long as the calyx-lobes. Tyrol.—Very closely allied to S. Hôstiti, possibly not specifically distinct. Little known in Amer. outside fanciers' collections.

73. Aizdon, Jacq. (Chondrâsæa Aizdon, Haw.). Fig. 3562. Perennial, cespitose, 4-20 in. high: sts. erect, foliace: basal lvs. curved, thick, rather flat above, smooth, the base ciliate, margin serrate, many-pored, more or less crustate with lime, serratures cartilaginous at the apex and antrorse acuminate; cauline lvs. subcylindric, crenate or spatulate, base glandular-ciliate; infl. a scape, corymbose-racemose, corymbose-paniculate or paniculate above, the branches 3-5-fl., more or less glandular-pilose, rarely glabrous: fls. cream-colored, commonly purplish red spotted in the center; calyx-lobes ovate; petals obovate or elliptical, 3-5-nerved,
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almost twice as long as the calyx-lobes: fr. globose. June. July. Alpine and boreal parts of Eu. and Asia, in N. Amer. from Greeneland and Lab. to Sask., 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. Pórtet, Stein, from Italy has white flat flowers and is apparently only a minor variation of S. Aizoon. Var. ambigua, Hort., is offered in the trade. Var. atropurpürea, Hort., is said to have slender branching sts. and rose-purple frs. Var. balcaná, Hort., also spelled balckána (S. balcina, Hort.), is a form with close rosettes of medium size and rather flat white frs. with larger red spots than usual (frs. reported as white & pink, p. 156). Balkan Mts. Var. baldivénsis, Farrar, with ash-gray lvs., which are short, thick and markedly dentate; their apex rounded: the young shoots glossy, blood-crimson: fls. whitish. N. Italy. Var. brevifoliá, Hort., with white frs. is offered in the trade. Var. bulgárica, Hort., has rosy spotted frs. Var. californíca, Hort. (S. californíca, Hort.), with white frs. must not be confused with S. califórnea, Greene (Microanthé califórnea, Small), a species of Section Boraphila, closely related to S. virgíniensis which is probably not in cult. Var. Chürchillii, Hort., with pointed gray lvs. in stiff rosettes. Var. culturá, Hort., is offered in the trade. Var. dòbia, Hort., is offered. Var. crécita, Hort., is offered in the trade. Var. floréscens, Hort., is a free-growing decorative form with clear lemon-yellow frs. produced in good spikes. Not to be confused with S. floréscens, Hort. (S. media x S. arctóides), which is apparently scarce in cult. Var. intácita, Engel. (S. intácita, Willd.), has beautiful white, unspotted frs. S. intácita major is the cultural name of a larger form, about 6 in. high. S. intácita minor is the cultural name of a dwarf form. Var. lagaveána, Hort., also known as La Grévane and La Ga Dauphane, is a miniature plant with tiny silvery rosettes and ruddy sts. 6 in. high, bearing 4–6 frs. on each st.: frs. creamy white, thick and waxy-like; the buds globular and pink-tinted. Var. lútea, Hort., has the lvs. longer, the rosettes more open, and the fls. deeper yellow than those of var. floréscens; fls. at first primrose-yellow changing to creamy yellow. Var. Mágyc, Hort. (S. Mágyc, Schott, not Hort.), is one of the tallest forms, with good-sized rosettes. Var. májór, Koch (S. Aizóon forma robústa, Engl.), has oblong-linear lvs. which are not much broader at the apex. Var. mínima, Hort., is a diminutive plant that elings tightly to the rock faces and looks almost like a gray moss: fls. white. Var. minor, Koch, has oblong-obovate lvs. shorter than the type. Var. notáta, Hort. (S. notáta, Schott), has small silver-margined lvs. and white frs. Var. paradóxa, Hort., is a form with long bluish lvs. their margins with silvery serratures: fls. white. Engadine. Gs. 74, p. 463. See S. paradoxa in suppl. list. Var. pectináta, Hort. (S. pectináta, Schott, Nym. & Kotsch), has narrow lvs. with blunt teeth and conspicuous silvery margins from Italy has white frs. and sets: the fls. are small, of a nice white and spotted with red.

Var. récita, Ser., in part (S. récita, Lapeyr., in part. S. Aizoó in forma grádena, Engl. S. carinátheca, Schott, Nym. & Kotsch), has lvs. which are spatulate-linear, slightly 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. réseà, Hort., has this same type, but has bright pink frs.

Var. rosuláris, Hort. (S. rosuláris, Schott, Nym. & Kotsch), is a variable form with flat rosettes, prominent type-form. Var. Stabíaena, Hort. (S. Stabíaena, Ten.), has large rosettes and sprays of creamy white frs. Not very distinct from the type.

S. Zelébori, Schott. Sts. densely and longly glandular-pilose toward the base, decreasingly so toward the apex: lvs. of the glaucous rosette, which is 1½ in. diam., almost linear, acute, very minutely serrate, the serratures inverted-acute and contigous (the lowest less so); calulins lvs. shorter, oblanceolate, acute, glabrous, above the middle sharply serrate (serratures rather recent), with apex appressed ciliate-calcareous: fls. white, not dotted; calyé glabrous to the calyx-lobes. Var. obtuse; 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.

S. cartílagínea, Willd. (S. Kolerántiana, Regel). Six to 9 in. high: st. sparingly glanduliferous, few-lvd.: lvs. rosalate, oblong or obovate-oblong, acute or acuminate; the margin cartilaginous toward the base, serrate, serratures antrorsely subacuminate, toward the apex subciliate, crenatures truncate: infl. a scapes, racemose or paniculate above, the branches numerous, white, rose, or purple; calyx-lobes ovate-triangular, rather acute; petals obovate, 2–3 times longer than the calyx-lobes. June–Aug. Caucausian region and Asia Minor.—S. Kolerántiana has been kept distinct by some but seems to differ only in the slightly more acute serratures of the lvs. In gardens it is more common under this name. A somewhat larger form is known as S. Kolerántiana major, Hort.

S. Cotylédón, Linn. Tufted, 6–24 in. high: st. erect: lvs. thick and fleshy, basal linalate or obvolute-linalate, short-apiculate, the base softly fimbriate; margin serrate, serratures cartilaginous, at their apex antrorsely acuminate; caulin lvs. inarticulate-lanceolate, the lower part glandular-ciliate, the upper serrulate; bracts linear, acute and glandular: infl. a scape, papyrio 3 times longer than 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 glaucous tube, oblong-acute; petals obovate-cuneate, 3–5-nerved, midwhee mostly bifid, 2–3 times longer than the calyx-lobes. May–July. Mountains of Eu. G. 11: 209; 34: 781; 35: 856. T. N. 12, p. 471.—Easy to prop. as it makes a large number of side shoots which root quickly when potted. Var. icelandica, Maxwell (S. icelandica, Hort.), is the largest form of the species and produces numerous offsets. The rosettes are very large and flat and the ligu palate are usually bronzed and leathery. G. 35: 707. Var. pyramidsílis, Ser. (S. pyramidsílis, Lapeyr., not Ten. S. pyramidsílis, Hort.), is a very robust form from 2–4 ft. high when in fl. The rosettes are large and glaucous and the lvs. very numerous in a large pyramidal panicle, white, speckled with crimson. May. June. G. C. III. 32: 389. G. 35: 163. G. 61, p. 393; 74, p. 266; 78, p. 349. Var. pyramidsílis, Hort., has more pointed lvs. and shorter plumes of white frs. Pyrenees.

S. mutáta, Linn. Six to 12 in. high: rhizome thick, horizontal or oblique: sts. ascending, foliose: basal lvs.
lingulate, rosulate; margin cartilaginous, densely fimbriate below, sometimes or absolutely so, with many little indistinct pits; cauleine lvs. lingulate-spulate, very obtuse: infl. racemose, panicle 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-merous, narrower than and twice the length of the calyx-lobes.


Section XIII. KARSCHA.

A. Caudicle lvs. broader or as broad above the blade as below.

B. Petals as long as or slightly longer than the calyx-lobes: fls. reddish or purplish. (The following four species are very closely related.)

C. Inf. spreading, branched.

D. Lower lvs. spatulate-lingulate, the tip somewhat recurved...

E. Fls. yellow...

F. Petals obovate to cuneate: basal lvs. not recurved at tip.

G. Lvs. spatulate, light gray-green...

H. Lvs. obovate-cuneate, shorter and broader than the preceding...

I. Petals elliptic-spatulate, twice as long as the acute calyx-lobes...

J. Petals rounded-oblanceolate: basal lvs. more or less recurved.

K. Recurred only at the tip of U.

L. Inf. 1-fld.: fls. pale or rosy lilac.

M. Inf. 2-fld.: fls. white...

N. Petals obovate-subrotund...

O. Fis. yellow or yellowish green.

P. Stamens as long as the petals...

Q. Petals decidedly longer than the petals...

80. Grisebachii, Degen & Doerrf. (S. media var. montenegrina, Hort.). Fig. 3563. Cespitose, 4-6 in. high, with short, densely foliose caulicles: fls. erect, leafy, densely glandular-pilose: basal lvs. imbricate, stiff, gray-green, reddish toward their base, the rosettes flattened-depressed, spatulate-lingulate, apex acute or obtuse, margin narrowly cartilaginous, elliptic below, 7-11 pits near the margin when old; cauleine lvs. spatulate, cartilaginous, and densely glandular-hirsute on both surfaces except toward the tip, which is mucronate and glabrous: infl. 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, obovate, about 3-5-nerved, scarcely longer than the calyx-lobes.

81. Stribnyi, Velen., also spelled Stribný, Stribny, and Stribury (S. porphyria var. Stribnyi, Velen.). Cespitose, 4-5 in. high, with short, densely foliate caulicles: fls. erect, branched, sparsely leafy, spreading, glandular-pilose: lower lvs. rosulate, spreading, sessile, spatulate-oblancoate, apex submucronate, fleshy, above intramarginally pitted, carinate below, margin narrowly cartilaginous toward the base, sparingly ciliate; cauleine lvs. oblong-spatulate, subacute, sometimes reddish toward the apex, margin below glandular-ciliate, 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 suberect, broad-spatulate, apex obtusely dentate, glabrous, about the same length as the calyx-lobes.

81. Friderici-Augusti, Bias., also spelled Friderici-Augustus and Federici-Augusti (S. porophylla, Boiss., not Bertol. S. Koch).—Saxifraga, 2-6 in. high with short densely foliaceous caudices; 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; cauline lvs. spatulate, glau-ular; infl. a spike-like raceme, dark purple; pedicels all androecious; the bracts: flat, dark purple; calyx glandular, the lobes ovate, obtuse; petals ciliate-spateate, 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. Friderici-Augusti, Engl., but differs from that species in the narrower lvs. and more spatulate raceme. It has also been referred to S. porophylla, Bertol., as a synonym: the latter is said to have lingulate basal lvs. with obtuse apex, and flesh-colored petals. The distinctions between S. Friderici-Augusti and S. porophylla seem to be very unsatisfactory. Much of the material cultivated as S. Friderici-Augusti is really S. apiculata.

82. Saxifraga, Lapeyr. Cespitose, about 2 in. high, with woody, densely imbricate-foliaceous caudices; sts. short and leafy, glandular-hirsute; lower lvs. sulcate, weakly keeled, leathery and stiff, both sides gray-green but violet at the base of the under surface, linear-lin- gulate, apex rather obtuse, margin narrowly cartilaginous, the lower portion ciliate and near the margin 7-9-pits noticeable with age; cauline lvs. linear-spatalate, glandular-hirsute and cartilaginous except the apical portion: infl. terminal, 1-3-fld., rarely cymose, 3-5-fld.; the pedicels and calyx glandular: fls. golden yellow, calyx-lobes ovate and acutish; petals broad-ovoblate, 5-7-nerve, more than twice as long as the calyx-lobes. April-July. Mountains of Eu. B.M. 5849.—Should be planted on a shady ledge where it will obtain plenty of moisture. Little known in Amer. Var. primúlina, 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-Côburugi, Kell. & Sünderr. Cespitose, about 2 in. high, with columnar foliaceous branched caudi- ces; sts. 1-3-fld., as is the case with S. Scardica, and tinted red-brown; lower lvs. somewhat glaucous, up to ½ in. long, little narrowed toward the top, margin fine-fairy below, apex thickened and incurved-pointed; cauline lvs. 9-12 in number: infl. close heads of 4-5 (5-6) large, rich yellow fls.: petals ½ in. long; ½ in. wide, strongly narrowed toward the base. March, April. March.

84. Scardica, Griseb. (S. scardónica, J. Wood). Cespitose, 3-4 in. high, with woody, very densely foliaceous caudices; sts. ascending and glandular-pilos: basal lvs. leathery, stiff, light gray-green, pale violet toward the base, oblong acute, spreading, upper surface con- cave, lower convex-carnate, lower margin indistinctly serrulate or ciliate, upper cartilaginous, entire, when old there are 9-15 pits near the margin; cauline lvs. few, lancelolate, acute, glandular-hirsute except the apical portion, cartilaginous and glandular-hirsute: infl. corymbose, 3-11-fld.: fls. white, ivory-white, or pale rose-red; calyx-lobes ovate, acutish; petals obovate-cuneate, 5-nerve, more than twice the length of the calyx-lobes. June, July, Orient. B.M. 8243. G. 65, p. 308. —This species is readily distinguished from S. Rocheliana by its keeled and more pointed lvs. The species itself is hard to grow and consequently is rare in cult. The plant grown as S. scardica vera is the true S. scardica, Griseb. G. 34:199. Var. obtusa, Sprague, differs from the type in having subaeute to obtuse lower lvs, with fewer pits, fl-sts. 1-5-fld. and green, and the calyx-lobes obtuse and less pubescent. March. Macedonia. B.M. 8058 (as S. scardica). G. 32:329.

85. Rocheliana, Sternb. also spelled Rochelâna, S. centrifusa, Spach —Cespitose-cushioned, growing mats 8-12 in. diam., 2-3 in. high, with more or less elongated, densely imbricated, foliose, often columnar caudices; 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; cauline lvs. few, obovate-spate- late cartilaginous and glandular-pilos except the apical portion: infl. corymbose-paniculate, 3-9-fld., borne on an erect purple-red glandular-pilos fl-st.; pedicels erect, these and calyx glandulose and pale green: fls. white; calyx-lobes ovate, obtuse, erect; petals obo- vate, clawed-attenuate, 7-nerve, three times the length of the calyx-lobes. April-July. E. and S. Eu.—Flowers freely. Var. coronophylla, Engl. (S. coriophylla, Griseb., also spelled coryophylla). 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 caudices which are subnaked below or short- imbricate-foliaceous, low and spreading, and glandular-hirsute to obtuse, the base ciliate, the upper margin cartilaginous; cauline lvs. cartilaginous and glandular-pilos except the apical portion: infl. corymbose, 5-7-fld., borne on erect fl-sts., these as well as the pedicels and calyx being black-glandular-pilos: fls. white; calyx-lobes ovate-oblong, obtuse; petals obovate, attenuate at base, 7-7-nerve, 3 times the length of the calyx-lobes. March-June. S. Italy. B.M. 6702. G. 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. Bôryi, Boiss. & Heldr. (S. marginátà, Bor. & Ch., not Sternb.). Cespitose-cushioned, about 1½ in. high, with densely imbricate-foliaceous caudices which are elongated and columnar: lower lvs. oblong-spateate, obtuse, glabrous, erect-spreading, subcoriaceous, flat above and subcarinate below, margins ciliate at base or others entire, remotely pitted near the margin; cauline lvs. few, minute and glandulose; infl. corymbose 3-5-fld.: fls.: white; calyx glandular, the lobes triangular-ovate, acute; petals elliptic-spateate, twice the length of the calyx-lobes. April-July. S. 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. Líchinia, Duthie. Cespitose, ½-1 in. high, with numerous very densely foliaceous, columnar caudices: lvs. rosulate, oblong, obtuse, recurved and thickened toward the apex, sparsely ciliate at the base, margin cartilagi- nous and incurved, 3-5-pitted toward the apex; cauline lvs. 1-2, alternate, erect, linear-oblong or spatulate, obtuse, glandular, half-clasping at base: infl. green borne on glandular-pubescent fl-st., which are lilac: fls. about ½ in. diam., pale or rosy lilac with a purple center; calyx ½ in. long, glandular-pubescent, the lobes ovate-oblong, obtuse; petals ½ in. long, obovate-rotund, cuneate at the base, the margins undulate. March, April. W. Himalayas. G.C. III. 35:290. Gn. 65, p. 250.—The plant is very dwarf, and is grayish green in color, though the top is green. At night it changes to a white flower.

89. squarrosa, Sieber. Very densely cespitose, about 3 in. high, with woody, subcylindrical caudices which are very densely imbricate-leafy: lvs. of the caudices dark green, imbricated, erect, becoming curved-spread- ing at the apex, linear-lanceolate, obtuse, submucronu- late, very narrowly cartilaginous, at the base fimbriate, the back convex and obtusely carinate above, marked with 7 pits, cruritate with lime when young;
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95. sancta, Griesb. Cespitose, about 2 in. high, the caulescences densely leafy: lvs. rigid, prickly, dark green, the lower imbricate, spreading, lanceolate, acuminate, stiffly mucronate, the entire margin cartilaginous, acuminate, 3–5 minute pits (noticeable when old) near the cartilaginous margin, fimbriate at the base, when young crustate with lime; caulescences lvs. linear-lanceolate, glaucous-pilose except the long-mucronate apex: infl. usual, 3-fl., white; calyx-lubes ovate-lanceolate, acute: petals obvolute, borne at the top of erect fl.-sts.; peduncles and calyx covered with spreading, glaucous hairs: fls. white with reddish veins; calyx-lubes ovate-lanceolate, acute: petals erect, obvolute, strongly cuneate-attenuate toward the base, many-nerved, 3 or 4 times as long as the calyx-lubes. April. S. Tyrol and N. Italy.

96. juniperifolia, Adams (S. juniperina, Bieb.). Cespitose, 1–2 in. high, the caulescences densely imbricate-foliose: lvs. of the calyx-glands, very green, stiff and prickly, erect, appressed, subulate, a little broader at the ciliate base, stiffly mucronate, toward the middle
and apex entire, almost 3-cornered, with 5-7 minute petals noticeable when old near the cartilaginous margin; cauline lvs. light green, markedly downy, and remote; racemes 2-9-fl.d.; fertile lvs. rather stiff, green with a grayish cast, the lower and those of the sterile branches imbricate in 4 rows, spreading or recurved from their middle, oblong-lanceolate, apex flat-triangular and 3-5-pitted, 3-cornered-carinate; often 3-fl.d.: petals obvolute ciliate at the obtuse, thick, sometimes rather oblong-obovate, 5-nerved, 6-8 mm. as long as the calyxlobes. March-June. Alps. var. macronucrata-aurea: oblong-lanceolate, densely pubescent, brownish, thick, very coarse, rather large, and the petals obverse-oblong, 5-nerved, 3 times as large as the calyx-lobes. March-June, rarely June. Alpine and boreal parts of the U.S. and N. Amer., south to Gulf of St. Lawrence, mountains of N. Vt., Mont., and Idaho. L.B.C. 9:869. G.C. III. 49:117. Gs. 71, p. 179; 76, p. 603; 83, p. 57.—An excellent little rock-plant, making a sedum-like mat, the foliage of a purplish cast. Many variations in cult. Var. alta Hort., has a compact habit, very dark green lvs., and starry white fls. Var. cocinea Hort., has fls. of a richer shade of purple than the type. Var. grandiflora Hort., is a form with elongated branches larger, obvolute-rotund petals which are attenuate only at the clawed base and 7-9-nerved: the fls. are large and rosy purple. Pyrenees. Var. media (Hort. & L.) has a form with very broad lvs., and less, soft rosy purple fls. whose petals are obvolute, rather acute, and 5-nerved. Italy. Var. majus Hort., has creeping, rooting stems, tiny rosettes of deep green lvs. and many fls. of a rich crimson red. This is considered by some to be identical with var. pyrenica or very nearly so. Var. pyrenica Hort., is a robust very free-growing form, with large crimson fls. A form of this variety with very large rosy lilac fls. and a rather erect habit, said to come from the mountains of Wales, is cult. under the name of S. pyrenica supérba. G.C. III. 21:419. Var. Rudolphiana, Kitte (S. Rudolphiana, Hornh.), a form with short branches, forming small, very dense tufts: upper lvs. and calyx-lobes glandular-ciliate: sts. short and more or less erect: fls. terminal and erect; petals obvolute, 3-5-nerved. Austrian Alps. Var. speciosa Hort., has a stouter and bolder habit and foliage than other forms of the species and has very large pale rose fls. showing very little tendency toward the magenta. Var. splendens Hort. (S. spéria var. splendens Hort.), is a form with large fls. of a very bright purplish crimson or intense rose-purple, which are produced very freely in March. Wales.—This will grow well on a north exposure. It is also grown under the name of var. pyrenica splendens. 98. biflora, All. (S. rosea, Lapeyr.) Caudicles prostrate, branched, the branches ascending, pilose above, about 2 in. high: lvs. opposite, rather remote, thick, fleshy, green or purple, lower obvolute-rotund, upper obvolute-spatacule, apex rather obtuse, rarely acute, 1-pitted, sparsely pilose and also ciliate, dorsally subcarinate: infl. corymbosely paniculate, 2-9-fl.d.; fls. frequently in pairs, dark violet, deep purplish crimson or blackish blue; calyx broad-ovate, glandular-hirsute, lobes obvolute 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. Caudicles prostrate, much branched, the branches densely cespitose, only about 1-2 in. high; lvs.-sts. erect, 1-4-fl.d., glandular-hirsute above: lvs. rather stiff, green with a grayish cast, the lower and those of the sterile branches imbricate in 4 rows, spreading or recurved from their middle, oblong-lanceolate, apex flat-triangular and 3-5-pitted, 3-cornered-carinate; upper lvs. obvolute ciliate at the obtuse, thickened, reflex apex, base hirsute: fls. large, rich ruby- to purple-red; calyx hirsute, the lobes oblong, obtuse; petals lanceolate, twice as long as the calyx-lobes. May-July. High Alps of S. Eu. Gs. 32:1110.—May be grown on a shaded ledge in rich, but stony, well-drained soil. Not common in cult. 100. petaláta, Terr. (Peltiphylhum petalium, Engl.). Umbrella Plant. Perennial. 1-3 ft. high, rhizome horizontal, fleshy, 2-3 in. thick: lvs. tufted, basal, long-petioled, the petioles often 1-3 ft. long and rough-glandular, blades large, petlate, almost centrally so, often 1 ft. across, orbicular, many-lobed, rather sharply and unequally toothed: infl. corymbosely paniculate which are longer haired than the petals and appear before the lvs. Fls. numerous: petals purplish or white, 1/2 in. diam; sepals ovate to oval, obtuse, glandular-ciliate; petals ovate to elliptical, obtuse. April. Margins of streams, Calif. and Ore. B.M. 6074. F.S. 23:2441. G.C. III. 27:139. Gs. 26, p. 545; 53, p. 6. Gs. 7:307. C.L.A. 17:412.—One of the largest of all saxifrages. Hardy in Mass., much desired in all parts of the U.S. where hardy effects are desired. Var. gigantesca Hort., is offered in the trade. 101. tellimoides, Maxim. Up to 3 ft. or more high: st. robust, erect, leafy: lvs. radical, long-petioled, the petiole provided with short adnate stipules at its base, blade suborbiculously petate, 5 in. or more across, 7-9-lobed, the lobes obvolute and mucronate-acute, unequally and coarsely mucronate-serrate: infl. corymbosely paniculate, many-fl.d.: fls. short-pedivial, greenish, calyx-lobes triangular-ovate; petals spatulate, bidentate at their apex, twice or more longer than the calyx-lobes. Japan. R.H. 1908, p. 251.—Hardy in England and resembles S. petaláta. 102. cordifólia × purpuráscens, Hort. The following named forms are some of the results of reciprocal crosses of these 2 species. They are all small, although varying much in stature and in color of fl. Athlete, Hort. (Athlete var. Splendens Hort.) said to be a fine variety. Megasea Brilliant Hort. (S. cordifólia var. Brillant Hort. Lvs. large, richly tinted in autumn and winter; fls. purple; calyx and pedicels crimson. compácta, Hort. (Megasea compácta Hort.) Fls. bright rose. corrupúgata, Hort. (S. cordifólia var. corrupúgata Hort. Megasea corrupúgata Hort.) Dwarf habit; lvs. large and rough: fls. pink. Cressus, Hort. (Megasea Cressus Hort.) Very pretty with red fls.
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AA. BETWEEN SPECIES OF SECTION II.

103. Vetteriana, Beauverd (S. hederacea × S. Huetiana). Lvs. intermediate between the two parents: fls. sulfur-yellow or whitish, the size of those of S. Huetiana and twice as large as those of S. hederacea; 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: fls. white, small, 2-3-fl.d.; 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.,” which is mentioned in English journals.

AAAA. BETWEEN SPECIES OF SECTION XIII.


111. Macabiana, Hort. (S. Cotyledon × S. Hottii. S. Hottii var. Macabiana, 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 large. May, June. A garden hybrid. Gn.W. 20:585. J.H. III. 57:61.

112. ambigua, DC. (S. media × S. aretioides). About 2½ in. high with reddish or purplish glandular fl.-st.: lvs. linear, nearly oblong and a little reflexed: fls. purple, red or coppery, with the petals a little longer than the calyx-lobes. Pyrenees. G.C. III. 54:183.—One of three native hybrids resulting from this cross, ambgua comes nearest to S. media, with red sepal and petals; S. luteo-purpurea, Lapeyr., is intermediate between the parents and has red sepals and yellow petals; while S. Lapeyrousi, Don, resembles S. aretioides more closely; its sepal are green and its petals yellow.

113. aurantia, Hort. (S. media × S. aretioides). More or nearly resembling S. aretioides but the rossettes are larger: fls. very similar. Very similar to S. luteo-purpurea, Lapeyr.

114. intermedia, Hort. (S. Grisebachii × S. Strighb. S. Grisebachii var. intermedia, Hort.). Very similar in all respects to the former, but with a racemose inflo. instead of a spike one, the pedicels longer than those of S. Grisebachii: fls. red. Probably a natural hybrid. G.C. III. 46:105.

115. Bertolíni, Sünderm. (S. Friderici-Augusti × S. porophylla). 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: inf. a nodding raceme borne on a red stem, with red leafy bracts which are tipped with green: fls. red, on short pedicels. A garden hybrid.—Does well in a crevice or on a ledge, but requires lime.

116. Kellneri, Sünderm. (S. Friderici-Augusti × probably a form of S. Surseriana). 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, Kellner (S. Ferdinánd-Côbargi × S. sancta). An intermediate in character, but vigorous like S. sancta. 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.


119. alpina, Hort. (S. nivalis × S. sancta). An intermediate in character, densely white to cream-colored, and very profusely. G.C. III. 44:186. Var. Alba, Hort. Habit free, the fl.-sts. 3 in. high, the fls. pure white or pale cream-colored and hyaline. Var. Málýi, Hort. (S. Málýi, Hort., not Schott, also spelt Mált and Moly). S. luteo-purpurea var. Málýi, Hort.), has deeper-colored fls. which are better shaped and
later opening than the type. Var. pálido, Hort., a form said to have pale yellow fls., is offered in the trade.

119. pándens, Sündem. (S. Rocheliana × S. juniperifolia). In general appearance 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. Its fl.-sts. are about 1-2 in. high, glan-
dular-hairy and tinged red-brown, bearing several deep golden yellow fls. which are larger and paler than those of juniperifolia. A garden hybrid.

120. Börissii, Kellerer (S. marginata × S. Ferdinandi-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 fls. which are paler than S. Ferdinandi-Coburgi. A garden hybrid raised in Sofia, Bulgaria.—S. Kyrillii is another product of the same cross.

121. Kyrillii, Kellerer (S. marginata × S. Ferdinandi-Coburgi). Another product of the same cross as S. Borissii but more closely resembling the former parent. The lvs. show the chalk-pits more distinctly; the green, glandular sts. are about 3 in. high and bear pale yellow fls. which are lighter and usually larger than those of S. marginata. March. A garden hybrid, raised at Sofia, Bulgaria.

122. Sündemanni, Hort. (S. marginata × S. Burseriana). A smaller plant than S. Obristii (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. Obristii, 3/4 in. diam.: lvs. 3/4 in. long, broadest at the base and tapering to a point as in S. Burseriana, upper surface channeled or concave and covered with a chalky deposit on the margins and apex: infl. 1-2 fl.-sts. borne on green fl.-sts. which are obtruse, bracted, and covered with glandular white hairs: fls. white, 3/4 in. across: sepal obtruse, tinged red-brown and glandular; petals with crisped margins as in some forms of S. Burseriana and double the length of the sepal. A garden hybrid. G.C. III. 49:228.—Very free-flowering.


124. kestoniensis, Hort. Supposed to be a seedling of S. Burseriana, though by some said to resemble S. scardica 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.

125. Bödyi, Dewar (S. Burseriana × S. arctioides. S. Burseriana var. Bödyi, Hort.). Plant tufted, gray and very slow-growing, fairly intermediate: lvs. more nearly resembling S. Burseriana, but instead of taper-
ing to an acute point they are linear with an abrupt point: infl. 1-3, rarely 4-5-fl.: fls. almost as large as those of S. Burseriana, but yellow as in S. arctioides. March. A garden hybrid. G.C. III. 39:290. G. 32:333. G.M. 53:317. Var. álba, Hort. (S. Burseriana var. Bödyi, Hort.). A plant which very little resembles S. Bödyi and by some is thought to be a hybrid (S. Rocheliana var. coriophylla × S. Burseriana). Lvs. subulate, arranged in small rosettes which form dense cushions: fls. white, borne on scapes about 2 in. high, bearing a cystis of 3-4 fls. Gt. 71, p. 178; 72, p. 177. It resembles S. Burser-
iana 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. Fulordside, Boyd (S. Burseriana × S. arctioides). Lvs. silvery, st. suffused with pink: fls. lemon-
yellow, borne in 2's or 3's, 3/4 in. diam., 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.—Fuss-flowering. The same cross as S. Boydi, but freer growing and with larger fls. of a better form.

127. Salomónii, Sündem. (S. Burseriana × S. Rochel-
iana. S. salmónica, 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-

128. Obristii, Sündem. (S. Burseriana × S. margi-
Hort., S. Ferdinandi-Coburgi). 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 st., about 1 in. across, ivory-white; petals broad, rounded and overtopped as in S. marginata. 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 fls. resemble S. marginata. Another distinct form resulting from this cross is S. Sündemanni.

129. Elisabethae, Sündem. (S. Burseriana × S. Burseriana. S. Cherriespree, Hort.). Very free-growing, form-
ing cushion-like tufts: lvs. deep green, in small rosettes which are closely packed together: fl.-sts. 2 in. high, tinged red, glandular; the bracts tipped with green: fls. yellow (variously stated as sulfur, primrose, and canary), quite large and in heads of 3-5. March, April. A gar-

130. Irvingii, Hort. (S. Burseriana var. macrantha × S. Fedricti-Augusti. S. Burseriana var. dgeva, Hort. S. Burseriana var. rosea, Hort.). This partakes more of the character of the former, with similar tufts of foliage and single fls. The latter plant shows in the color of the fls. which are blush-pink, deeper at the center. The fl.-sts. are only 1 in. or so high and the plant is very free-blooming. March. A spontaneous plant at Keswick. G.C. III. 155:149. p. 193; 79, p. 152. G.M. 58:149.—S. kevensis is another product of the same cross but more allied to S. Fedricti-Augusti.

131. kevensis, Hort. (S. Burseriana var. macrantha × S. Fedricti-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; fls. intermediate in shape: sepal deep red and glandular, while the petals are rose, much deeper colored toward their base. March. A garden hybrid. G.C. III. 51:247.

132. bursiculátæ, Jenkins (S. Burseriana var. major × S. apiculata). Plant about 3 in. high, with silver-

133. Paulinae, Sündem. (S. Burseriana var. minor × S. Ferdinandi-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. Elisabethae, but the foliage is more glaucous and the rosettes are smaller. Var. complícata, Hort., is said to have compact cushions
134. 

**Haagei**, S. ündern. (S. *sænta* × S. *Ferdinandi-Coburgi*). This more nearly resembles the latter parent. Its habit is very compact, its foliage is similar and glaucous, its flowers are large, bracted, tinged red-brown, and glandular-hairy; its golden yellow, 4 to 5 at a st., clustered in heads. March, April. A garden hybrid. *Gn. 78*, p. 170.

135. 

**Godseffiana**, H. ort., also known as S. Godseff and S. L. S. Godseff (S. *sænta* × S. *Elizabeth*). Habit of growth intermediate, foliage spiny and in close tufts: fls. 3–4 in. high, reddish and having reddish greenish base. It is seen in the garden. *S. circinata*, H., is offered in the trade as a white-flowered species. —S. *cornutæ*, H., is offered in the trade and said to have white fls.—S. *carpophylla*, H., is offered in the trade as one of the many species of S. *Carpophylla* which are not recognized. Here is a missspelling of phylla, which is a variety of S. Rocheiana.—S. *circinata*, H., is said to have silver-bracted foliage and little purple pin flowers of white fls. —S. *paradoxa*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *atrorirens*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. *S. latifolia*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *Hedwicca*, H., forms cushions of rather palm green, about 6 in. high, the growth being packed and somewhat rosetted; its white fls. are pure white and numerous. Probably belongs in Section *Dactyloides*.—S. *Hector*, H., is offered in the trade. —S. *Hybrida*, H., ort., not others—S. *desipna*—S. *Hybrida*, H., said to be a white-flowered species. It is locally seen in the garden. *S. circinata*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *Ivana*, H., is offered in the trade as a very compact form, 6 in. high, with white fls. Probably belongs in Section *Dactyloides*.—S. *Lindeisiana*, H., also spelled Lindisiana, is offered in the trade as the white-flowered species. It is locally seen in the garden. —S. *Lingaforsii*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *palmata*, H., is uncertain and seems to be sometimes S. *palmata*, sometimes S. *palmata*, and sometimes S. *palmata*, as one of these species with variegated foliage. —S. *Paradoxa*, H., is described in a trade-list as a beautiful member of the *Aconitum* group with long white foliage. —S. *pallida*, H., is possibly a hybrid between S. *crucisata* and S. *Hostii*. Considered by some as a variety of S. *Aconitum*, which is a species of the genus *Aconitum*.—S. *Pedatifida*, H., is offered in the trade as a white-flowered species. —S. *Pseudofischeri*, H., is offered in the trade as a hybrid of the encrusted section. *S. sancata*, H., is offered in the trade as an early yellow-flowered form. —S. *prolifera*, Don.=Leptarrhenia prolifera, B. Br. =S. *sænta*, H., is offered in the trade as a dwarf plant of spreading habit, growing 4 in. high and having white fls. Probablly belongs in Section *Dactyloides*.—S. *rugifera*, Lap. =S. *sænta*—S. *rugifera*, Sahih. =S. *hypnoides*. Which of these is the material offered in the trade as a very compact plant growing 6 in. high, with white fls. cannot be determined with certainty. It is probably the second as it is said to belong to the mossy section.—S. *Schroederi*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *Semenfölia*, H., is offered in the trade.—S. *Stibophyti*, Bois. Fig. 3538. Of the Cymbalaria group, perennial, creeping, forming long-tailed yellow or black or reddish lobed lvs. and small yellowish fls.: petals ovoid-elliptic. A good rock-plant, but not to be in the trade. —S. *Strobilophyti*, B. Br. =S. *sænta*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *Tautschii*, H., is offered in the trade as a white-flowered species. *Var*. *persifolia*, H., is also offered.—S. *tenuifolia*, H., is offered in the trade as growing 6 in. high, with white fls. Probably belongs in Section *Dactyloides*.—S. *Van Holtei*, H., is offered in the trade. It belongs to Section *Bergenia* and has light pink fls.—S. *speciosa*, H., is offered in the trade as a white-flowered species. It is locally seen in the garden. —S. *Webbiaea*, H., is offered in the trade. Possibly belongs in Section *Dactyloides*.

**C. **(Latin, *ich*, referring to medicinal use). *Dissectaceae*. *Scabiosa*, or *Morning Bride*. Annual or perennial herbs, their base more or less woody, comprising some of the showy and commonly cultivated garden flowers.

Leaves entire, dentate-lorate or dissected; heads terminal, depressed subglobose or ovoid-conical, pedunculate or rarely sessile in a dichotomous inf.; flowers of the involucre 1–2-rowed, hermaphroditic; fls. blue, rose, yellowish, or white; calyx bristly; corolla-1 4–5-cleft, subequal or frequently oblique or 2-lipped; stamens 4, very rarely 2: achene adnate to the involucre at the base or up to the middle. About 70 species, Eu., Asia, and Afr., rare in the tropics.

In any moderately good garden soil a succession of flowers is produced from June until frost. The flowers are very serviceable for cutting purposes. Propagated by seed or division. Many of the perennial species act like biennials in cultivation, and often flower the first year from seed. *S. atrapurae*, or *purple saxifrage*, is a common garden annual, of easy cultivation from seed.

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**KEY TO THE SPECIES.**


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-epsilon, the lobes radiate. June and later. S. Eu.

4. brachiatA, Sibth. & Smith. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately parted, segments oblong or oblong-linear, entire or dentate; the upper often undivided: calyx-long-stipitate; corolla white or yellowish white, rarely rose or blue, lobes nearly entire or crenate: fruiting head spherical. Eu., Asia Minor, and Persia.

5. ucRANICA, Linn. (S. Wilfienii, Roem. & Schult.). Biennial or perennial: st. erect, branched: lvs. pilose-pubescent with appressed white hairs; the lower pinnately parted, segments oblong or oblong-linear, entire or dentate; the upper often undivided: calyx-long-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. ovate-linear, long-spatulate, entire; the other lvs. lyrate, lateral segments on each side 1-2, short, lanceolate, terminal segment much larger: involucre segments at base; calyx limb short-stipitate; corolla pale violet, lobes denticulate: fruiting head ovate. Asia Minor.

7. atropurpurea, Linn. (S. major, Hort. S. martima, Linn. S. calyptrata, St. Amans.) Sweet Scabious. Fig. 3564. An annual branching plant about 2 ft. high: radical lvs. lanceolate-ovate, lyrate, coarsely dentate, st.-lvs. pinnately parted, the lobes oblong, dentate or cut: fls. dark purple, rose, or white, in long-peduncled heads, becoming ovate or oblong in fr. July-Oct. S. Eu. Gn. 21, p. 118. B.M. 247. F.S. 12:1203. —Very variable and in common cult. S. varia, Hort., not Gilib., is probably a name applied to mixed varieties of S. atropurpurea. Var. candidissima, Hort., is a white-flowered form; also occurs double under the horticultural names of candidissima flore-pleno and candidissima plena. Var. occinea, Hort., is a scarlet-flowered form. Var. compacta, Hort., only a compact form, probably referable to var. grandiflora. Var. flore-pleno, Hort., see var. grandiflora. Var. grandiflora. Var. atropurpurea var. maxima, Hort. S. atropurpurea var. flore-pleno, Hort.), is really a large-flowered strain occurring in several variant forms based on habit, fl.-color, and the like. One form is known horticulturally as grandiflora compacta, also occurring double, and a second as maxima plena. By some authorities this variety includes all the foregoing: it is the common garden strain. Var. major, Hort., also known horticulturally as grandiflora major, is a tall-growing form of which the following variations are named in the trade: major aurantia, major sulphurica, and major compacta atropurpurea. Var. maxima, Hort., see var. grandiflora.

S. minuta, Hort., see var. minuta. Var. minima, Hort. (S. atropurpurea var. minor, Hort. S. minor, 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: minor auroa flore-pleno, also known as S. minor auroa flore-pleno, which has light yellow double fls.; nana foliolosa with yellow foliage, and nana plena. 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 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 sts., good for cutting.

8. japonica, Miq. Perennial, tufted, about 2 ft. high, dichotomously branched: lvs. pinnatisect, lobes narrow: fl.-heads terminal or axillary, very long-peduncled, violet-blue, about 2 in. across, involucral bracts in 2 rows, very unequal, shorter than the fls. Sept. to frost. Japan. —Closely allied to S. atropurpurea.

9. ochroleuca, Linn. (S. Cumboraria var. ochroleuca, Hort. S. alata, Hort.). A hardy perennial herb about 18 in. high: an annual bearing, whitish-pubescent, the radical crenate or lyrate pinnatifid, tapering to a petiole, pubescent on both sides, those of the st. 1-2 pinnately divided or cleft into oblong or linear lobes: peduncles long, slender: lvs. of the involucre shorter than the fls. June to autumn. Eu. and Asia. Var. labiata, Hort. (S. labiata, D. Don). Height 1 ft. lower lvs. canescent-villos, the upper glabrous. Resembles the type but is smaller in all its parts. B.R. 717.


F. TRACY HUBBARD.†

SCABIOSA. For common scabious, see Scabiosa. For Shepherd's or Sheep scabious, see Jasione perennis.

SCÆVOLA (Latin, a diminutive of sceva, the left-handed, probably alluding to the form of the corolla). Goodeniaeæ. Herbs, subshrubs, or shrubs suitable for greenhouse culture: lvs. alternate, fls. solitary between 2 bracteoles, sessile or pedunculate, axillary or the peduncles dichotomously branched with a fl. in each fork; calyx-tube adnate, limb usually very short; corolla oblique, the tube slit open to the base, lobes nearly equal; ovary wholly inferior or rarely the summit free; 2-celled with 1 erect ovule in each cell, or 1-celled with 1 or 2 erect ovules: fr. indehiscent, more or less succulent. —About 83 species, mostly Australian, but also the Pacific Islands, Asia, and one each in Afr. and the W. Indies. A few of the species which have been cult. are: S. attenuata, R. Br., with broadly lanceolate lvs. and blue fls. in terminal leafy spikes. Austral. B.M. 419. = S. cuneifolia, var. cuneifolia minor, B.M. 55. S. atropurpurea with oblong-cuneate upper lvs. and blue fls. in a long interrupted spike. Austral. S. suavolens, R. Br., a prostrate, or decumbent hardy perennial or subshrub with petiolar lvs. obovate to oblong-spatulate, and blue fls. in interrupted terminal hisurate spikes. Austral. For a recent treatment of this genus, see Krause in Engler's Pflanzenreich, hft. 54 (IV. 277 and 277a), 1912.
SCANDIX

SCANDIX (Greek, to sting, in reference to the roughness of the fr.). Umbelliferae. Globular or pubescent annual herbs, one of them grown for foliage and bloom: lvs. pinnately compound, the segms. small and narrow; umbels composite, few-rayed, or now and then simple (1-rayed); involures none or 1-bracted; fls. white, polygamous; calyx-teeth minute or wanting.

SCAPHOSÉPALUM (Greek, boat and sepal, alluding to the form of the lower sepal). Orchidaceae. 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 nearly so; labellum and sepal small.—The genus contains about 10 or more species.

In a coolhouse well protected from the sun. Keep the summer temperature as low as possible. Give plenty of water when growing. When at rest, water sparingly but do not allow the plants to become entirely dry. Use as small a pan as possible. The culture is like that for masdevallia. (Wm. Mathews.)

SCAPHYGLOTIS (Greek, boat and tongue, referring to the hollowed labellum). Orchidaceae. Branched epiphytic orchids grown in the greenhouse: new branches borne annually at the apex of the old branch, solitary or paired, sheathed at the base, 2-ldv. at apex, finally fleshy thickened, forming pseudobulbs which are linear or narrowly fusiform; lvs. narrow, sometimes linear, coriaceous: fls. in pairs or few in fascicles between the lvs. at the base of the innovation, small; sepals erect 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-auricled at the apex; pollinia 4.—About 15 species, Mex. to Brazil.

SCHAUERIA (after J. C. Schauer, professor at Greifswald, 1813-1845). Acanthaceae. Erect half-shrubby herbs, of greenhouse cult., with entire lvs.: fls. yellow or red, in a terminal thyrs 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.

SCHAUERIA flavicoma, N. E. Br. (Justicia flavicoma, Lindl. Justicia flava, Hort., not Kurz.). Fig. 3556. Half-shrub by 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-

3565. Scandix
Pecten-Veneris. (X½)

3566. Schauera flavicoma, often known to the trade under the name of Justicia flava. (X½)
lobes long, subulate, glandular-hairy, persistent after the corolla has fallen, Autumn. Brazil. B.M. 2816 (as *Justicia calycotricha*). B.R. 1027. L.B.C. 20:1921 (as *Justicia callitricha*). J.H. III. 61:277.—This plant has been confused with *S. calycotricha*, Nees, and has long been cult. under that name. *S. calycotricha*, Nees, has a smooth calyx and broader ovate lvs. which are very obtuse or subacute at the base.

**HEINRICH HASSELBRING.**

**SCHEELEA** (after Scheele, distinguished German chemist). *Palmaceae*. Finnen palms from Trop. S. Amer. They are spineless, deciduous, or dwarf: II-segments, arranged in regular series or grouped, linear, in young plants unequally and obtusely 2-cut at the apex: fls. yellowish, dioecious or monoeccious, the males very numerous in the upper part of the branches, the females few or solitary in the lower part and sometimes peduncled; petals of the males long-club-shaped or cylindrical; stamens 6, shorter than the petals: fr. 1–3-seeded.- About 10 species. Almost unknown in Amer. Cult. in hot moist house. Prop. by rarely obtainable imported seeds. Considered by some the same as *Cocos butyracea*. The following species has never been described as a Scheelea and it is only by inference on Karsten's part that it can be placed there. *S. butyracea*, Karsten. This species was once cult. in S. Calif. Francechi remarks that it comes from Venezuela and is a magnificent palm with the habit of attalea. H. A. Siebrecht states that it is rare in cult. and that it is more interesting than beautiful. On account of its large st.-base or crown, it requires so large a pot or tub for the size of the plant that it does not make a very ornamental subject.

**N. TAYLOR.**

**SCHEERIA** (Frederick Scheer presented the original species to the Royal Botanic Gardens at Kew, he having received material in 1850, through J. Potts, from Chihuahua, Mex.). *Gesneriaceae*. A name proposed for 4 Mexican and Trop. American herbs which are now referred to *Achimenes* (which see). From Achimenes, Seeman, its founder, distinguished it "by its truly infundibuliform, not bilobed, stigma." In habit, the genus suggests *Achimenes hirsuta*, A. pedunculata, and *A. multiflora*. In the American trade one species is offered, *S. mexicana*, Seem. (*S. carolitseens*, Hook. f.). St. erect, hairy, ovate, dentate, stout-stalked, opposite: fls. solitary in the axils, stalked, the corolla 2–2½ in. long, the tube inclined or drooping and curved, the wide-spreading 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743. H.F. II. 3:160 (as *Shuria mexicana*). Gt. 2:354. This will be found under its accepted name *Achimenes Schereri*, Hems!, in the supplementary list, Vol. I, p. 208.

**L. H. B.**

**SCHEFFLERA** (named after G. C. Scheffer). Including *Heptapleurum*, *Paratropia*, and *Sciadophyllum*. *Araliaceae*. Glabrous or pubescent trees or shrubs or sometimes climbing by means of switch-like branches, grown in 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 spineless, 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, subglobose or angulated. About 150 species in the tropical regions of the world. *Paratropia Stelteneriana*, Barb.-Rodr., belongs to this genus. See under *Paratropia*.

**odorata**, Merr. & Rolfe (*Polyscia odorata*, Blanco). A glabrous vine 6–18 ft. high:

**F. TRACY HUBBARD.**

**SCHIMA** (said to be an Arabian name). *Ternstroemiaceae*. Evergreen trees or shrubs, suitable for the warm-house: peduncles 1-fl., solitary in the axils or above crowded in a short raceme; fls. showy; sepals 5, slightly unequal; petals 5, much larger, connate at base, strongly imbricate, the outermost concave or somewhat hooded; stamens numerous; ovary 5- (rarely 4–6) celled: caps. ligneous, commonly depressed-globose.—About 9 species, Trop. Asia. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as *Gordonia Schima* and *Gordonia* is closely related generally, distinguished by Bentham and Hooker as follows: Schima has inferior radicles, sepals scarcely unequal, ovules few in each locule and laterally affixed; Gordonia has superior radicles, sepals markedly unequal, ovules numerous in each locule and pendulous.


**F. TRACY HUBBARD.**

**SCHINUS** (Greek name for the mastic-tree, *Pistacia Lenticus*; applied to this genus on account of the resinous mastic-like juice of some species). *Anacardiaceae*. Resinous dicycous trees, one much planted in California.
SCHONUS

Leaves alternate, pinnate; fls. sessile, axillary; panicles terminal, bracteate; fls. small, whitish, with short, 5-lobed calyx, 5 imbricate, petal-like, linear petals, and 10 stamens: frs. a globose drupe.—About 17 species, all S. American except one in the Hawaiian Isl., one in Jamaica, and one in St. Helena. Only two are cult.; they are semi-tropical and grown in the warmhouse at the E. and in N. Eu., in the open at the S. and in Calif. From the San Francisco Bay region. 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 sows 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 oleander 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. terebinthifolius 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 Brauntom.)

Molle, Linn. PERUVIAN MASTIC-TREE. CALIFORNIAN PEPPER-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 frs. the size of peppercorns (whence the popular, but misleading, Californian name), of a beautiful rose-color. Peru. G.F. 8:505. R.H. 1889, p.225. G.C. III. 17:588, 589. Gn. 25, p. 418. B.M. 3339.—In South and Cent. Calif. more extensively cult. than any other ornamental tree except, perhaps, the blue gum (Eucalyptus globulus), and thriving best in the warm interior valleys, though hardy on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. Molle was a generic name used by Tournefort, and placed in apposition with Schinus by Linnaeus (explained above).

terebinthifolius, Raddi, with racemose fls., lvs. composed of 7 broader, somewhat serrated lfts. and scarlet berries, is sparingly met with in cult. in S. Calif., and probably hardy in San Francisco. Brazil.

dependens, Ort. (Duavaa dependens, DC.), is a shrub or small tree, with more or less drooping branches: lvs. 1½-in. long, oblong or ovate; fls. yellow, 1 line long, produced in great numbers in races about as long as the lvs.: berries black. W. S. Amer. B.M. 7406. B.R. 1508 (Duavna ovata); 1573 (D. dependens); 29:59 (D. longifolia).—The berries are said to be used medici. in Argentina. The genus Duvana was distinguished from the genus by simple foliage, but it is now considered a subgenus of Schinus.

Jos. Burtt Davy.

SCHISMATOGLOTTIS (Greek, falling tongue, referring to the fact that the limb of the spathe soon falls off). Araceae. Herbs, with stoloniferous rhizomes and the caudex above ground, grown in the warmhouse and also adapted to culture in the dwelling where a day temperature of 70° can be maintained throughout the winter. Leaves oblong or ovate-cordate, rarely hastate or lanceolate, frequently marbled, maculate, or striped; petiole sheathing at base or nearly to the middle; peduncles solitary or fascicled: spathe cylindrical; spadix sessile, included in the spathe, upper portion male which is cylindrical or clavate, lower portion female, shorter or narrower, cylindrical or conical, sometimes the two are interrupted by an aborted male area: fls. monocious, male perianth none; stamens 2-3, distinct; female perianth none, staminoids if present few, ovary oblong.—About 75 species, mostly natives of the Malay Archipelago. Monographed by Engler in Engler's Pflanzenreich, hft. 55 (IV. 23Da), 1912.—Among the finest variegated foliage plants of the arum family and hardly if at all inferior in beauty and ease of cult. to the popular dieffenbachias, which they closely resemble. For cult. see Diesenbachia and also see Philodendron, to which the genus is somewhat closely allied.

AA. Petiole shortly and broadly sheathed only at base.

b. Blade oblong-lanceolate; caulicle erect.

c. concinna, Schott (S. Lavadleii, Lind.). Lvs. lanceolate or lanceolate-oblong, rounded or narrowed at the base but not cordate, blotched with silvery white, some of the blotches much larger than others: petiole 6-8 in. long; blade 5-7 x 1½-2½ in.; sheath reddish. Malayas. I.H. 28:418. Var. immaculata, N. E. Br. (S. Lavadleii var. Landeriiana, Lind.), differs in having purple sheaths and leaf stalks, and foliage green above, dark wine-purple below. Var. purpurea, N. E. Br., is a Sumatran form with foliage blotched gray above and dark wine-purple beneath.

BB. Blade ovate, about 1½ times longer than broad; base emarginate or subcordate.

c. The petiole longer than blade.

D. Upper surface of blade ashy-blotched.

püchra, N. E. Br. (S. decora, Bull.). Lvs. ovate, obliquely cordate, irregularly blotched with silvery

3568. Foliage and fruit of Schinus Molle. (X⅔)
SCHISMATOGLOTTIS

Ivs. 3110 Var. are Wittmanidna S. New green, A.G. in. was broad posterior are impacted c.

SCHISMUS midnerve, small plain oblongifdlia p.

SCHIZANDRA

pusilla, 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 compound divisions. Kurly locally as 'curly-grass'. The prothallus resembles the protonema of a moss, being filamentous rather than thallose as in ordinary ferns.

L. M. UNDERWOOD.

SCHIZÁNDRÁ (Greek, schizein, to cleave, and aner, andros, man, stamen, referring to the cleft or separate anther-cells). Including Sphaxóstema and Maximo-

vicia. Magnoliáceæ. Ornamental vines grown chiefly for their handsome bright green foliage and the scarlet or orange-red berry-like fruits.

Deciduous twining shrubs: lvs. alternate, long-petioled, entire or dentilicate, exstipitate: fls. slender-stalked, in few-fld. axillary clusters, dioecious or monoe-

cious; sepals and petals 9-12, not differing; stamens 5-15, more or less connate; carpels numerous, imbric-

ated in the fl., developing into berries disposed on the elongated filiform receptacle, forming a drooping ra-

ceme.—Ten or 12 species in E. Asia from N. China and Japan to the Malay Archipelago and one species in N. Amer. The frs. of the Asiatic species are eaten in their native countries.

These are handsome vines mostly twining to the height of 10 to 20 feet, with bright green medium-

sized, generally ovate or elliptic, slender-stalked leaves and with axillary long-stalked usually cup-shaped white or red flowers followed by showy 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. occidentalis grows only South Texas. This species has the racemes hanging rocks, trees, shrubs, or fences, and seem to thrive best 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. Propagation is by seeds, by greenwood cut-

tings under glass, root-cuttings or layers, and also by suckers.

coccineá, Michx. High-climbing shrub: lvs. slender-

petioled, ovate or oval, acuminate, entire or obscurely denticulate, glabrous, 2-3½ in. long: fls. monoe-

cus, crimson-purplish, ⅜-⅜ in. across; stamens 5, connate into a 5-lobed disk with the anther-cells widely sepa-


chinénésis, Baill. (Maximoviácia sinénésis, Rupr.). Climbing to 25 ft.: lvs. broadly oval or ovate or acute, or acuminate, remotely denticulate, dark green and shining above, glabrous except at the veins beneath, 2-4 in. long; petiole ½-1½ in. long: fls. dioecious, pinkish white, ½ in. across, fragrant; stamens 5, divided at the apex: berries scarlet, forming a rather dense raceme 1-4 in. long. May, June. Japan, N. China, Amurland.


SCHIZANDRA

Seeds

The form deep several purple.

3

Offered anterior

A.

Plenty early any.

Cult.

Brown,

Hort.,

Leaves corolla-tube lip

164.


ALFRED REHDER.

SCHIZANTHUS (Greek, split and flower; from the incised corolla). Solandraceae. BUTTERFLY FLOWER. Erect half-hardy annual herbs, more or less glandular, violaceous, grown outdoors and also in the greenhouse for bloom. They can be trained into immense pot subjects.

Leaves frequently pinnatisect, the segms. incised or dentate: cymes terminal and open: fls. incised, showy and variously colored; calyx deeply 5-lobed, almost 5-parted, the lobes linear; corolla-tube short or elongated, cylindrical, the limb spreading, oblique, somewhat 3-lipped, laciniate; perfect stamens 2, exerted; disk inconspicuous; ovary oblong, 2-celled: caps. membranaceous-chartaceous; seeds numerous.—About 7 species, all from Chile. These choice plants are of easy cult. in any, good garden soil. They are also useful as pot-plants for spring flowering, the seed being sown in early fall and the plants kept in a light house and given plenty of root-room as they need it. There is a strain offered in trade under the name of S. hybridus, Hort., which is not readily placed botanically. It does not appear to be specific in rank and apparently consists of a series of large-flowered garden hybrids. It is offered in several variations.

a. Corolla-tube as long as the calyx; stamens short-exserted.

b. Middle segm. of the anterior lip of the corolla notched at summit.

pinnatúus, Ruiz & Pav. (S. pórrigens, Graham. S. Pristíhi, Paxt.). 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 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; 1562 (as var. humilita). Gng. 12:613. G.W. 3, p. 497.—The plant known horticulturally and in trade, as S. grandiflorus, Hort., and variations, undoubtedly belongs here.

Var. álbus, Hort. (S. grandiflorus álbus, Hort.), has fls. slightly larger than the type, white or yellowish. Var. can-
didissimus, Hort., has pure white fls. Var. compáctus, Hort., is a compact form similar to var. nanús, and offered in several forms in the trade. Var. lilácínus, Hort., has lilac fls. Var. nánús, Hort., is dwarfer than the type, offered in several colors in the trade. Var. níveus, Hort., has pure white fls. Var. oculá tus, Hort. (S. grandiflorus oculátus, 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. B.H. 1862:451. H.F.II. 2:264.

Var. papílonácceus, Hort., has a central coloring somewhat as var. oculátus, with the general color of the fl. marbled in various shades. Var. róseus, Hort., has rose-colored fls. Var. tigrílóides, Hort., is also cult.

F. T. HuBBARD.

SCHIZOCÉPSA (Greek, cut and capsule or fruit). Taccáceae. Perennial herbs: root tuberous: lvs. radical, entire, nerve; scape undivided, the fls. umbellate, pedicelled; perigonium-tube connate with the ovary, the limb superior, 6-parted, unequal, finally deciduous; stamens 6; ovary 1-celled with 3 parietal placentae: caps. 1-celled, dehiscent along the angles into 3 valves which are soon recurved. One species. China. S. p. tagiínea. Hance. Plant entirely glabrous: lvs. rather broad, lanceolate, entire, acute, 8-9 in. long, gradually narrowed to a short basally sheathing petiole: inf. umbellate, 15-20-fl.: fls. angled-pedicelled, yellowish green; caps. trigonous, vertically convex-complanate. China. G.W. 4, p. 169.

SCHIZOCÉNTRON (Greek for split and thorn). Melastomáceae. A monotypic genus, the species being S. élegans, Meissn. (Heíria élegans, Schlecht. Heíria procumbens, Naudin. Heterocéntron élegans, O. Kuntze). A low creeping vine-like plant forming a dense carpet, rooting at the joints: branches terete or nearly so, reddish, somewhat appressed-pubescent: lvs. ovate, distinctly petioled, obtuse: fls. solitary and terminal on slender peduncles, less than 1 in. long; corolla a deep
SCHIZOCENTRON

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.

SCHIZOCODON (Greek cut and bell, referring to the fringed corolla). Diapensiaceae. Glabrous herbs, with the cædus perennial and scale-bearing between lvs., suitable for outdoor planting: lvs. all radical, long-petioled, ovate-rootund, base cordate, crenulate-undulate, leathery and persistent: fls. few at the top of the scape, racemose, subsecond, nodding, 1–2-bracted; calyx 5-parted, the segms. linear-oblong, striate-nerved; corolla 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. 34:323; 44:347. V. 20:119.—This is probably the only species in the genus, as S. uniflorus is Shortia and S. ilicifolius 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.†

SCHIZOLOBIUM, to cleeve and pod, alluding to the manner of dehiscence. Leguminosae. Tall trees adapted to the warmhouse and planted outdoors in the extreme South: lvs. large, bipinnate; lfts. numerous, small; fls. in axillary racemes, borne at the highest point 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.

exélsus, Vog. A tree reaching a height of 120 ft. in its native habitat: lvs. fern-like, with 18 pairs of lfts. which are about 2 in. long and 20-jugulate, oblong, very short-petiolulate, white beneath and golden pilose on the midnerve: fls. yellow, in large panicles. Brazil. R.H. 1874, p. 113.—Intro. into S. Fls. and S. Calif.

F. TRACY HUBBARD.

SCHIZONOTUS: Holodiscus.

SCHIZOPÉTALON (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, oblong. The species is allied to S. Galax. S. WALKER, Sims. St. weak, assurgent: lower lvs. 4–5 in. long, sinuate-pinnatifid, elongate-oblong in outline, long-attenuate at base, securate on both surfaces, distant: peduncles solitary, axillary, but collected at the top into a raceme: fls. white; calyx cylindrical; petals spreading, ovate, incise-pinnatifid. Chili. B.M. 2579. G. 24:240.

SCHIZOPHRAagma (Greek, schizein, to cleave, and phragma, wall; the inner layer of the wall of the valves is eleft into fascicled fibers). Saxifragaceae. Ornamental vines grown for their handsome bright green foliage and their showy clusters of white flowers. These plants are climbing by aerial rootlets: lvs. opposite, long-petioled, dentate or entire: fls. in loose cymes; sepals and petals 4–5; stamens 10; style 1; ovary 4–5-loculed; marginal sterile fls. consist only of 1 large white sepal, terminating the branchlets of the inflo.: fr. 1, 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 climg 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 Greenwood cuttings under glass; also by layers.

hydrangeoides, Sieb. & Zucc. Climbing to 30 ft. and more: lvs. on reddish pétioles 2–3 in. long, orbicular or broadly ovate, shortly acuminate, rounded or cordate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2–4 in. long: cymes peduncled, 8 in. broad; marginal fls. pedicelled, consisting of an oval to broadly ovate white

3570. Schizocodon soldanelloides. (X½)

SCHENIA 3113

fl. - heads
Pseudobulbs
Three
P.F. J.

obs. oblong, Burma, Willd. crustaceous-coriaceous. 

Swiss placed notes Ivs.: obovoid

After England 24:208. the Ivs. house the Ivs.

8520. of Hydrangea coccinea, long: cent. Rehd.

China. ovate long: cent

broadly supported

Hydrangea

stamens 5-8; disk-florets 3-4-celled: fr. stems: subtended petals, which form a considerable beard: fr. from the apex of the youngest joints, 2½-3 in. long, scarlet-red: fr. red. Brazil. B.M. 7201.

SCHLEICHERÀ (named for J. C. Schleicher, a Swiss botanist). Sapindàceae. Tree of some economic value and hardy in the far south of the U. S.: lvs. alternate, not stipulate, pinnate; lfts. opposite (or alternate), entire, repand-white or slightly serrate: inlf. simple elongated peduncles or racemes: fls. small, fast- eded, regular, polyygamous dixoecious: frs. yellow, small, cup-shaped; petals lacking; disk complete, glabrous, brawny, ovary 3-4-celled: fr. dry, crustaceous-coriaceous. One species, Asia. S. trifuga, Willd. A large tree: lvs. paripinnate, 8-16 in. long; lfts. 4-8, opposite, 1-10 ⅞-4⅞ in., elliptic or elliptico-oval, obtuse or short-acuminate, entire, sessile or subpetiolate, racemes axillary; fls. yellow, small, 3½-1 in. long, ellipsoidal, glabrous, apiculate, smooth or spiny. Himalaya region, south through India, Ceylon, Burma, to Java and Timor. Intro. into Calif. —The timber is good, the bark is astringent and when mixed with oil is used by the natives to cure the itch, the oil of the seed is of economic use, and the subacid pulpy aril is edible. F. TRACT HUBBARD.

SCHLIMMIA (named in honor of M. Schlum.), Orchidàceae. Epiphytic herbs, with oblong somewhat spindle-shaped 1-lvd. pseudobulbs, suitable for the greenhouse with cattleyas and the like: lvs. leathery, contracted to the petiole: scapes erect or recurved from between the pseudobulbs, simple, few-sheathed: fls. rather large, fleshy, ivory-white, few in a lax raceme, short-pedicelled; sepals, the dorsal free, narrow, con- cavel-keeled, the lateral very broad, connate with the foot of the column, forming a helmet-like sac; petals narrower than the dorsal sepal, spreading at their tip; labellum variously lobed, the apex reeling on the foot of the column; pollinia 2.—Three species from the Colombian Andes. S. jasminodora, Planch. & Lind. Pseudobulbs long and slender: lvs. oval, long-petioled: scape about 1 ft. high bearing 3 second fls.; fls. white and very fragrant; dorsal sepal linear erect; petals reflexed; labellum fleshy, shorter than the column. Colombia. S. trifida, Reichb. f. Pseudobulbs elongate-ovate, clustered: lvs. oblong, acute: scape lateral, drooping, deep purple, bearing a 1-sided raceme of about 4 fls.: fls. fragrant; dorsal sepal turned downward, lateral waxy white with a few purple spots inside; petals linear, acute, bent outward; labellum trifid at the apex, white, marked with rich orange. Colombia. G.C. II. 7:141.

F. TRACY HUBBARD.

SCHLUMBERGERÀ (named for Friedrich Schlumberger). Cactàceae. Similar to Zygocactus in habit, but with regular fls. and angled fr. Schumann referred some of the species to Phyllocactus (Epiphyllum), but such a reference can hardly be entertained. The genus seems to be confined to Brazil, but little is known about it in a wild condition. Its treatment should be the same as Zygocactus (the old Epiphyllum). Two well-known species are in cult.

Russelliana, Brit. & Rose (Epiphyllum Russellianum, Hook.). Sts. more upright, with pendent branches: joints 3½-1½ in. long by ⅛-¼ in. broad, oblong or obovulate to obovate, light green; margins crenate, with 2-4 areoles on either side, bearing a few very short dark gray bristles; fls. from the end of the youngest joints, red, 1½-2½ in. long: fr. red, 4-angled or narrow- winged. Brazil. B.M. 6317.

Gärtneri, Brit. & Rose (Epiphyllum Gärtneri, Schum. & Schott. E. Russellianum var. Gärtneri, Rus.) Epiphyllum Cactus. Sts. of more upright habit, with drooping branches: joints long-oblong or elliptical to obovate, ⅝-2½ in. long by ⅛-1 in. broad, dark green, margins crenate, with about 5 areoles on either side, bearing 6-12 rather stiff, long, yellow or brown bristles, which are especially conspicuous on the truncated apex, where they form a considerable beard: frs. from the apex of the youngest joints, 2½-3 in. long, scarlet-red: fr. red. Brazil. B.M. 7201.

J. N. ROSA.

SCHENIA (named in honor of Dr. Schen). Compositàceae. An annual, adapted to the greenhouse in the N. and outdoors in the S.: lvs. alternate or the lower ones opposite, entire: fl.-heads in a loose corymb: involucrle tubinicate or campanulate: outer bracts scarious, imbricate, inner row petal-like; receptacle without scales; florets all tubular, 5-toothed; those of the circumference fertile, the disk-florets sterile.—One species, Austral. S. Cassindina, Steetz. An erect corymbose branched annual, 1-2 ft. high: lvs. lanceolate to linear, or oval: frs. in a loose terminal corymb: outer bracts of involucre brown, the radiating laminae of the inner white or pink, oblong; achenes in a single row at the circumference. Austral. J.H.I. 47:7.
SCHOMBOLÈLIA (compounded from Schomburgkia and Laelia). Orchidaceae. A generic name to designate the hybrids between Schomburgkia and Laelia. *S. tibicinis* = *S. tibicinis × L. tenebrosa*.

SCHOMBOLÈLIOCÁTTLEYA (compounded from the names Schomburgkia and Laeliocattleya). Orchidaceae. A name to comprise the hybrids between Schomburgkia and Laeliocattleya. *S. schachbrunnensis* = *S. rosea × L. Lucía*.

SCHOMBURGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). Orchidaceae. Orchids with the habit of cattleyas or laelias, except that they are less compact. Pseudobulbs long, fusiform, bearing several brown scales and 2–3 leathery lvs. at the summit; fl.-sts. from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls.; fls. like those of *Laelia* 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. (X/4)

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. Lyonsii* are to be classed amongst the showy easily grown orchids resembling laelias. (Wm. Mathews.)

tibicinis, Batem. (*Epidendrum tibicinis*, Batem.). Fig. 3571. Pseudobulbs 1–1½ ft. long, tapering upward: lvs. 2–3, oblong, leathery: raceme 4–8 ft. high, bearing numerous fls. each 3½ in. across; sepals and petals oblong, undulate, crisp; lateral lobes of the labellum large, euculate, middle lobe small, emarginate; fls. 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; 9:651. Var. grandiflora, Lindl. Fls. larger and paler, with more yellow in the lip. B.R. 31:30. B.M. 4476.

SCHÖTIA (compounded from Schomburgkia and Cattleya). Orchidaceae. A genus established to contain the hybrids between Schomburgkia and Cattleya. *S. spirális* = *S. tibicinis × C. Mosaic*.


Leaves odd-pinnate; lfts. leathery, or small; stipules short: fls. red, showy, clustered in short panicles; bracts and bracteoles ovate or oblong, caducous; calyx-tube disk-bearing, tubinate, short or the base long-attenuate, sepals 4, strongly imbricated; petals 5, slightly unequal, subsessile, imbricated, either ovate or oblong or minute scale-like; stamens 10, free, or shortly connate at the base; ovary stipitate; legume oblong or broadly-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 separation of this species into varieties and species; lfts. 8–32, linear, oblong, or obovate: fls. crimson, in terminal panicles. S. Afr. B.M. 1153 (as *S. tamarindifolia*).—Intro. in S. Calif.

bb. Petals shorter than the calyx.

brachypétala, Sond. A large shrub or small tree: lfts. 8–10, larger than in *S. speciosa*, ovate-oblong or obovate: panicles many-fl., axillary and terminal; flowers conical, crimson; petals very small, linear; hidden by the calyx. S. Afr.—Cult. in S. Fls. and S. Calif.
an outdoor plant. Lvs. bipinnate, often sensitive, petiole without glands, frequently bristly between the pinnar; the lfts. small; stipules bristle-like; fls. in globose heads or cylindrical spikes, peduncles solitary or fascicled at the axes, rose or purplish, 5-4-merous, sessile, perfect or polygamous; calyx very minute; petals connate to the middle in a funnelform corolla; stamens numerous, free; ovary subsessile: legume linear, acute or acuminate, both sides acute.—About 10 species, all American; one has also been discovered in Trop. Afr. These plants are also known as Morunzia, the following species, in that case, taking the name *M. uncinata*, Brit. uncinata, Willd. Sensitife Brier. A hard herbaceous perennial, branched and decumbent, 2-4 ft. long, well armed with short pinnar: lvs. very sensitive, with about 6 pinnae; pinnae with 16-30 lfts.; fls. pink, in globular heads nearly 1 in. through May-July. Va. to Ill. and south. B.B. 2:256.

**SCHREBERA** (perhaps after J. C. D. Schreber, 1739-1810, physician and naturalist). Oleaceae. Trees with unequally pinnate lvs. and fls. in very much-branched cymes: calyx tubular-bell-shaped, irregularly 4-7-lobed; corolla salver-shaped; tube cylindrical; lobes 4-7, spreading; stamens 2, near the top of the corolla-tube; ovary 2-celled.—About 15 species, Afr. and India. Nathusia, with 4 species at the date of Engler & Prantl, Die Pflanzenfamilien, IV. 2 (1890), is a synonym of this genus.

**swietenioides**, Roxbg. (*Nathusia swietenioides*, Kunze). A tree, about 40 ft. high, nearly glabrous; lfts. 5-7, ovate, acute, 4 x 2 in.: fls. white, with brown marks, about 1/2 in. across, in many-fld. cymes. Cult. in S. Fla.

**SCHUBERTIA** (named after Gotthilf Heinrich von Schubert). Asclepiadaceae. Twining shrubs, occasionally grown in the warmhouse; lvs. large: lvs. large, white, borne in loose umbels; sepals ovate, generally acute, alternating with spines: fls. white, corolla funnelform or salver-shaped, with a broad tube; crown upright, included: follicles thick and hairy.—About 6 species from S. Amer. *S. grandiflora*, Mart. & Zuc. Fig. 3572. Branches twisting, straw-colored, covered with long rigid red-brown hairs; lvs. cordate, obovate, acute, both surfaces densely brown-pubescent: umbels few-fl.; pedicels long-hairy: fls. white; sepals ovate-acute; corolla long, tube gourd-shaped, glabrous inside, the lobes oval-elongate, obtuse, erect, sparsely pale yellow pilose Brazil. G. 36: 503; 37: 351. Gt. 50: 1492. G.F. 3: 369 (adapted in Fig. 3572). Gn. 32:25. *S. graevolens*, Lindl. (*Araujia graevolens*, Mast.), is a Brazilian climber, likely to be found in collections of greenhouse plants, smaller-fl., than the above. See p. 2610, under Physianthus. There may be confusion in the use of the names *S. graevolens*, *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. *Kohleria Warszewiczii*, Hanst.). Perennial herb, 3-4 ft. high, with catkin-like stolons: st., petioles, lvs., and calyx villous-hirsute: lvs. opposite, long-petiolate, 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. Colombia. B.M. 4843. Gt. 2:256.

**SCIADOPHYLLUM** (shade leaf, because of the umbrageous foliage). *Araliaceae*. As understood by Bentham & 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 calyptrae 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, skias, skiados, umbrella, 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. monoeious; the staminate ovary, 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 ovules: cone oblong-ovoidal, woody; the bracts crowded, with the broadly orbicular thick scales spreading at the margin; seeds oval, compressed, with narrow wing, emarginate 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
SCILLA

(SCILLA) (the old Greek name used by Hippocrates: I injure, according to Miller, alluding to the poisonous bulbs). Lis àèéé. SQUILL. WILD HYACINTH. BLUEBELL. Perennial bulbous plants remarkable for easy culture, quick growth and beautiful blue, rose, or white flowers, blooming early in the spring (some in autumn), and therefore desirable plants for the wild-garden, rock-garden, or border; they are very useful in pots for midwinter flowers, for window-boxes and for room-decoration; some are stone plants; some of the South African forms have handsome spotted foliage.

Bulb tuniculate, large or small: Ivs. radical, 1 to several in number, linear, liriform, lanceolate, oblong or nearly ovate, in Scilla autumnalis appearing after the fls.: scape 1 to several, simple, leafless: fls. in racemes, which are several- to many-fl., open, compact or spiral: bracts small, sometimes minute, hyaline: pedicels short or long, sometimes filiform: fls. small or middle-sized (1 in. across), segms. of perianth distinct, perianth blue, porcelain-blue, rose-colored or whitish, open-rotate, cylindric-campanulate, or open-campanulate, segms. persistent for some time; stamens 6, affixed at base below the middle of the segms.: anthers ovate or oblong, dehiscing longitudinally, introrse; ovary sessile, stigma small, capitulate; ovules 2 in each locale, rarely 8–10, ascending: caps. globose; seeds 1–2 in each cell, rarely more; testa black, appressed; embryo small in albumen. The genus is distinguished in Eu., Asia, and Afr. in temperate districts. The genus is distinguished from Ornithogalum chiefly by the color of the fls. and deciduous perianth, from Hyacinthus by the segms. distinct from the base or very nearly so. Great Britain possesses 3 species of Scilla, S. verna, S. autumnalis, and S. nonscripta, while Germany has, in addition to S. autumnalis, 3 others, viz., S. amana, S. bifolia, and S. italica. For S. Fraseri, see Camassia.

Among the early flowers there is none more valuable than the scillas. They are considerably in form of flower and foliage, 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 Asia Minor or Taurian kinds are in advance. The form of S. sibirica known as multiflora is the form nearly always before type bifolia. There is also sometimes cultivated in the garden a pleasing white scilla, with hyacinth-like flowers, known to the trade as S. amana. 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). Chionoscilla 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 series of years, they seldom disappoint one 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 by offsets 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 no special connection on account of its yielding a medicine for many centuries held in esteem. Almost everyone is familiar with syrup of squills, and has obtained relief from its use in severe colds. The scales of the bulbs contain mucilage, sinstrin, sugar, and crystals of calcium oxalate (stated by botanists to ward off snails); the active principles are scleripin, scilicin, 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 more varieties of species have been defined botanically. The following names are thought to include all those in the American trade, but other species are known to fanciers.

INDEX.

KEY TO THE SPECIES.

1. None scripta, Hoff. & Link. (S. nütans, Smith. S. festiva, Salv. S. cernua, Salv. Hyacinthus nonscriptus, Linn.). Common Blue Squill. Harebell. Lvs. 10-18 in. long, ½ in. broad, subaerate, concave; scape solitary, tall, stout; raceme 6-15 in.; flowers in pairs: fls. blue, purple, white, or pink, drooping. April-June. W. Eu., Great Britain. B.M. 1461. Among the garden forms are Alb, white; caerulea, blue; lilacina, lilacblue; rosea, rose- or pink-colored; cernua, nodding. —This is one of the most beautiful of squills, fragrant, thriving best in somewhat shady and sheltered places. It is placed in the genus Hyacinthus, on account of the general form of the perianth, it was removed to Scilla as having the segms. distinct or nearly so, and is now often considered as forming a distinct genus (Agraphis, Link; Endymion, Dumort.), either alone or with other species which connect it with the other squills.


3. Hispánica, Mill. (S. campanulata, Ait. S. pátula, DC.). Spanish Jacinth. Bell-flowered Squill. Lvs. 5 or 6, glabrous, ascending, lanceolate, ½ in. broad, subobtuse, convex at back: scape long; raceme equatorial, 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. Gn. 78, p. 456; 79, p. 265.—Hardy. Several varieties of it are in the trade under the specific name campanulata, viz., álba, white; albomálor, large white; círcea, flesh-colored; hyacinthoides, hyacinth-like; rosea, 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. Numidica, Poir. (S. parviflora, Desf.). Bulb ovoid, 1-2 in. thick: lvs. 4-6, fleshy, herbaceous, linear, 6-8 in. long, 1½-3 in. broad, suberect: scape solitary or paired, ½-1 ft. high; racemes dense, 30-60 flds.: pedicels short, ascending, 3-5 in. long; bracts minute, linear, evanescent: perianth rose-purple, 1½-3 in. long: single ovule in each of the ovarian cells: caps. small, globose, grooved. Flowering in winter in its native home, Algeria.

3575. Scilla peruviana in full bloom.—Also known as Scilla ciliaris. (X3)


6. Autumnalis, Linn. Autumn Squill. Starry Hyacinth. Lvs. several, obtuse, channeled, half-linear, growing on through the winter and dying away in the spring: scapes several: racemes corymbose, spike, open; perianth rose-colored, ½ in. across. July-Sept. Eu. (Great Britain), N. Afr. B.M. 919.—Hardy. The flowering sts. generally precede the lvs. but occasionally the two come up together. As the flowering advances, in most cases a tuft of lvs. similar to those of S. verna shoot out by the side of the st. for the following year.

7. Peruviana, Linn. (S. ciliaris, Hort. S. Clivii, Parl.). Cuban Lily. Peruvian Jacinth. Hyacinth of Peru (once thought to be a Peruvian plant). Fig. 3575. Bulb large, ovate, tuniate: lvs. many, broad-linear, 6-12 in. long; margins ciliated with minute white
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 Peru. 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. *monophyllum*, Link (*S. monophylla*, Plan. *S. pumila*, Broth.). Dwarf Squill. Lf. solitary, inclosing the base of the scape, 2 in. long, ½ in. broad, involute, ovate-acuminate, with a callous apex, glabrous; scape erect, slender, usually 5-20-fl.; pedicels long, ascending, springing from a small sheathing bract; perianth bright lilac, ½ in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May. Spain, Portugal. B.M. 3023.—Hardy.

9. *bifolia*, Linn. Fig. 3576. Bulb tunicated, oblong-oval; lvs. 2, seldom 3, cumulate, 4-8 in. long, ½-1½ in. broad; scape 2-8-fl., ebracteate; 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: *álba*, white-fl.; *rósea*, pink-fl.; *rubér-rima*, red-fl.; *spléndens*, 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. *nataleus*, Planch. Bulb thick, large, ovoid, subglobose; lvs. broadly lanceolate, glabrous, 9-12 in. long, 3-4 in. broad, ascending; scape erect, terete, 1-1½ ft. long; raceme dense, simple, elongated, open, many-fl. (50-100); bracts solitary, subulate; fls. pale blue, stellate, rotate; pedicels long, pale blue. Natal. B.M. 5079. F.S. 10:1043.—Suitable for greenhouse cult. It is a graceful and elegant species, suitable for cult. in pots.

11. *hyacinthoides*, Linn. (*S. parviflora*, Salisb.). *Hyacinth Squill*. Lvs. 10-12, spreading, 1½ ft. long, ½-1½ in. broad, narrowed at both ends, minutely ciliate-denticulate on the margins: scape straight, long; racemes many-fl., broad, open; pedicels long, 1-1½ in.;bracts whitish, minute, persistent; perianth bluish lilac, open, campanulate. Aug. Medit. region. B.M. 1140.—Hardy. This species is noted for its extreme shyness 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. *sibirica*, Andr. (*S. amáena* var. *précoz*, Don.). *Siberian Squill*. Fig. 3577. Lvs. 2-4, ascending, narrow, 4-6 in. long; scape 1-6, 3-8 in. long; racemes 1-3-fl.; fls. rotate, horizontal or drooping, with short pedicels; perianth deep blue. March. Russia, Asia Minor. B.M. 1025. Gn. 11, p. 165. P.M. 14:110. 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., *álba*, *multíféora*, *pálida*; *amáena*, dwarfer with brighter blue fls.

13. *amáena*, Linn. *Star Hyacinth*. Fig. 3578. Lvs. 4-7, flaccid, ascending, glabrous, 6-9 in. long; ½-2½ in. broad; scape several, equaling the lvs.; racemes several-fl.; 4-8, open; fls. distant, ½-1½ in. diam., blue; pedicels ascending or spreading. March. Austria, Germany. B.M. 341. G. 37:295.—Hardy. It grows luxuriantly, several flowering sts. being found on the same plant.

14. *itállica*, Linn. *Italian Squill*. Bulbs ovate, clustered together: lvs. radical, several, flaccid, spreading, lanceolate, acute, 4-8 in. long; ½-2½ in. broad; scape several, equaling the lvs.; raceme dense, many-fl.; pedicels filiform, spreading; bracts in pairs: fls. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segms. puberulous at apex; filaments white; anthers sagittate, dark blue. March—May. B.M. 693. L.B.C. 15:1483.—Hardy. This plant has less brilliant fls. than either *S. sibirica* or *S. bifolia*, 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. *Barnárdia japonica*, Schult. f.). *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; raceme 20-60-fl.; pedicels carébles, fine blue; *álba*, fine white, free-flowering; *rósea*, distinct flesh-colored; *rubra*, deep red, large and fine.

linear Ivs. 2–4 in. long; scape seldom 6 in. long, with several small, erect blue fs. in a short, terminal raceme, almost flattened into a corymb; perianth-segs, scarcely above 3 lines long, spreading. Spring. A plant occurring in stony and sandy wastes near the sea in W. Eu., as in Denmark, reappearing farther east on the Rhine and in Sardinia.—Hardy.

SCIRRUS

3578. Scilla amona. (X ½)

S. axillaris, C. H. Wright. Of robust habit: lvs. 1 ft. long, 3½ in. broad; raceme many-fl.; perianth-segs, white outside with green keel, bright violet edged with white inside. Hab. N. Pothos, Siehe. Bulb bluish violet: lvs. 1–2 in. long, about ½ in. broad at apex; scape slightly taller than lvs.; pedicels one-half as long as fls.; fls. 2–6, bright blue, often tinged with violet; filaments white, thread-like. Asia Minor. G.C. III. 44: 19, dese.

John W. Harshberger.

SCINDAPUS (an old Greek name, transferred to these plants). Araceae. Climbing perennials, differing from Monstera in floral characters and in the long-petioled, long-sheathed, ovato-lanceolate, or ovate-acuminate lvs.—Species about 20 (Engler & Krause, Pflanzenreich, IV. 23B), E. Indies. Scindapsus comprises one popular and worthy greenhouse plant, that known to gardeners as S. argyraeus; also S. aureus, Engler (see Pothos aureus).

pictus, Hassk. Internodes of the st. 3–4 in. long, 2 in. thick; petioles 1½–2 in. long; blade 4–6 in. long, 2½–3½ in. wide, one side half as wide as the other, coriaceous, bright green (drying black), obliquely ovate-cordate. Var. argyraeus, Engler (S. argyraeus, Hort. Pothos argyraeus, Hort.), is the cult. form, with broad, deeply cordate If.-blades which are spotted and blotched above with silvery white. Celebes, Philippines, Java.

S. amolarus, Hort.—Monstera acuminata.—S. Cucumis, Presl, is sometimes kept separate as Cucumis maritifolia. Not known to be in the trade. It is a question whether the Aglaonema commutatum sometimes mentioned in horticultural literature is this species or is properly referable to Aglaonema.—S. pertusum, Hort. =Rhapidophora pertusa.

Jared G. Smith.

SCIRPUS (Latin for bulrush). BULRUSH. SEDGE. Cyperaceae. A large group of rush-like or grass-like plants inhabiting the whole globe. Flowers perfect, in spikeslets 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. 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.


Holoschénus, 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.; spikelets 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.

lacúsiris, Vahl. Great Bulrush. Sts. terete, smooth, tall, stout, and flexible, 3–9 ft: lvs. reduced to a few basal sheaths: bracts very short, erect: umbel compound, flexuous: spikes in heads of 1–5, oblongconical, pale brown, 2½–3 lines long; scales ovoid-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. lacusiris is a 3-style form common in Eu., not found in Amer. S. Tabernamontanus, 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 zebrinus, Hort.). S. validus, Vahl, and S. occidentalis, Chase, are 2-styled American species. S. heterocháctus, Chase, is a 3-styled American form. The bulrush is very effective as a border plant in aquatic gardens.
SCIRPUS

BB. Rootstocks almost wanting: stt. cespitose, forming turf, 3-12 in. high, very slender.

cernus, Vahl (S. grádica, Koch. Isólepis grádica, Hort.). Fig. 3579. Sts. very slender or filiform, cylindric, 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, oblong-lanceolate, 1-3 lines long; solid or thin-walled, obtuse, pale brown or whitish; bristles none; styles 3: achene in greenhouse plants rarely maturing. Widely distributed, common in Eu. G. 21:614; 25:111.—Grows well in damp pots, the drooping sts. producing a very graceful effect. This plant is now considered under Scirpus by practically all authors. S. cernus is an older name than S. grádica.

K. M. WIEGAND.

SCLERÓCARPUS (Greek, hard and fruit), the achenes are inclosed in a hardened pales). Syn., Gymnópsis, in part. Compositae. Annual or perennial strigose-pubescent herbs, suitable for outdoor planting in the S.: stts. branching: lvs. alternate or the lower rarely all opposite, dentate or subentire: heads small or medium, at the ends of the branches, pedunculate, many-fl.: fls. yellow; the ray-fls. to several, fertile; pappus wanting: achenes more or less 4-sided with a broad flat summit.—About 15 species. N. Amer., region of Texas and Mex. Trop. Afr., and Trop. Asia. S. uniserídis, Benth. & Hook. f. (Gymnópsis uniserídis, Hook. Gymnólomia uniserídis, Hort.). Annual, 1-2 ft. high, loosely branched: lvs. alternate, slender-petioled, deltoid- or rhombio-ovate, or the uppermost lanceolate, coarsely dentate, the strigose pubescence of the lower surface canescant: corollas orange. Texas and Mex. R. H. 1853:261. G. C. III. 28:165.

SCLEROCÁRYA (Greek, hard and nut or kernel). Anacáríaceae. Trees or shrubs, one of which, S. caffra, has been intro. into S. Calif.: lvs. aggregated toward the ends of the branches, alternate, odd-pinnate, glabrous; lfts. opposite, long-petiolate, very entire, glaucous below: the male fls. spicate; fls. polygamous; sepals 4, orbicular, colored, imbricate; petals 4, oblong, obtuse, spreading, reflexed, imbricate; disk depressed, entire; stamens in the male fls. 12-15, in the female fewer; ovary subglabrous, 2-3-celled: drupe somewhat fleshy, the shell woody, 2-3-celled.—About 5 species, Trop. and S. Afr. S. caffra, Sond. Glabrous: lvs. alternate, 6-12 in. long; lfts. 1½-2 in. long, with a short, often oblique tapering point, base acute, pale below: male spikes 2-4, terminal: fls. very short-pedicelled, bracteolate, the dried pedicel red: drupe suborbicular, the size of a small walnut. S. Afr.

SCOLÓPENDRUM (from Scolopendrum, the name of a centiped, the resemblance being found in the lines of linear sori on the backs of the lvs.). Polyópidóceae. The name most common in the trade for the hart's-tongue fern (known as Scólpéndrum vulgare) and its varieties. See Phyllílita.

SCÓLYMUS (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 parsnip. 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 scarios 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, pinatifid, 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.

L. H. B.

SCOPÓLIA (named in honor of Joh. Ant. Scopoli, 1725-1788). Solanáceae. Erect slightly branched glabrous hardy perennial herbs for outdoor planting: lvs. membraneous, entire: fls. lurid purple or greenish, veined, nodding, borne on solitary filiform pedicels; calyx broad-campanulate, membranaceous trunuatedly 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, 1 in Eu., 1 in Himalaya, and the others in Japan and China. S. confusiásplices, Hook. (Ulyssipónum confusiásplices, Linn.), 1 ft. or more high: lvs. entire, petiolate, about 3 in. long, ovate or obovate-oblong, subscipidate: fls. soli- tary, axillary, nodding; corolla lurid red, yellow, or green inside. Russia. B. M. 1126.—Somewhat used in medicine.

SCORÓDOSMA: Ferula; supplementary list.
SCUTELLARIA (Greek, scutellum, and tail, 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-stamined, on axillary or terminal racemes, drooping; calyx with the 2 upper lobes connate above; petals long-clawed, the standard suborbiculate, the wings oblique-obovate or oblong, the keel inerupted, beaked-acuminate; stamens free from the standard; ovary sessile, many-ovuled: legume subterete, crenate-involute, subulate or umbrella, the ribs often tuberculate or muricate and indents.-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 peduncle, 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. Medit. region. See the article *Worms.*

SCORZONERA (old French scorzon, serpent; *S. hispanica* 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 white. It 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 hisurte: lvs. sometimes entire and grass-like, or wider, sometimes more or less pinnately lobed or dissected; heads long-peduncled, yellow, the fls. all radiate: achene sessile or villous; Ivs. herbaceous, 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 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.

*hispanica,* Linn. *Scorzonera.* Black SALSIFY. Perennial herb, 2 ft. high: st. much branched: lvs. clasping, lanceolate, or in some forms linear, undulate, glabrous: heads solitary at the ends of the many branches of the inf. Cent. Eu. WILHELM MILLER.

SCOTCH BROOM: *Cytisus scoparius.* S. *Pine: Pisus sylvestris.*

SCOURING-RUSH: *Equisetum.*

SCREW BEAN: *Prosopis. S. Pine: Pandanus.*

SCROPHULÁRIA (a reputed remedy for scrofula). *Scrophulariaceae.* Pigwort. Herbs or subshrubs, glabrous or hisurate, often fett, 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, rather large, greenish, purple, purple, liried or yellow; calyx deeply 5-delt or 5-parted; corolla 5-lobed, short, 4 erect, the anterior one spreading; stamens 4, perfect, didynamous: caps. ovoid or subglobose.—About 150 species, Medit. region, Orient and N. Amer.

*aquatica,* Linn. A tall glabrous plant: stts. very acute-angled or winged: lvs. ovate-oblong, rather often binate; the petioles winged; the pedicels elongated, often 1–2 ft. long, the cymes peduncled, laxly many-flld.: calyx-segms. orbiculate. Eu. and Caucasus. Var. *variegata,* Hort., the lvs. have a broad white marginal band.

marilândica, Linn. (S. nodosa var. marilândica, Gray). A tall-growing hardy perennial herb, usually 5 ft. high, often more, with large, dark green, ovate-acuminate lvs. and small, dull purplish or greenish fls. in a nearly naked, open thyrse. Throughout the U. S. —The plant is sometimes used as a foliage background for the herbaceous border. It is too inconspicuous in fl. and too weedy in habit for general use.

F. TRACY HUBBARD.

SCURVY-GRASS (*Cochlearia officinalis,* Linn.), a common European perennial, is so called from its antiscorbutic qualities which have long been recognized. Stimulant, diuretic, stomachic, and laxative properties have been ascribed to it. In general appearance—leaf, flower, and fruit—it somewhat resembles its close relative, water-cress, but in flavor it is acrid, bitter, pungent, and has a strong suggestion of tar. Bruising reveals a disagreeable odor. When cultivated it is treated as an annual, the seed being sown on garden loam in a cool, shady place where the plants are to remain. It is grown to a limited extent in America, has escaped from cultivation, but so far has not become obnoxious as a weed like water-cress and horse-radish. Consult Vol. II, p. 808, for botanical description. M. G. KAINS.

SCUTELLARIA (Latin, dish; referring to the form of the persistent calyx): *Labiate.* *Skullcap.* Annual or perennial herbs, or decumbent or diffuse rarely tall and erect subshrub 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-flld. 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 long-exsert, 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.

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<td><em>Inf. composed of fls. in terminal single or panicked racemes. (The delimitations between this and the following section are not well marked).</em></td>
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<td>I. LUPULINARIA</td>
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<tr>
<td></td>
<td>A. Lvs. green on both surfaces or hardly crenate.</td>
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<td></td>
<td>Aa. Lvs. hoary beneath, incise-dentate or pinnatifid.</td>
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Section II. *Heteranthemia.*

All American species.


Section III. *Stachymachus.*

A. *Lvs. subsecise or short-petioled, sub-ternate or linear—11. baikalensis*

AA. *Les. petioled, crenate or serrate, ovate or subrotundate.*

B. Base of the Ivs. narrowed, blades usually ovate-oblong or oblong-lanceolate.

1. *mifana* var. *liriodendron*. B.M. 635.

C. *Margins serrate.*

D. *Sts. procumbent or low, scarcely 1 ft. high.*

EE. *Surface of U. villous above and below: Ivs. small, subrotundate.*

4. * indica* var. *radiator.*

D. *Corolla purple to violet.*

7. *peregrina* var. *albida.*


5. *violacea*, Heyn. Herb. 6-12 in. high: st. erect or ascending: Ivs. petiolate, cordate-ovate, 1-3 in. long, crenate, pubescent or glabrous beneath; racemes 4-5 in. long, lax, subsimple: fls. opposite, secund; calyx pubescent; corolla ½ in. diam., violet. India and Ceylon. B.M. 5820. G.W. 14, p. 620.

6. *altissima*, Linn. St. erect, branched: Ivs. petiolate, ovate or ovate-lanceolate, crenate, base broad-cordate, scarcely rugose; racemes elongated, somewhat branched, villous; fls. opposite, secund; calyx villous; corolla creamy yellow, 4 times as long as the calyx. S. & E. Eu. and Caucasus.

7. *peregrina*, Linn. Sts. procumbent: branches elongated, glabrous or pubescent near the ends: Ivs. petiolated, ovate, obtuse, crenate, base rotund-truncate, glabrous or slightly pubescent: racemes elongated, lax: fls. subsecise, opposite, secund; calyx large, somewhat pilose; corolla violet, pubescent outside. S. Eu. and the Orient.—The sts. and Ivs. are frequently glabrous and dark purplish or reddish.

8. *älta*, Linn. Branches elongated, pubescent: Ivs. ½-1½ in. long, petiolar, broad-ovate, coarsely crenate, base rotundate-truncate or the lowest crenate; racemes often more than 1 ft. long, lax: fls. opposite, secund, subsecise; calyx pilose; corolla ½ in. long, dirty white, villous outside. S. Eu. and Cent. Asia.


Subsection *Augentipolli.*


Section IV. *Galericularia.*

A. *Fls. scarlet or red, irregularly arranged in axillary and terminal racemes: lax herbs or shrubs.*


AA. *Fls. blue or violet.*

B. *Inf. composed of axillary racemes: lax, strongly branched herbs.*

17. *latteriföra.*

BB. *Inf. composed of solitary axillary fls.*

13. *galerul captcha.*

CC. *Margins of Ivs. entire.*

D. *Blades oblong-lanceolate or linear.*

12. *angustifolia.*

DD. *Blades ovate.*

E. *Lvs. petiolate, remote.*

16. *antirrhinoides.*

EE. *Lvs. subsecise, approximate.*

F. *Plants without moniliform tubers.*


FF. *Plants with moniliform tubers.*

15. *Brittonii.*

Subsection *Genuinë.*

12. *angustifolía*, Pursh. A hardy perennial, about 6 in. high, with Ivs. ½-1 in. long, narrowed at the base, and violet-blue fls. ½-1 in. long, with the corolla-tube slender. Mois ground, N. W. U. S.


15. *Brittonii*, Porter. Glandular- or viscid-pubescent, branching from the base, 4-8 in. high: Ivs. oblong or oval, sessile and entire or the lowest short-petioled and slightly crenulate: fls. solitary in the axils; 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. resinoso.

16. antirrhinoides, Benth. Resembles the larger-leaved forms of S. angustifolia, but has longer petioles and the lvs. mostly obtuse at base and also shorter and broader fls. 7-10 lines long. Shady ground, N. W. U. S.

Subsection LATEROFILE.

17. lateriflora, Linn. A hardy perennial, increasing by slender stolons, 1-2 ft. high. lvs. ovate to lanceolate, 3-7 in. long; raceme solitary or terminal, narrow, leafy bracted; fls. blue to nearly white. Moist soil throughout the U. S. B.B. (ed. 2) 3:106.

Subsection PTERILIOIDICAE.

18. Mociniana, Benth. A tender, moderately low, shrubby plant, probably the most showy of the genus, with opposite, long-elliptical, acute lvs., and long, tubular, red fls. with a yellow throat, about 1½ in. long, in dense, terminal spikes. Autumn. Mex. R.H. 1872:350. 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 smaller pots with a single st., when they will flower at about ¾ height. Cuttings are easily rooted.

S. aurantiaca, Hort., is offered in the trade.—S. pulchella, Hort., not Bunge, belongs to Section III and is closely related to S. indica var. japonica, but the plant has more slender twigs, somewhat smaller lvs., which are short stiff-hairy on the upper surface and a looser raceme with somewhat darker blue fls. Hab. (?), Gt. 6:296.—S. splendens, Link, Klotzsch & Otto, belongs to Section II and has broad ovate, obtuse or scarcely acuminate, crenate lvs., with the base cordate and both surfaces hirsute; raceme elongated; fls. sparse; corolla scarlet. Mex. B.M. 4239 (as S. cordifolia).

SCUTICARIA (Latin, scuticca, 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 l.: 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 l. but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. S. Steillii 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.)

Steillii, Lindl. Fig. 3531. Lvs. attain a length of 4 ft. as thick as a goose neck; fls. on short scapes; 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. 1956 (both as Maxillaria Steillii).

Hádwenii, Planch. Lvs. 1½ ft. long; fls. with spreading sepals and petals oblong, sharply acuminate, yellowish green, blotted with brown; labellum obovate-elliptic, white with flesh-colored spots. Brazil. B.M. F.S. 7:731 (both as Bifrenaria Hádwenii). G.M. 41:558.

SCYPHANTHUS (Greek, beaker and flower, alluding to the shape of the flower). Syn., Grammatodecrpus. Losadaceae. Climbing pubescent half-hardy annual herbs for outdoor border planting: lvs. opposite, 2-5-pinnatisect; fls. axillary, sessile, yellow, calyx-tube linear-elongate, lobes 5, spreading, linear-spatulate; petals 5, saccate, alternate, with smaller scales which are hooded, 3-arristate and at base have 2 calli; stamens 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 (Grammatodecrpus volubilis, Presl). Sts. herbaceous, climbing and twining, frequently branched: lvs. opposite, rough with minute deflexed hairs, the lower ones biannifid, the upper ones smaller and only pinnatifid, all the segms. oblong, 1-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, spatulate, leafy segms.; petals 5, forming a cup, obovate-spatulate, deeply saccate 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 Pachyschima. The Seaforthia elegans of cultivation, however, is said to be Archonophanaxis, mostly A. Cunninghamii. The original name is of it A. Alexandre; the original species described by Brown as S. elegans becomes Pachysperma elegans, Blume.

According to Dammer (G.C. III. 31, pp. 18-20) the true Pachysperma elegans of Blume is met with but rarely in European gardens. What is cultivated under this name in most cases is either Archontophanaxis Cunninghamii or A. Alexandre. These phoenixes "are decorative hardy palms, forming on the Riviera very fine high-stemmed specimens. In youth they form bifid leaves, the blade almost horizontal. 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 other pinnate-leaved palms." Seaforthia elegans, Hort., and Pachysperma elegans, Hort., are apparently sometimes Archontophanaxis Cunninghamii and sometimes A. Alexandre. 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-glaucescent or white; it is well figured in G.C. III. 31:19; also in B.M. 4961 as Seaforthia elegans. A. Cunninghamii is figured in B.M. 7345 as Pachysperma elegans. The true Pachysperma elegans, Blume (Seaforthia elegans, R. Br., not Hort.), with pinnules erose 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, Loroma, 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.

SEA-KALE
SEA-KALE

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 require about as much room as rhubarb; they are usually spaced 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 shellings. 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 cutage 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. 573.

L. H. B.

SEA-LAVENDER: Statace. S.-onion: Urtica maritima; also applied to Orithagaptum caudatum and Selina verna. S. pink: Armoria.

SEBASTIANIA (from Antonio Sebastiani, a writer on Roman plants 100 years ago). Euphorbiaceae. Tropicai shrubs scarcely in cult.; juice milky; lvs. alternate, small, usually entire, ind. usually terminal; fls. apetalous; staminate calyx with 2-3 sepals free or connate at the base, imbricate; stamens 1-5; ovules 1 in each cell of the ovary: seed carunculate. About 75 very variable species, all tropical except S. ligustrina, Muehl. Arg., in swamps from N. C. to Fla. S. Palmar, Rose, has very poisonous juice and the seeds are among the best known of the "Mexican jumping beans" which are inhabited by a small lepidopterous larva whose actions cause the springing motions of the seeds.

J. B. S. NORTON.

SECALÉ (the ancient Latin name, said to be derived from seco, to cut; according to some applied to spelt). Graminaceae. Spikelets with 2 perfect fls., sessile on opposite sides of a zigzag rachis, forming a terminal spike; glumes subulate, 1-nerved; lemmae keeled, long-awned.—Species 2 in S. & S. Craig, an annual of S. Russia, and S. cereale, the cult. rye, which, according to Hackel, is derived from a wild perennial form (S. montanum, Guss.), native in mountains, S. Eu. and Cent. Asia.


A. S. HITCHCOCK.

SECHIUM (probably from the Greek sekas, "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 lobed, cordate at the base; tendrils 2-5-branched, opposite the lvs.: fls. small, monocious, axillary, the pistillate solitary, the staminate in small clusters; calyx-tube saucer-shaped, the limb 5-lobed; corolla rotate, deeply 5-lobed, ovato-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.

edule, Swartz (Chayota edulis, Jacq.). CHAYOTE. CHAYOTEL, CHOUCHOUTE. Chochro, Chuchit, or Chxix. CHOKO. CHADITA. MIRKTON. CHRISTOPHINE. PIPIYELLA. 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. 1863:51; 111:24:476; 28:450.

The chayote is grown successfully in southern California and about New Orleans, where it is fairly common. In Florida the stigma 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, the skin, 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 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

3582. Fruit of Sechium edule. (X2/3)
Florida and the Carolinas, a vine may yield fifty to one hundred or more fruits in a season. The fruit can easily be shipped, and stored for two to four months at moderate temperatures. In tropical and subropical regions there are numerous varieties, differing somewhat in flavor and value.

MASON NATHANDE

**SECURINÉGA** (Latin, secinis, hatchet, and negare, to refuse, alluding to the hard wood). *Euphorbiaceae*. Shrubs sometimes grown for the bright green foliage.


S. Siberia to Amurland and N. China.

*S. rugosissima*, Mull. Arg. (S. japonica, Mitt.). Very similar to *S. rugosa*; branches becoming brown or purple; lvs. usually more obtuse; pistillate fls. 2-3-Japan, Korea, N. and Cent. China.—S. Leucopyrus, Mull. Arg.—*Flagaea Leucopyrus*.

**SECHIUM** (Gk., sechon, small or little; Spanish, chico, little). (If endangered, the plant is to be kept as a specimen for the future.) A large genus of succulent plants, probably native to Mexico, though one species occurs in Brazil. Used as an ornamental in greenhouses and gardeners.

The species are divided into two groups, one the subterranean types, the other the rosette types. The former are the more desirable species for the average greenhouse, especially for the sedum type, which is hardier and more versatile than the rosette types.

**SEDUM** (Sedum and star). *Crassulaceae*. A genus founded in 1605 to include seven species, most of which had been theretofore referred to Sedum, but differing from that genus in having underground storage roots, spreading spreading, slender, and sometimes woolly, with succulent leaves. The species are divided into two groups, the subterranean types, the other the rosette types. The former are the more desirable species for the average greenhouse, especially for the sedum type, which is hardier and more versatile than the rosette types.

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**Sedums** are of the easiest culture. 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 low flowers, such as *S. spectabile* and *S. yellowish* slate, which are hardy 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.

**SEDUMS** (Latin, sedes, to sit: the plants fix themselves on rocks and walls). *Crassulaceae*. Succulent herbs, rarely shrublike, mostly hardy and perennial, useful for rockeries and one species, *S. spectabile*, a frequent showy border plant. *Sedum*, St. Suetonius, Vol. I, page 207. Objects of this kind may be planted in rock gardens, walls, or any place where they can be exposed to a sufficient amount of sun. They grow best when there is sufficient moisture and are therefore suitable for dry soils or sandy soil.
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 turkostanicaeum, 57.
 variegatum, 7, 36, 42.
 versicolor, 48.
 violaceum, 18.
 Waltichianum, 40.
 Woodwardi, 29.

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. The lvs. papilloso-pilose.
F. Apex of lvs. acute or acuminate.
G. Apex of lvs. distantly dilated, abruptly tapered to a much narrower upper part.
H. Apex of lvs. not distinctly dilated, not abruptly tapered to a much narrower upper part.
I. Petals acute or acuminate.
J. Sepals subulate.
K. Sepals ovate-lanceolate.
L. Apex of sepals acuminate.
M. Apex of sepals blunt.
N. Petals blunted.
O. The lvs. incurved, those of the barrens shoots forming dense conical rosettes.
P. The lvs. reflexed, those of the barrens shoots not forming such marked rosettes.
Q. Fls. white, pink, or purple.
R. Lf.-blades broad as compared to length.
S. Petals oblong or linear to lanceolate.
T. Petals oblong and blunted.
U. Color of fls. blue (sometimes rosy blue).
V. Color of fls. white.
W. The midrib of the petals pink.
X. brevifolium.
Y. Petals lanceolate and acute.
Z. Plant farinoso-pruinose.
AA. Plant not farinoso-pruinose though often more or less glaucous.
BB. Lf.-blades narrow as compared to length.
CC. Petals relatively narrow, their base somewhat narrowed.
DD. Petals relatively broad, their base somewhat narrowed.
EE. The lvs. linear.
FF. Sts. viscid-pilose above.
GG. Sts. not viscid-pilose through.
HH. Lf.-blades ½-1 in. or more broad in the widest place.
II. Plant subpubescent or puberulent.
JJ. Margin of lvs. entire.
KK. Petals oblong or oblanceolate.
LL. Sts. viscid-pilose above.
MM. Sts. not viscid-pilose through.
NN. Lf.-blades ½-1 in. or more broad in the widest place.
OO. Plant subpubescent or puberulent.

SEDAUM

EE. Barren shoots present.
F. Sepals lanceolate, relatively narrow.
FF. Sepals deltoid, oval, oblong
GG. Inf. glandular.
HH. Inf. not glandular.
II. The inf. rather open or racemose-cymose.
JJ. The inf. more or less densely coryphose-cymose.
KK. Buds 5-angled: fls. pinkish.
LL. Buds nearly terete, oblong:
MM. Fls. white.
NN. Album.
OO. Margin of lvs. entire.
PP. Petals united below.
QQ. Petals not united below.
RR. Sepals ovate.
SS. Sepals obovate-lanceolate.
TT. Sepals obtuse, obtuse.
UU. Sepals rounded.
VV. Sepals acuminate.
WW. Sepals acute.
XX. Sepals obtuse.
YY. Sepals dentate.
ZZ. Sepals entire.
AA. Sepals acuminate.
BB. Sepals obtuse.
CC. Sepals acute.
DD. Sepals obtuse.
EE. Sepals dentate.
FF. Sepals obtuse.
GG. Sepals acute.
HH. Sepals obtuse.
II. Sepals dentate.
JJ. Sepals obtuse.
KK. Sepals obtuse.
LL. Sepals dentate.
MM. Sepals obtuse.
NN. Sepals obtuse.
OO. Sepals obtuse.
PP. Sepals obtuse.
QQ. Sepals obtuse.
RR. Sepals obtuse.
SS. Sepals obtuse.
TT. Sepals obtuse.
UU. Sepals obtuse.
VV. Sepals obtuse.
WW. Sepals obtuse.
XX. Sepals obtuse.
YY. Sepals obtuse.
ZZ. Sepals obtuse.
AA. Sepals obtuse.
BB. Sepals obtuse.
CC. Sepals obtuse.
DD. Sepals obtuse.
EE. Sepals obtuse.
FF. Sepals obtuse.
GG. Sepals obtuse.
HH. Sepals obtuse.
II. Sepals obtuse.
JJ. Sepals obtuse.
KK. Sepals obtuse.
LL. Sepals obtuse.
MM. Sepals obtuse.
NN. Sepals obtuse.
OO. Sepals obtuse.
PP. Sepals obtuse.
QQ. Sepals obtuse.
RR. Sepals obtuse.
SS. Sepals obtuse.
TT. Sepals obtuse.
UU. Sepals obtuse.
VV. Sepals obtuse.
WW. Sepals obtuse.
XX. Sepals obtuse.
YY. Sepals obtuse.
ZZ. Sepals obtuse.
England and one of the commonest in cult. Thrives best in poor soil and is a good plant for drying 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. hawaiianum, 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. ½-in. across, in a 2-parted cyme, with a central sessile fl.; sepals linear-oblong. Morocco. Var. Maiwaena, Hort., is said by the trade to be the same as var. hawaiianum. Var. sesquangulare, Hort., is offered in the trade; it probably is S. sesquangulare.

2. Stathlii, 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, ¼-½-in. long: fls. yellow, 7-9 lines across, in 5-branched terminal cymes, the branches of which are recurved; sepals puberulent, linear-oblong; petals lanceolate, with a short dorsal awn just below the apex. Mex.

3. multiceps, Coss. & Dur. Perennial, about 2-6 in. high, base subshrubby, much branched: barrel shoots flexuoso or erect, bearing dense rosettes of lvs. at their tips; fl.-sts. usually taller, erect: lvs. ½-¾-in. long, glaucous or pruinose, pinkish and papillose, linear or oblanceolate, subterete: fls. pale yellow, about ½-in. across, 5-merous, in many-branched; 2-6-fld., scorpoid cymes; sepals linear-oblong; petals oblong-lanceolate; anthers pale yellow. Algeria. G.C. II. 10:717.

4. sesquangulare, Linn.? (S. acre var. sesquangulare, Godr. S. boloniense, Lois. S. Forsterianum, Reichb., not Smith. S. puchellum, Hort., not Michx.). Perennial, glabrous: barrel shoots ascending 2-3 in., branched; fl.-st. erect, 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, ½-in. across, in a 3-5-branched umbellate cyme, 1-3 in. diam.; sepals linear-oblong; petals lanceolate. Eu. The Linnean material probably differs very little from S. acre, but the horticultural material (especially the European) may be distinct.

5. tenuifolium, Stroph. (S. amplexicaule, DC. Semperium tenuifolium, Sibth. & Smith.). Perennial, glabrous, evergreen: barrel branches 2-4 in. long, slender, wiry, ascending; fl.-sts. decumbent, ascending, about 6-9 in. high. lvs. of the barrel shoots dilated and membranous at base, gradually tapering to a long awl-like point; of the fl.-sts. alternate, sessile, ½-in. long, terete, with a membranous auricle at base: fls. numerous, golden yellow, secund in 2-flowered cymes, with a sessile fl. in the fork; sepals ovate, oblong, acute, united below into a cup-shaped tube; petals oblong-lanceolate, ¼-in. long, keeled; filaments greenish, anthers yellow. Mediterr. region.—There are often 6-10 petals in this species.

6. stenoptatum, Pursh. Perennial, tufted, glabrous: sts. 3-6 in. high, erect from a decumbent base: lvs. crowded on the barrel shoots, sessile, linear or lanceolate, ½-in. long, terete: fls. bright yellow, ½-in. across, branched scorpoid cymes; sepals subulate; petals linear-lanceolate, acuminate. Alberta to S. D., Neb., New Mex., and Calif.

7. sermentodesmus, Bunge. Perennial, glabrous: shoots slender and prostrate: lvs. crowded, opposite or whorled, ¼-½-in., linear, terete or slightly flattened: fls. bright yellow, ½-in. across, numerous, in a flat-topped, umbellate, 5-6-flowered cyme, with a solitary fl. in the fork; branches recurved, the fls. on the upper surface only;
8. Forsterianum, Smith. Perennial, forming small tufts, glabrous or slightly glaucous: Ivs. of the barren shoots many-ranked, forming terminal rosettes, ob lanceolate or lanceolate, flattened but subterete, spurred at the base: fls. yellow, in a compact, round-topped cyme; sepals ovate; petals lanceolate. England.

—This is now kept distinct, but it has been referred to S. rupestre and also to S. pruinatum, 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. rupestre, Linn. Perennial, glaucous, reddening with age and drought: barren shoots numerous, creeping, 1-3 in. long; fl.-sts. ascending erect, 6-12 in. high: Ivs. 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, 2-3-forked cyme, with a pedicellate fl. in the center of each fork; sepals oblong-lanceolate, whitish with a pink midrib; petals oblong, with a pink midrib; anthers pink. France and Medit. region.

—Closedly related to a dasyphylhum of which some authorities have made it a variety. Rather tender and sensitive to root-moisture. Var. album, Hort., is said to have bronze lvs. and to grow 6 in. high. Var. Pottsi, Hort., is offered in the trade as a form with tiny round Ivs., covered with white meal.

10. reflexum, Linn. (S. collinum, Willd.). Perennial, glabrous; sts. trailing; fl.-sts. erect, 8-10 in. high: Ivs. 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, ½-¾ in. long, linear-subulate, reflexed, terete, gibbous at base: fls. 4-8-merous, yellow, ¾ in. across, in a decurved, many-flld. 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. ablescens, Haw. S. glauces, Smith), is glaucous: Ivs. rarely in rosettes: fls. ½ in. across, 6-merous. Eu. and N. Afr. Var. cristatum, Mast. (S. monstrotum, Hort. S. robustum, Hort.), has the sts. fasciated so as to form a crest like a coxcomb. Var. viridescens, Mast. (S. virides, Willd.), is similar to var. ablescens, but has pale sulfur-yellow lvs.—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-tinged: fls. white or rosy tinted, about ½ in. across, in few-flld. 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. carloum, Linn.; also spelled caeruleum (S. astreum, Desf.). Fig. 3584. Annual, glabrous, or pilose in the infl.: 2-3 in. high, branched from the base: lvs. tufted, ¼-⅓ in. long, oblong, obtuse, pale green, spotted with red: fls. pale blue to rose-lilac, ⅓ in. across, 5-7-merous, in a lax, many-flld. cyme, which is 1 in. diam.; sepals oblong; anthers reddish brown. Medit. region. B. M. 2224. B. R. 520. G. N. 27, p. 315.—Said to thrive in a sandy soil, and to be adapted to carpet-bedding.

13. brevifolium, DC. Perennial, said to grow about 4 in. high, glaucous, tufted: lvs. crowded in 4 rows, about ⅛ in. long, ovoid, subglabose, pinkish, densely mealy pubescent: fls. white, ½ in. across, in an umbellate, 2-3-forked cyme, with a pedicellate fl. in the center of each fork; sepals oblong-lanceolate, whitish with a pink midrib; petals oblong, with a pink midrib; anthers pink. France and Medit. region.

—Closedly related to a dasyphylhum of which some authorities have made it a variety. Rather tender and sensitive to root-moisture. Var. album, Hort., is said to have bronzey lvs. and to grow 6 in. high. Var. Pottsi, Hort., is offered in the trade as a form with tiny round Ivs., covered with white meal.

14. farinosum, Lowe. Perennial, glaucously pruinose, glabrous: sts. tufted, creeping, much branched: lvs. crowded in 4-6 rows, deciduous, ¼ x ⅓ in., oblong, very obtuse: fls. white or flesh-color, nearly sessile, ¼ in. across, crowded in a 2-3-parted cyme, 5-7-nerous; calyx-tube very short, se Georg. linear-oblong, pink-tipped; petals lanceolate, acute, keeled; anthers purplish brown. Madeira.—Masters says that most of the material cult. under this name is really S. album.

15. dasyphylhum, Linn. (S. glauces, Lam.). Perennial, about 2-4 in. high, glabrous: sts. tufted, slender, branching: lvs. crowded, sessile, spreading, oblong-acute or suborbicular, thick, studded with crystalline pimples: fls. white to pinkish, about ⅘ in. across, in a lax, few-flld. axillary cyme; sepals oblong, fleshy; petals lanceolate; anthers black. Eu., N. Afr.—The material cult. under the name of S. glauces probably belongs here; see also S. rupestre and S. hispanicum. Var. glanduliferum, Moris (S. corsicum, Duby), has minute gray-green lvs. which are more or less densely glandular-pubescent: fls. white. Corsica and N. Afr. B. M. 6027.

There is a form of this offered in the trade under the name of S. corsicum var. grandiflorum.

16. pottsi, 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, ½-⅜ 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.

18. **villosum**, Linn. Annual. 3-4 in. high: stts. rather simple, erect, viscid-pilose above: lvs. alternate, subterete, rather remote, linear, obtuse: fls. dull rose or white, in a small, rather loose, few-fl., terminal cyme; sepals ovate and green; petals ovate, rather acute. Alpine and N. Eu.—One of the few species that likes a moist situation, suitable for a bog or similar location.

19. **hispanicum**, Linn. (S. glaucum, Waldst. & Kit., not Smith. S. pilidium, Ten., not Bieb.). Annual or biennial (Masters says perennial), glaucous, glabrous or glandular-pilose above: barren shoots 2 in. long, branched; fls.-sts. 3-4 in. high, reddish: lvs. densely crowded, about 1/2 in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pimplies at the tip; fls. on a rather slender, pinkish white, in 3-7-branched, umbellate cymes; sepals deltoid; petals oblong, narrowed at base. Cent. and E. Eu., Spain is uncertain.—Commonly grown under the name of S. glaucum; see also S. dasyphyllum and S. rupestre.

20. **arboreum**, Mast. Perennial, subshrubby, about 4-6 in. high, glabrous, evergreen; branching from near the base, with no separate barren shoots: lvs. of the shoots deltoid, subulate, terete or somewhat 4-sided, 1/2in. long, horizontally spreading; of the younger shoots more or less crowded, linear, terete: fls. white, 5-merous, about 1/2 in. across, in many-fl. terminal cymes; sepals linear-oblong; petals lanceolate, keeled; filaments white. Hab.(?).

21. **puchellum**, Michx. (S. puchellum, DC.). Perennial, glabrous, trailing or ascending: branches slender, 3-6 in. long; lvs. in several rows, linear, scarcely 1/4in. long, terete, pointed, gibbous at base: fls. rosy purple, 1/2in. across, in a 3-4-branched cyme, with fls. erect and crowded in 2 rows along the upper surface, each with a leafy bract; sepals lanceolate, obtuse; petals lanceolate; anthers orange. Va. to Ga., Ind., Mo., and Tenn. B.M. 4263. G.C. III. 10:143. The minute lvs. assume rich tints of red, brown, and purple. The branches of the infl. are 3-4 in. long and gracefully arched.

22. **monregalense**, Balb. (S. cruciatum, Desf.). Perennial, glabrous except the infl., which is glandular: barren shoots spreading, erect, or creeping, 1-4 in. long: lvs. of barren shoots crowded, linear or obovate-oblong, 1/2-3/4in. long; those of the flowering shoots scattered, narrower and often spotted pink: fls. white, 1/2in. across, 6-merous, in a terminal, lax, many-fl. paniced cyme; sepals deltoid, pink-spotted; petals deltoid-lanceolate, acuminate, pinkish brown beneath; anthers pinkish. N. Italy and Corsica. L.B.C. 5:464.


24. **Iydiun**, Boiss. Perennial, glabrous, cespitose: barren shoots 2-3 in., erect, reddish; fls.-sts. 4-5 in. high: lvs. crowded, 1/2in. long, linear, subterete, greenish or red-tipped, bluish, narrowed with numerous fine pimplies at the tip when seen under a lens: fls. pinkish, 1/2in. across, in a many-fl., corymbose cyme; buds 5-angled; sepals oblong, reddish; petals lanceolate, rather obtuse; anthers reddish. Asia Minor. G. 37:25.—A good plant for rockeries. Some of the material grown in gardens as S. pulchellum and S. anglicum are really this species. Var. *abreum*, Hort., was offered in the trade. Var. *glaucum*, Hort., is offered in the trade as a glaucous-lvd. form.

25. **album**, Linn. Perennial, about 4-6 in. high, glaucous, cespitose: barren sts. erect or creeping, rooting, olive-brown; fls.-sts. erect, pinkish: lvs. alternate, spreading, linear-oblong, about 1/2in. long, obtuse; fls. white, about 1/2in. across, in a corymbose cyme, which are much branched, about 2-3 in. diam.; calyx-tube cup-shaped, segms. broadly ovate to subrotund, obtuse; petals lanceolate; anthers reddish. Eu., Temp. Asia, and N. Afr. Gt. 27, p. 315. G.M. 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 1 1/2 ft. high, slender: lvs. spreading, elongate-linear, 2-3 in. long, attenuate, more or less serrate toward the tip; fls. dioecious, yellow, 5-merous, rather small, in a dense, many-fl., corymbose cyme, which is commonly leafy; sepals and petals linear. Soongaria, China, and Turkestan.—Allied to S. roseum.

27. **roseeum**, Scop. (Rhodoila rosea, Linn. S. Rhodola, D.C.). Perennial, 4-8 in. high: rootstock thick, fleshy, exalching a perfume of rose-water: sts. annual, several from the same stock, erect and unbranched: lvs. scattered, glaucous, 1 1/2in., sessile, flat, spatulate or oblong or oblong, obscurely 1-nerved, slightly toothed at apex; fls. dioecious, greenish or reddish purple, in a terminal flat-topped, subglobose cyme, about 1 in. diam.; sepals 4, lanceolate or oblong; petals 4, linear-oblong; stamina 4 in the male, lacking in the female fls. Eu., N. Amer., and Himalaya. Gt. 12:403 (as var. lanceolatum). B.B. (ed. 2) 2:207.—A neat-growing species well adapted to the rockery. Var. linifolium, Hort., is offered in the trade.

28. **dendroides**, Moç. & Sessê. Shrub, 4-12 in. high, much branched, smooth: lvs. flat, fleshy, obovate or spatulate, sessile, 1/4-1/3 in. long; lvs. sessile or nearly so, bright yellow, in a paniculate cyme, numerous; calyx-lobes ovate; petals lanceolate. Mex.

29. **Woodwardii**, N. E. Br. Perennial, glabrous: sts. simple, about 1 ft. high, green: lvs. alternate, lax, 1/4-2 1/2in. x 1/4-1 1/2in., obliquely cuneate-obovate, irregularly and obtusely dentate above, green, flat: fls. yellow, sessile, about 1/2in. across, in dichotomously branched, 2-5-parted, rather flat, rather lax cymes, which are 2-1/2-4 in. diam.; sepals linear-subulate; petals lanceolate, China (?).—Resembles S. Aizoon, but differs in the obliquely obvate, obtusely toothed lvs. and larger, looser cymes.

30. **oreganaum**, Nutt. (Gormania oregana, Brit.). Perennial, glabrous: fls.-sts. erect, simple, 3-6 in. high: lower lvs. about 3/4in. long, all spatulate-cuneate, rounded at apex: fls. yellow, changing with age to pink, in a compound cyme; sepals lanceolate to ovate-lanceolate; petals linear-lanceolate, long-acuminate, more than 3/4in. long. Alaska to N. Calif.

31. **spathulifolium**, Hook. Fig. 3586. Perennial with slender rootstocks, glaucous, ultimately reddish: barren shoots creeping or ascending, 3-4 in. long; fls.
ascending, sometimes 4–8 in. high, simple or sometimes branched; lvs. of barren shoot forming a terminal rosette 1–1 ½ in. diam. and producing offsets from the base; lower lvs. obovate-spatulate, ½ × 3 in.; cauline smaller and clavate: fls. numerous, yellow, ½ in. across, in terminal fork ing cymes, with 3–5 principal branches about 3 in. long, these are 2-divided and bear fls. only on the upper side; sepals lanceolate or oblong-lanceolate; petals lanceolate, keeled; anthers yellow. N. W. N. Amer. G.C. II. 5:821; 10:377. Gn. 24:462. Gt. 21:741. Questionable whether it is hardy in the E.

32. Pámeri, Wats. Perennial, caulescent, about 6 in. high, erect and branching, glabrous and glaucous: lvs. thick, flattened, 1–1 ½ × 3 in., spatulate-obovate, slightly apiculate: fls. deep orange, in a racemose panicle whose branches are 1–2 in. long; sepals narrowly lanceolate; petals narrowly lanceolate.

33. obtusatum, Gray (Gormnáia obtusátum, Brit.). Perennial, glaucous or green; sts. prostrate or ascending, 2½–6 in. high; fls. erect, terete, reddish, ultimately leafless: lvs. rosetulate, 1 × ½ in., spatulate, entire, glaucous, becoming reddish green; fls. yellow, ¾ in. across, in terminal, spreading, umbellate cymes, 1½–2 in. diam.; sepals oblong-acute; petals lanceolate; anthers yellow. Calif.

34. nicaense, All. (S. ochroleucum, Chaix. S. altissinum, Poir.). Perennial, glabrous and glaucous: rootsstock thick and woody: sts. 6–8 in. long, at first prostrate, afterward ascending; fls. erect, 10–12 in. high: lvs. of barren shoots ascending or spreading, ½–¾ in. long, glaucous, reddish when old, ovate-lanceolate or oblong-lanceolate, scarcely auricled; of flowering shoots appressed, lanceolate, distinctly auricled: fls. greenish yellow, 5–6-merous, ½ in. across, in terminal many-flld, leafless umbellate cymes; sepals deltoid-lanceolate; petals oblong, boat-shaped; anthers yellow. Medit. regnum. G.M. 67:785–9. S. ochroleucum F. & T. differs from this but does not seem to differ very much.

35. formosanum, N. E. Br. Annual, about 6 in. high, glabrous; st. repeatedly dichotomously or trichoto mously branched from near the base, indistinctly 4-sided; lvs. 1–3 in whorls at the branchings of the sts., with 1–3 on the long internodes, 1½–1 ½ × ½ in., flat, spatulate; fls. sessile, yellow; sepals green, fleshy, spatulate; petals lanceolate; anthers at first red, finally black. Formosa.—Intro. into Calif.

36. japonicum, Sieb. Perennial, 4–6 in. high, glabrous; sts. diffuse: lvs. scattered or opposite, elliptical to spatulate, flat and somewhat reticulate veined, entire, bright green, channeled above: fls. yellow, ½ in. across, in loose, terminal and lateral, panicled, many-flld. cymes; sepals oblong; petals lanceolate. Japan.

It is extremely doubtful whether this species is or has been common in cult.; most of the material so named is probably S. alboseum. Var. abro-marginatum, Hort., probably is the same as S. kamtschaticum var. aureo-marginatum. Var. macrophyllum, Hort., is offered in the American trade as a compact bush, 15 in. high, with white or white fls., the centers of which are light pink; presumably S. alboseum var. aureo-marginatum. Var. variagátum, Hort., mentioned in American trade is presumably S. alboseum var. variegatum, which is a large-1vd. plant with decided yellow-blotched lvs.

37. Seleklánun, Regel & Mnaek. Perennial, spreading, pilose: sts. 1–1½ ft. high, erect: lvs. sessile, ascending, upper 1½ by less than ½ in., lanceolate from a broad base, ciliate, apical third serrate-margined: fls. numerous, yellow, about ¼ in. across, in a many-flled terminal cyme which is hollow-top ped and leafy; sepals linear; petals lanceolate; anthers yellow. Amurland, Manchuria. Gt. 11:361.—Close to S. Aizoon, but differs in the pilded sts. and the narrower and pilose lvs.

38. Middendorfianum, Maxim.; also spelt Midd endorf. Perennial, 4–16 in. high, cespitose, glabrous: lvs. ½ to nearly 3 in. long; lowest spatulate; the rest linear-spatulate, upper part serrate, upper surface channel ed: fls. yellow, ¾–5 in. across, in many-flld cymes; sepals linear-oblanceolate; petals fusiform, base rather broad, apex long-accumulate; anthers dark purple. Amurland.

—Some of the larger material grown under this name probably does not belong to this species. Var. hybrídum, Hort., a form said to have fine autumn tints, is offered in the trade.

39. hybrídum, Linn. Perennial: sts. creeping, gla brous or glandular: lvs. alternate, pelted, about 1 or more by ½ in., spatulate, upper half coarsely toothed, lower part entire and tapering; teeth red-tipped: fls. numerous, yellow, in terminal, glabrous cymes; sepals oblong-lanceolate; petals oblong; anthers orange-brown. Himalayas.—Readily distinguished by its almost pinna tuffed foliage. In India the lvs. are said to be sometimes red. It seems to suffer from wetness in winter and probably should be wintered under glass or otherwise protected from the wet.

40. asiáticum, Spreng. (S. Wallichianum, Hook.). Perennial, 6–12 in. high; sts. annual, erect, unbranched, glabrous, slender: lvs. opposite, decussate, sessile, ¾–1 in. long, linear, oblong, coarsely and irregularly toothed; fls. numerous, greenish yellow, bisexual, in compact, terminal, globose cymes; sepals oblong-lanceolate; petals oblong; anthers orange-brown. Himalayas.—The lvs. of S. Aizoon and by some considered a variety of it. Differs in having unequal sepals and the peculiar flake-shaped buds. A good border plant. S. Lekhmanii of some gardens belongs here.

41. Maxímoviczii, Regel Perennial, about 1 ft. high, glabrous: sts. erect, or somewhat 4-sided; greenish: lvs. subopposite or alternate, subsessile, 1½–1½ in. long, oblong-ovate or oblong-lanceolate, regularly toothed; upper lvs. longer and narrower: fls. yellow, numerous, in a dense flat spreading cyme; buds flask-shaped; sepals unequal in size, lanceolate, rarely somewhat spatulate at apex; petals lanceolate. Japan, Amurland. Gt. 15:328. Gn. 10. 19:203. 27. p. 316.—Similar to S. Aizoon and by some considered a variety of it. Differs in having unequal sepals and the peculiar flake-shaped buds. A good border plant. S. Lekhmanii of some gardens belongs here.

42. kamtschaticum, Fisch. & Mey. Perennial, glaabrous: branches 6–10 in. long, greenish or pinkish; fls. erect, 4–6 in. high: lvs. alternate or opposite, about 1½ × ½ in., oblong-ovate, deep green, coarsely but regularly toothed above the middle, tapering gradually to the petiole: fls. numerous, yellow, ½ in. across, in terminal, umbellate irregularly pyramidal cymes which are 1–3 in diam.; sepals greenish, deltoid; petals lanceolate, apiculate, keeled; anthers subglobose, orange. Kamchatka, Korea, and Japan. Var. aureo-margínatum, Hort., is offered in the trade; S. japonícum var. aureo-margínatum probably is the same thing. Var. variegátum, Hort., is offered in the trade as having variegated lvs. and yellow fls. By some dealers the lvs. of the plants are said to be purple and the material so named is undoubtedly misnamed and is probably some form of S. Telephium or one of its close allies.

43. Aizoon, Linn. Perennial, glabrous, 1 ft. or more high, usually 1½–2 ft.: sts. several, unbranched, erect, subangular: lvs. alternate, sessile, distant, oblong-lanceolate, 2½ × ¼ in., coarsely and irregularly toothed:
SEDUM

3587. Sedum Sieboldii.

fls. scarlet, in a many-flowered, panicle cyme, which is 2–4 in. diam.; sepals deltoid, acute, pilose; petals lanceolate, ½ in. long. Asia Minor and Caucasus. Gt. 16:551; 33:1155. Gd. 19:354. R. H. 1846:5. —Position, apparently rare in cult., but said to be very showy; the fl-color is almost unique in the genus.

44. Sempervivoides, Fisch. (S. Semperdew, Ledebe.) Biennial, pubescent, 2–5 in. high: basal lvs. in a rosette of 40–50, obovate, cuneate, pubescent and ciliate, about 1 x ½ in., cauleine clasping, greenish red, oblong, acute:


- rophyllum var. atropurpureum, Hort.), has stts. erect, glabrous, 1¼–2½ ft. high; lvs. opposite, oblong-ovate, bronzey or dark purple; petals whitish, red-tipped. 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. Purpureum, Hort., has been offered in the trade as a form with green-and-gold foliage. Var. color, Van Houtte (S. Rodigasia, Hort.), is a form with pink stts. and lvs. heavily variegated with white, their margins pink. F.S. 16:1669.

49. spectabile, Bor. (S. Fabaria, Hort., not Koch). Showy Sedum. Fig. 3588. Perennial, robust and glaucous: stts. 18–24 in.; lvs. opposite, decussate or in whorls of 3, 3½ in. flat, scarletly petioled, ovate or spatulate, entire or obscurely sinuate-dentate: fls. numerous, ½ in. across, pink, in large flat-topped, inversely pyramidal, leafy and umbellate cymes; sepals whitish, linear-lanceolate; petals slightly concave; anthers orange. Japan(?). Gd. 27, p. 315. I.H. 8:271. Gt. 22:47. —The fls. are said to vary from rose to yellow and 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 stiff clay and not to do so well in lighter soils. Var. album, Hort., a white-flowered form is offered in the trade. Var. atropurpureum, Hort., is a form with rose crimson fls. Var. rubrum, 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. erythrodictum, Mast., not Miq. S. japonicum, Hort., not Siebold. S. macrophyllum, Hort., not Hort. Vilm.). Perennial, glaucous: stts. several, ascending, about 1½ ft. high, glabrous: lvs. up to 2½ x 1½ in., alternate or in whorls of 3, 3½ in. long-petioled, claret or red-purple, in the trade. Var. roseum, Hort., is a form with crimson fls. Var. speciosum, Hort., as variegatum, Hubb. (S. erythrodictum var. speciosum, Mast. S. japonicum var. speciosum, Hort. ex W. Mill.), has the lvs. irregularly blotched yellow in the center. Gt. 21:709.


52. Telephium, Linn. Orpine. Live-forever. Fig. 3590. Perennial: stts. erect, 12–18 in. high: lvs. scattered, rarely opposite, 2–3 x 1–1½ in., oblong-ovate, dentate; lower wedge-shaped at base, upper somewhat rounded: fls. numerous, pink, red, spotted or sometimes pure white, in dense terminal and lateral panicles, cymes; sepals lanceolate; petals lanceolate, 2–2½ lines long, somewhat recurved. Cent. Eu. to Siberia and naturalized in N. Amer.(7). (The American material may be another species which is almost impossible to distinguish horticulturally, namely S. purpureum, Tausch, and which is described, to &c., by many authors.) Var. bordieri, Mast. (Anacampseros Bordieri, Jord. & Fourn. S. Bordieri, Hort. S. anacampseros var. Bordieri, Hort.), has reddish stts.: lvs. distinctly petioled, oblong, tapering at base: fls. pink, in
53. **Sedum**

**Sedum** is a genus of flowering plants in the family Crassulaceae. They are commonly known as stonecrops and are known for their ability to grow in dry, rocky areas. The genus includes about 400 species, which are found throughout the world, particularly in Europe, Asia, and North America. The leaves of many species are fleshy and succulent, and the flowers are typically small and inconspicuous. Some species are cultivated as ornamental plants due to their colorful flowers and interesting foliage. **S. spathulatum**, also known as the live-forever, is a popular garden plant with rosette-like growth that can be propagated by taking leaf cuttings. It is drought-tolerant and easy to grow, making it a good choice for rock gardens and xeriscaping.
SEEDS

violate, 1/4 in. across, in dense, terminal, globose cymes; sepals lanceolate; petals oblong-lanceolate. Cent. Eu. B.M. 118.—Suitable for edging and rockeries, but the ffs. are comparatively rarely produced. Var. Börderi, Hort., equals S. Telephium var. Börderi.

63. stellatum, Lindl. Annual, glabrous: sts. erect, 3-4 in. high, branched at the base: lvs. of the barren shoots in a rosette, suborbicular, crenate, flat; cauline alternate or rarely opposite, petiolate, 3/4-3/5 in. long, oblong, crenate; fls. purple, obscure, with a small yellow ring in the throat, terminal cymes; sepals lanceolate; petals lanceolate. S. E.-Europe.

—S. abditum, Hort., is offered in the trade as a form growing 6 in. high, with a lax, many-branched cyme. This variety, which is 2-3 ft. high, produces large rosettes of cymes; sepals broad-deltoid; petals ovate-lanceolate.

—S. atrorubens, Hort., is offered in the trade, var. S. belli, Hort., is offered in the trade as a form growing 6 in. high, with a lax, many-branched cyme. The flowers are deep pink; petals yellow; sepals deltoid; flowers terminal, solitary, in cymes; sepals triangular, acute; petals yellow; sepals ovate-lanceolate, acuminate; style pubescent.

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3591. Seed-like fruit of hop-tree. (Natural size)

3592. Natural planting of maple seeds.

SEEDS AND SEEDAGE. A seed is a ripened embryo, and its integuments and storage supplies, 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 semence, and is comparable with the words graftage, layerage, and cuttage. See Spores.

In general literature and common, a seed is that part of the plant which is the outcome of flowering 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 miniature 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 beet, lettuce, and sea-kale. The winged seeds of elms, hop-tree (Fig. 3591), 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. 3592). Beans and peas are true seeds; the fruit part is 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 embryonic plant. The first visible stage in germination is the swelling of the seed. Thereafter the integument is ruptured, and the caulis appears. When the caulis protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 3590). Germination does 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. 3594). See, also, Figs. 3595 and 3596. 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 them in soil in conditions that somewhat nearly approach 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.
Seeds and Seedage

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 be given a definite temperature. The requisite temperature and moisture vary with the different kinds of seeds and also with these factors must 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, but varies also to economize time and labor. In planting in the seed-bed to the field, the gardener unconsciously chooses only the best plants and thereby the crop is improved. The seed-bed may be in a forcing-house or hotbed, or in the open. If it is in the open, it should be near the buildings, 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, and be kept dry, it is well to cover it the previous spring or fall with a coating of not too rich manure. This retards the moist-
ture, and the leaching from the manure adds plant-food to the soil, thereby enabling the young plants to secure an ample store of the same. 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. To prevent this it is well to handle common vegetables and flower seeds in gardeners' flats (Fig. 3507). 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 ornamental plants require 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, that is, less than one year old. Some seeds, however, of which those of melons, pumpkins, and cucumbers are examples, may become 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 hardy 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 or warm, they will spoil. Nuts and hard seeds of Hardy plants usually profit 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 and growing.

Seed-breeding may be considered from at least two very distinct viewpoints: first, the origination and development of new varieties and individualities, 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 inversely to one's 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 brought to light, for it is the 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 effect the cultural value. Lastly, the development of new varieties of real value can come only through the practice of almost infinite patience which makes one come back to the soil and reap 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.
SEEDS AND SEEDAGE

seeds but a single variety or marked form of real value to the cultivator.

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 seedling plants from year to year, never giving way to the ever-present temptation to use some suggestive 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 nearly 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>Seed</th>
<th>Acres</th>
</tr>
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<tbody>
<tr>
<td>Bean</td>
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<tr>
<td>Cabbage</td>
<td>2,000</td>
</tr>
<tr>
<td>Corn</td>
<td>15,000</td>
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<tr>
<td>Cucumbers</td>
<td>15,000</td>
</tr>
<tr>
<td>Onions</td>
<td>2,000</td>
</tr>
<tr>
<td>Muskmelons</td>
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<tr>
<td>Watermelons</td>
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</tr>
<tr>
<td>Radish</td>
<td>4,000</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>50,000</td>
</tr>
</tbody>
</table>

3596. Germination complete in Indian corn.

3597. Gardener's flat, or a shallow box, in which seeds are sown and small plants handled. A good size for a flat is 16 x 20 inches, and 3 inches deep.
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 for stock ideas, were 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 other vegetables) and greatly increased in the seed trade during the same 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 Welles, "of the Point," 1764; Samuel Deall, a dealer in general merchandise in New York in 1770; William Davidson of New York in 1768, while in Philadelphia, in 1772, we find one Pella- 
tiah Webster advertising clover and duchess-grass seed; James Loughhead, "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 by the farmer or grower and sold as a regular business. 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 Inglis for $15, Inglis agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small begin-

nings from which has grown a trade which now amounts to many millions; and this relation between sown and reaped is largely the foundation of relations which have obtained in the trade ever since.

With the development of the railroad 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 dis-
bution by Congressmen has tended to negative this benefit. The originally beneficent distribution of free seeds to pioneers and needy settlers was a form of agri-
cultural encouragement which there could be no criticism, but it has degenerated into an abuse, which is estimated to have taken a trade of some $4,000,000 during the past two or three decades out of the hands of the men who have built up the business.

Grant Thorburn's catalogue of 1822 was the first to be issued in pamphlet form, and it was the pioneer of the many finely illustrated actual catalogues with which we are familiar today. These catalogues have been largely instrumental in facilitating the speciali-

zation of the industry and its subdivision in the hands of the country dealer, who buys seeds at wholesale, combining as they do the most complete lists and illus-

trations of varieties with directions as to methods, con-

ditions, and seasons for planting. They are distributed in hundreds of thousands. Up to 1844 the wording on the bags was written by hand, a laborious and expen-
sive process, which of itself is an indication of the small volume of the trade at that date.

In regard to the prices of seeds, A. J. Pieter's admirable report for 1890 in the Yearbook of the Depart-

ment of Agriculture may be taken as the best informa-
tion up to that date, and it indicates the development of the business in its earlier years. He says in part:

"The statistics of exports date from 1855, and no separate returns of imports were given prior to 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 1825 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 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggre-
ges $5,393,663. In the ten years ending with 1889, 

brick and grass seeds were largely grown on the farm, and 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 reduc-
tion 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 1900) is $1,411,013 as against $826,019 for 1899, an increase of above 70 per cent. Aside from this are grass seed to a value of $15,137,683 in 1906, not including beans, peas, and miscellaneous seeds. "Other grains and seeds" amounted to $2,185,706 in 1899 and $3,000,000 in 1909 of $97,536,085. (See Tracy, page 3135.)

The importation of staple garden seeds has largely decreased by 1870, and with the exception of a few staples in agricultural and flower seeds, America may be said to have become to a great extent self-supplying. The greatest development of this industry has taken place since the close of the war. In 1878 J. J. H. Greg-
ory estimated that there were in all 7,000 acres devoted to garden seeds, while the census of 1890 showed that there were 506 seed-farms, containing 169,850 acres. Of these farms, 200 were established between 1880 and 1890, and it is likely that about 150 more were started during the same period. The census figures do not give the actual acreage devoted to growing seeds. As many seeds are grown by those not regularly in the business, it is probable that census returns as to acreage are under rather than over the mark. The statistics available in the United States Census are very imperfect, partly owing to the lack of a continuous system in presentation, both in the returns of home industry and also in custom-house returns, but chiefly to the reluctance of seedsmen and growers to make public the results of their business methods or even the methods themselves.

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>
<thead>
<tr>
<th>Seed Type</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden peas</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Garden beans</td>
<td>400,000</td>
</tr>
<tr>
<td>Onion seed</td>
<td>500,000</td>
</tr>
<tr>
<td>Lettuce seed</td>
<td>400,000</td>
</tr>
<tr>
<td>Cabbage seed</td>
<td>300,000</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>200,000</td>
</tr>
<tr>
<td>Tomato seed</td>
<td>150,000</td>
</tr>
<tr>
<td>Radish seed</td>
<td>125,000</td>
</tr>
<tr>
<td>Turnip seed</td>
<td>50,000</td>
</tr>
<tr>
<td>Beet seed</td>
<td>25,000</td>
</tr>
<tr>
<td>Celery seed</td>
<td>6,000</td>
</tr>
<tr>
<td>Miscellaneous seeds</td>
<td>25,000</td>
</tr>
<tr>
<td>Sweet peas, flowering</td>
<td>200,000</td>
</tr>
</tbody>
</table>

Probable invoice cost of imported garden seeds: 2,600,000.
SEEDS AND SEEDAGE

The seeds usually offered by seedsmen in their catalogues, or in the seed-stores throughout the country, are purchased from various parts of the world, and the seedsmen who sells seed to retail to the planter direct seldom grows his own seed, although some of the larger firms now conduct seed-farms on which they grow certain specialties, and most of them conduct trial and experimental grounds.

The wholesale seed business is divided into two distinct lines, one of so-called grass-seed 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 supplies his own trade with a small quantity of other 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 beets and mangolds, cabbage and cauliflower, turnips 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 seed-growing is conducted on the subcontracting plan, the grower keeping an agent in a certain locality and letting out small contracts with the farmers. The flowers, legumes, and flower seeds, as well as the larger 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 seed-farms, and practically all of their capital is invested in the seed business. What are considered the “smaller vegetable seeds” and “California specialties” are carrot, endive, leek, lettuce, onion, parsnip, parsley, radish, salisfy, 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 the Southern States. Corn is grown largely in the South; also okra. The best cabbage seed is produced in Long Island and to some extent in the country about 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 these crops, and when they do their contracting and developing and where they grow the seeds which they send out to the farmer to produce crops for them. 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 scientifically than are field crops. It requires a 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 and abundant labor, but also in sections where they can be marketed. Beets may be grown in 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 pea; 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 tomato; others nothing but cabbage; others who raise only sweet corn; others field corn; and others confine themselves to watermelon. Owing to the frequency of crop failures in seed production, and the demands of the larger farms, most seedsmen contract with at least two or three sources of supply and usually both widely separated.

Commission box assortments comprise one of the principal methods pursued in America for the sale of seed. This plan places with merchandise and grocery stores an assortment of staple seed in flat papers and cartons. These assortments are usually sold on commission, but some firms sell the assortments outright. The boxes and unsold seed are collected every year and returned to the home firm, where the papers are torn, the seed tested and repacked with a proportion of new seed. Some twenty firms are engaged in this line of seed distribution, and one firm has nearly 150,000 customers to whom it consigns these assortments. Many of the merchants who take these commission boxes also carry small lots of staple seeds in bags to sell in bulk and are therefore seed merchants in a small way. They usually refer the base of supply on the seed-houses who also concern them the box.

Dealers in garden seeds are also large dealers in flowering bulbs, such as hyacinth, tulips, narcissi, crocus, 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 seeds. The latter is practically a business by itself, devoted to such seeds as blue-grass, 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 being 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 grocer and dry-goods store carries a stock during the spring season. These men, however, deal as a rule with the larger houses, and constitute the principal class of middlemen for retail trade.

The seed-growing and merchandizing industry is represented by the American Seed Trade Association. J. M. Tronox & Co. and C. C. Moos & Co.

SEEMANNIA (named for Berthold Seemann, 1825-1871). Geaneriadaceae. Strigose-pubescent perennial herbs with rhizomes, suitable for the warmhouse: sts. stout, simple: lvs. verticillate, in 3’s or 4’s, very short-petioled, frequently canescent below; the upper ones reduced to bracts; pedicels solitary in the axils; fls. red-purple, turbiniform, bracteolate; fr. a long, acutely pointed beak with a calyx 4's, with a very short petioled: fls. solitary, bright scarlet; calyx with 5 narrow lobes; corolla tube-ribbed downward, broadly and obliquely subcampanulate, with very short erect-spreadings lobes; disc annular, undulate and not divided; ovary almost entirely inferior: caps. nearly inferior.—Two species, S. Amer., S. silvatica, Hanst. (S. ternifolia, Regel). Plant 3-4 ft. high: lvs. 3-4 in. wide, very shortly petioled: fls. solitary, bright scarlet; calyx with 5 narrow lobes; corolla short-gibbose at base. Winter. Peru. Gt. p. 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. Wildenovii is a very choice large-growing species of the bronze and blue class. Another is S. uncinita, 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 jardinieres. For this purpose a well-grown selaginella should be a dense compact mass of fluffy and feathery green, not a weak thin struggling 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. Martensi, and some other

3598. A selaginella used to cover the soil of an orchid pot.—S. denticulata. (X4)

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. Syringe 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. Emmeliana, which is generally considered to flourish 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. Emmeliana; 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°. 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. Martensi, and S. Emmeliana; for carpeting the soil, S. denticulata; for table decoration, S. Emmeliana and S. Martensi; for cutting, the commercial kinds; for veranda-boxes, S. Brauni; for bronze and blue colors, S. Wildenovii and S. uncinita; for specimen plants and exhibitions, S. Kraussiana, S. Lemonii, S. viticulosa, S. Wallchii, and S. Wildenovii. Also the following, which are generally considered more difficult subjects: S. atrorubridis, S. harmatodes, 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, but at the end of the day it 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. Brauni is an old favorite which is often incorrectly labelled S. Wildenovii in commercial circles, or "foliage" in the popular sense, are exceptionally tough and wiry for the genus. Variegated forms appear in S. Martensi, S. Kraussiana, and S. involvens, the last-named species being prolific in singular forms. S. viticulosa 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: native species 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. decumbent, usually rooting throughout.
D. Plants perennial; lvs. firm.
E. Sta. continuous, i. e., without joints.
SELAGINELLA

F. Branches $\frac{1}{3}$ in. or less wide: stks. 6-9 in. long .......... 2. denticulata
3. serpens
4. patula

FF. Branches $\frac{1}{3}$ in. or more wide: stks. 1-2 ft. long . . . 5. uncinata
6. plumosa
7. conciana
8. stolonifera
9. Kraussiana

EE. Sts. articulated .............. 10. Cunninghamii
11. brasiliensis
12. apus
13. albo-nitens

DD. Plants annual; lvs. and st. veins and flaccid ............

CC. Main sts. ascending, branched nearly or quite to the base.
D. Roots confined to the lower half of the sts.
E. Plants perennial, with continuous lvs.
F. Color of lvs. and st. pole or bright green
14. atroviridis
15. californica
16. Martensii

FF. Color of lvs. dark green, becoming red; st. reddish brown
17. rubella

EE. Plants annual . . . .

DD. Roots confined to the base of the sts.
E. Sts. crowded in rosettes, curling closely when dry .......... 19. involvens
20. lepidophylla
21. cupsidata

EE. Sts. 6-12 in. high, not curling in rosettes ............ 22. Emmeliarna

EE. Sts. elongated (2 ft. or more), not crowded . .
F. Lvs. equal-sided at base ....... 23. Wallchii
24. Victoria

FF. Lvs. produced on upper side at base .......... 25. gracilis
26. Lobbi
27. Willdenovii

CC. Main sts. climbing ..........

CC. Main sts. erect, the branches confined to the upper portion, naked below.
D. Sts. not jointed .
E. Color of lvs. straw-colored, or at most only pink-tinted
F. Lvs. long, the ultimate divisions of st. $\frac{1}{2}$-3 in. wide . 28. grandis
FF. Lvs. shorter or minute; the ultimate divisions of st. $\frac{1}{2}$-3 in. wide.
G. Plants usually less than a foot high .......... 29. viticulosa
GG. Plants 1-2 ft. high .......... 30. caulescens
31. Braunii
32. flavicola
33. Vogelli
34. Lyallii

EE. Color of sts. crimson ......
35. erythrops
36. hemastodes

DD. Sts. jointed in lower two-thirds . .

BB. Foliage of spike of two kinds, the smaller forming a lower plane; the larger an upper .......... 38. cordifolia
39. molliceps

1. rupestriS, Spring. A small, rock-loving perennial, with branching sts. 4-5 in. long, many-rankled lvs. ending in a white awn, 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. denticulata, Link. Fig. 3598. Sts. less than 6 in. long, matted: lvs. of the lower plane slightly spaced, denticulate, cordate on the upper side at base and imbricated over the st.; lvs. of upper plane cuspidate.

Medit. region throughout.—Trade names are vars. aerea and foliis variegatis.

3. serpens, Spring. Sts. 6-9 in. long, trailing, bright green, copiously branched: lvs. of lower plane crowded, obtuse, spreading, ciliated at the rounded base; lvs. of upper plane obliquely oblong, acute. W. Indies.—Long in cult.

4. patula, Spring (S. sarmentosa, A. Br.). Sts. slender, trailing, pale green, 6-9 in. long, with long, tail-like tip, and fewer and fainter branches: lvs. of lower plane crowded, erect-sheathing, oblong-lanceolate, somewhat acute; lvs. of upper plane one-third as long, acute. Jamaica.

5. uncinata, Spring (Lycopodium cajum and Selaginella cajus, 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 cuspidate, much imbricated. China.—In 1893 John Saul offered "S. cajus arborea" with the remark that S. lepidophyllum was a synonym thereof.

6. plumosa, 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. concina, Spring (S. serrulata, 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-cuspidate, much imbricated. Mascarene Isls.—Var. foliis variegatis, Hort., is cult.

8. stolonifera, Spring. Sts. a foot 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. Kraussiana, 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. aerea and variegata are American trade names.

10. Cunninghamii, 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 cuspidate. Brazil.

11. brasiliensis, 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, cuspidate. Brazil.—Similar to preceding but with longer lvs.

12. apus, Spring. Sts. 1-4 in. 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.

13. albo-nitens, Spring. Sts. slender, trailing, the lower branches slightly compound: lvs. of lower plane spaced on main st., short-ciliate, bright green; lvs. of upper plane one-third as long, cuspidate. W. Indies.

14. atroviridis, Spring. Sts. 6-12 in. long, ascending, doubly grooved above: lvs. of lower plane spuriously 3-nerved, firm, broadly rounded; lvs. of the upper plane half as long, long-cuspidate, much imbricated. India.
15. californica, Spring. Sts. 4-6 in. long, 4-angled, copiously pinnate: lvs. of lower plane ovate, minutely cuspidate, dentiliculate on the upper side at the base; lvs. of the upper plane very small, obovate-oblong. Said to come from Low. Calif. but not known at Kew and doubtfully in cult. in this country.

16. Martensi, Spring. Fig. 3509. Sts. 6-12 in. long, flat or rounded below, angled above: lvs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly imbricated over the st. at base; lvs. of upper plane obliquely oblong, long-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, ciliated and imbricated 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. Poulteri, Hort. Veitch. Sts. densely tufted, slender, suberect, 2-3 in. long, 3-4 times dichotomously forked: lvs. of lower plane spaced, suborbicular, 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 flattish expanse, curling closely into a ball when quite dry: lvs. of lower plane oblique, 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 brown exterior to expand and show its bright green 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 ciliate 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. Emmelianus, Hort. Fig. 3600. Sts. 6-12 in. high, the primary branches ascending, bipinnate: lvs. of lower plane close, obliquely ovate, those of the branch-lets narrower and minutely spinulose; lvs. of upper plane raised above those of the lower one-half as large, spinulose-serrulate, short-cuspidate. S. Amer. (7).—Named for Th. Emmel, a German gardener. Var. aeria 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. Wallichii, 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 1½-1 in. long. India and the E. Indies.—Highly ornamental.

24. Victoriae, Moore. Sts. 3-4 ft. long, with lanceolate-deltoid, ciliate branches, with the lower branchlets forked or slightly pinnate: lvs. of lower plane crowded, a line long, truncate at base and obscurely petaled; lvs. of upper plane one-fourth as long, short-cuspidate: spikes 1-2 in. long. Borneo and Fiji Isls.

25. gracilis, 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. Lobbii, Moore (S. cognata, 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. Wildenovii, 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, tinted with blue, obscurely petaled; lvs. of upper plane one-third as long, obliquely oblong, not cuspidate. India and the E. Indies.


30. cauliscens, Spring (S. ambana, 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. argenteus, Hort., is advertised.


32. flabeliata, Spring. Sts. erect, deltoid, decom- pound, with contiguous final branchlets: lvs. of lower plane obliquely ovate, acute, broadly rounded and ciliated at the base; lvs. of upper plane obliquely ovate, cuspidate. Widely distributed in tropical regions.—One of the forms of this is cult. as S. crispa, Hort.

33. Vogelli, Spring (S. africana, A. Br. S. Persille, Spring). Sts. decompose above, the lower pinna deltoid, petiolate, 3-4-pin-nate: lvs. of lower plane lanceolate, ascending, often revolute on both edges, truncate at base; lvs. of upper plane minute, strongly cuspidate. Afr.

34. Ljalli, Spring. Sts. deltoid above, the lower pinna bipinnate, the final divisions ½-1 in. long, ⅕-⅙.­
in. wide: lvs. of lower plane oblong-lanceolate, falcate, acute; lvs. of upper plane minute, acute. Madagascar.

35. eríthrous, Spring. Sts. under a foot long, deltoid and decuminate above, the lower pinnae 3-pinnate, the ultimate divisions $\frac{1}{4}$–$\frac{1}{4}$in. wide: lvs. of lower plane oblong-lanceolate, acute, strongly ciliate; lvs. of upper plane one-half as long, cuspidate. Trop. Amer.—S. setosa, Hort., is said to be a starved form.

36. hamaúdes, Spring (S. filicina, Spring). Sts. 1–2 ft. long, the deltoid pinnae 3–4-pinnate, the ultimate divisions $\frac{1}{4}$–$\frac{1}{4}$in. wide: lvs. of lower plane ascending, oblong-rhomboid, acute, dilated on upper side at base, not ciliated; lvs. of upper plane minute, cuspidate. Venezuela to Peru.

37. géniculáta, Spring (S. elongata, Kl.). Sts. 2–3 ft. long, decuminate, 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. córdifólia, Spring (S. cordáta, 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, cuspidate. W. Indies.

39. móliceps, Spring (S. rubricáulis, 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 lanceolate, cuspidate. Afr.

The following American trade names can not be satisfactorily accounted for as species: S. acutíata is said to be one of the most important commercial species cult. in Amer.—S. eríthrea is cult. at Harvard Botanic Garden.—S. Lágeríadá was intro. from Colombia 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. Pitcheriana is of dwarf habit and with sts. and under surface of fronds red and upper surface dark green.—S. Mandiádelá is a recent intro. by W. A. Manda which can not be satisfactorily placed.—S. paradosa. Offered by John Saul, 1893.—S. Pitcheríadá. Cultivated S. Lágeríadá. Colombia.—S. rubricáulis and S. triumpluláris were offered by Saul in 1893.—S. umbrosa. Once cult. by Pitcher & Manda, of the United States Nurseries.

L. M. Underwood.
R. C. Benedict.†

SELENCÉRÉUS (moon goddess and cereus). Cactáceae. 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 one of the prettiest of our few native ornamental crucifers. It has small yellow fls. about $\frac{1}{4}$in. 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. 6007.

E. TRACY HUBBARD.

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E. TRACY HUBBARD.
SELENICEREUS

b. Spines of the sts. not accicular.

c. Sts. blue-green.

pteranthus, Brit. & Rose (Cereus pteranthus, Link & Otto. Cereus nycladus, Link). Stout, suberect, or clambering vines: branches much elongated, bluish green, 4- or 6-angled; spines 1-4, short: fls. large, white, very fragrant, 7 in. long, the ovary covered with long white hairs, dotted with the short acicular spines. Mex. Lem. Cact. f. 11. Gesamm. Kakteen f. 35.—One of the commonest and best night-blooming cacti.

do. Sts. deep green.

d. Knobs on ribs tereete and low.

MacDonaldia, Brit. & Rose (Cereus MacDonaldi, 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. Hon- duras, probably, but some recent writers claim it came originally from Argentina. B.M. 4707. Cact. Journ. 2:133.—One of the most beautiful-leaved species of the cactus family and one of the best of the night-blooming kind.

dd. Knobs on ribs flattened, rather high and reflexed.

hamatus, Brit. & Rose (Cereus hamatus, Scheidw. C. rostratum, Lem.). Sts. oblong to ovoid and ophriwing: climbing or clambering, bright green, about 8 in. diam.: ribs usually 4, interrupted by flattened reflexed knobs bearing small arocles: spines 5 or 6, bristle-like, white; hairs more or less deciduous: fls. large, 10-12 in. long, white. Cent. Mex. Monatsschr. Kakteen 9:23. Gesamm. Kakteen Nachtr. f. 7.—Numerous hybrids have been made by crossing numerous of this species, especially S. grandiflorus, S. MacDonaldi, and S. hamatus, with certain species of related genera. Some of these hybrids have been given distinct names in Cereus, such as C. Mäguyarid, C. Regelii, and C. urdoros.

Cereus inburnum, Otto. Sts. slender, climbing, 4-5-angled, deep green; arocles small, naked except on juvenile shoots and then bearing several white bristles: fls. said to be large, probably nocturnal, but not often appearing on cult. plants. This is a rather insignificant plant. Intro. from Venezuela many years ago. This is not a true Cereus, and without seeing fls. or fr. its real status cannot be definitely stated. Karl Schumann, however, associated it with this group, and if of this alliance, it should be placed near C. hamatus.

J. N. Rose.

SELENIPÉDIUM. For the species included in this genus in "Cyclopedia of American Horticulture," see Phymagomphium. True Selenipidiums (or Selenipedium) are few and seem not to be in cult.


SELF-HEAL: Brunella.

SELF-STERILITY OF FRUITS: Pollen and Polination.

SELINUM (Greek name for parsley). Umbelliferae. Branched perennial herbs, glabrous, tall or rarely low, of little horticultural value: fls. pinnately decompound; umbels compound, white, yellow, or rarely yellowish green; calyx-teeth obsolete or rarely noticeable; petals cuneate or broad, emarginate or 2-lobed: fr. ovoid or nearly quadratic.—About 35 species, mostly in the northern hemisphere but 1 from the mountains of Colombia and 1 from S. Afr.

tenuifolium, Wall (Oreósmé Candolle, Edgew.). A herbaceous perennial with finely cut fern-like foliage, st. often 8 ft. high, branched, wiry, white, rarely or yellowish green; white fls.: ultimate segms. of lvs. narrowly lanceolate, acute: fr. 2-3 lines long, much compressed dorsally, 4-6 times as broad as thick; lateral ridges much the broad- est. India. Gn. 38, p. 221.—Offered as a novelty in Amer. in 1899 and recommended as a foliage plant for single lawn specimens.

F. TRACY HUBBARD.

SEMELE

SELLIÉRA (named for Natale Sellier, a French engraver who worked for Cavanilles). Goodeniiaceae. Two creeping and rooting perennial herbs of Austral. and New Zealand. and one of them extending to Chile; plant glabrous: lvs. entire, or compound; fls. small, white, or pale yellowish green; stamens 3; ovary 2-celled or imperfectly so: fr. fleshy and indehiscent. The plants are probably not regularly in cult., but S. radicans, Cav., has been listed abroad as an aquatic: it grows in muddy or marshy places near the sea in New Zealand, Austral., and S. Amer.: sts. sometimes creeping several feet, forming matted and interlaced patches: lvs. very small to 4 in. long, nearly linear to obvate-spatulate, obtuse, entire, narrowed into long petiole: fls. 1 or 2 on the peduncle. 3½ in. long, white: fr. about 3½ in. long, ovoid or subovoid. See Krause, in Engler's Pflanzenreich, lft. 54 (IV. 277 & 277a). 1912.

SELLIGÜA (personal name, from Selliique, naturalist and mechanician). Polyplodiaceae. A group of ferns referred to Diels (Engler & Prantl, Die Natüren Plantenfamilien) to Polyplodium. Only P. Féei, Mett. (Selligüa Féei, Bory, Gymnographia Féei, Hook.), appears to be listed. It is described by Schneider as a small stote species of the Malay Isl., Java, and Borneo: fronds 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.

SEMECÁRPUS (Greek, mark and fruit, referring to use of fruit-juice). Anacardiaceae. Trees, sometimes grown in the warmhouse, or in the open far S.: lvs. alternate, simple, leathery: fls. small, polygamious, in terminal or lateral, branched, bracteate panicles; calyx 5-cleft, segms. imbricated and deciduous; petals 5, spreading, somewhat unequal; disk annular and rather broad; stamens 5; ovary superior, sessile, 1-celled: nut or drupe reniform.—About 55 species, Trop. Asia and Austral.

Anacárdium, Linn. f. MARKING-NUT TREE. A moderate-sized deciduous tree with large, oblong or obovate-oblong lvs. 8-24 in. long by 5-10 in. wide: fls. greenish white, ⅔ 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.

SÉMELE (named for the mother of Bacchus). Liliaceae. CLIMBING BUTCHER'S BROOM. A warmhouse plant, hardy outdoors in the extreme S.: st. shrubby and branched, high-climbing over trees attaining a height of 50-60 ft., cladodia fl.-like, alternate or few, solitary at the axils of fuscous-membranaceous scales, ovate-lanceolate, acuminate, leathery: fls. small, yellow, fascicled, the fascicles on the margins of the cladodia; petiole persistent, tube very short, turbinate, almost hemispherical; crown none; ovary sessile in the perianth-tube, 3-celled: berry globose, pulpy, indehiscent.—One species, Canary Isl. What appear to be lvs. and cladodia: cladophylla. They are organs which have the form and function of lvs. but not the morphology. Semele belongs to the small group of 4 genera known as the Asparagus tribe, all the members of which have cladophylla. Semele differs from the butcher's broom (Ruscus) in having 6 anthers instead of 3 and in having the cladophylla instead of the small, short midrib. Asparagus differs from both in having the fls. not borne on the cladophylla and the filaments free instead of grown into an urn-shaped body.

SEMI Begoniála is a recent genus of the Begoniaceae, differing from Begonia in having a tubular male flower (SYMBegonia has a tubular female flower), apparently not in cult. S. Sodirea. 1.5, 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, free or 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 Gardner's Chronicle for 1879, and his treatment has thus 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 for the most part greenhouse plants, and the specific limits are very uncertain and unsatisfactory, no two authors agreeing. The key given 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. 3692) which are sent out from the parent plant, thereby suggesting the popular name "hen-and-chickens." The leaves are thick, short, and succulent. The flowers, which are borne in panicked cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual flowers are larger than those of sedum, but the clusters are less showy. Houseleeks are propagated more for foliage than for flowers. They are not used for as great a variety of purposes as sedums, but they are popular for carpet-bedding, rockwork, and covering dry banks and bare sandy wastes. They are of the easiest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for permanent carpet-beds, and for this special purpose are preferable to the more popular but tender echeverias. The foliage remains green all winter. The leaves are often spotted red toward the tip, and this color is brighter if the plants have full sunight. The names "houseleek" and "hen-and-chickens" are loosely applied to the whole genus. If these names are too restrictions, the former should be used for Sempervivum tectorum and the latter for S. soboliferum. The common 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. 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.

INDEX.

A. Plants without secondary rosettes on offsets; fls. usually small.
   b. St. herbaceous, with the basal ls. in a rosette.
   bb. St. shrubby, with the ls. in a rosette at the end of the branches.
   c. Surface of the ls. villous.
   d. Base of the ls. rough, with roundish oocyte.
      e. Petals elliptical; calyx-segments ovate.
      ER. Petals linear-lanceolate; calyx-segments short-triangular.
        f. Lvs. oblong-spatulate.
      DD. Lvs. oblong-lanceolate; petals ttingulate.
      cc. The fls. large; petals filiform on the margin and keel.
      dd. New rosette rolled into round balls.
         e. Lvs. oblong-lanceolate.
         f. Lvs. oblong-lanceolate.
         d. New rosettes not rolled up into round balls.
   DD. Lvs. spathulatum
   bb. Fls. usually 13-merous (9-14-merous); widely expanded at maturity.
   C. Color of fls. yellow or yellowish.
   D. Surface of the ls. glabrous.
   E. The ls. ovate-lanceolate.
   EE. The ls. ovate-lanceolate.
   DD. Surface of the ls. more or less hairy.
   FF. Blade of the ls. enlongated, linguately, or oblanceolate.
   GG. Blade of the ls. more or less ovate-lanceolate.
   ff. Segs. of calyx oblong.
   mm. Segs. of calyx lanceolate.
   FF. Petals linear-lanceolate; petals acute, green-straite externally.
   gg. Petals lanceolate, minute, not green-striate externally.
   CC. Color of fls. reddish or purplish.
   d. Inner lvs. of rosettes with hair tips connected by fine hairs like a spider's web.
   ee. The following 6 species are very closely related.

B. St. herbaceous, with the basal ls. in a rosette.
   1. Poculiforme.
SEMPERVIVUM

E. Rosette lvs. glabrous or merely puberulent at apex.
F. Calyx-segs. lanceolate-linear, acute; cauline lvs. lanceolate-linear. 18. heterogloss. (trichium)
FF. Calyx-segs. lanceolate-oblong, obtuse; cauline lvs. oblongate to oblong. 19. Moggridgei
EE. Rosette lvs. more or less hairy, of calyx linear—rosette lvs. oblongate. 20. arschnoideum
FF. Segms. of calyx ovate to lanceolate;
G. Cauline lvs. lanceolate; rosette lvs. oblongate. 21. Doellianum
GA. Cauline and rosette lvs. lingulate. 22. Laggeri
DD. Inner lvs. of rosettes not connected by fine hairs like a spider's web.
E. Tips of lvs. with a tuft of hairs.
F. Lvs. ovate. 23. Hausmannii
FF. Lvs. oblanceolate.
G. Cusp of If. distinct; fls. rose-red. 24. Pomelii
GG. Cusp of If. obscure; fls. bright red. 25. fimbriatum
EE. Tips of lvs. without a tuft of hairs.
F. Surface of lvs. of the rosettes subescent.
G. Stamens two-thirds as long as petals. 26. assimile
GG. Stamens half as long as petals.
H. Barren rosettes not more than 1 in. diam. 27. pumilum
HH. Barren rosettes more than 1 in. diam.
I. Fls. numerous, mauve or red-brown. 28. montanum
J. Fls. few (4–8), bright red. 29. flagelliforme
FF. Surface of lvs. of the rosettes glabrous.
GG. Rosette lvs. more or less ovate or obovate.
H. Lf.-blade broadest toward the base.
J. Color of lvs. gray-green. 31. Mettenianum
HH. Lf.-blade broadest toward the apex.
I. Petals lanceolate. 32. blandum
J. Petals linear.
K. Sepals linear-lanceolate. 33. Lamottei
LL. Sepals lanceolate-lanceolate. 34. tectorum
GG. Rosette lvs. oblongate-cuneate.
HH. Red-brown tip of rosette lvs. none or obsolete.
II. Young rosettes on peduncles 1 in. or more long. 35. Funckii
III. Young rosettes sessile or nearly so.
I. Lvs. glaucescent. 36. glaucum
J. Lvs. pale green but not glaucous.
K. Cauline lvs. green-tipped; petals rose. 37. Verliothii
KK. Cauline lvs. claret-tipped; petals white-margined. 38. atlanticum
LL. Red-brown tip of rosette lvs. distinct.
I. The cauline lvs. red-brown throughout. 39. triste
II. The cauline lvs. partly green.
SEMPERVIVUM
cauline lvs. close, red-brown, lanceolate, ¼–1 in. long; fl.-st. including the infl. 6–8 in. high, densely short-pubescent: fls. 6-merous, pale straw-color, in a dense panicle 2½–3 in. diam.; calyx-teeth linear-oblong, finely glandular-puberulent, tips reddish brown; cauleine lvs. equal, broad, long-acuminate: fls. white, or roseaceous Paniculate; petals linear-lanceolate. Hab. (?)

8. Reginea-Amalthe, Heldr. & Sart. Rosettes about 3 in. diam., the new ones sessile; lvs. 100 or more to a rosette, ovate-lanceolate, ciliate, all bright purplish brown in the upper half, green only toward the base, glabrous, margin ciliate, outer lvs. 1½–1 ¼ x ½–2 ½ in.; cauleine lvs. crowded, lanceolate, brown, slightly pubescent: fl.-st. including inf. 6 in. high, densely pubescent: fls. 6-7-merous, pale yellow, in a dense many-fld. capitule; calyx finely glandular-puberulent, margins lanceolate; petals lllaginate; obtuse, obscurely tricuspidate, densely glandular externally. Mountains of Greece.

9. soboliferum, Sims (S. globiferum, Linn. as to synonyms and many other authors, not Linn. as to plant cited). HEN-AND-CHICKENS. Houseleek. Barren rosettes globular 1½–2 in. diam., the cauleine lvs. 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, obvolute-cuneate, obscurely ciliate, pale light green, glabrous, margin minutely ciliate, outer ones tinted with red-brown especially on their back, ¼–½ x ¼–½ in.; cauleine lvs. very densely glandular-puberulent, acute: fl.-st. including inf. 6–9 in. high, very robust, finely pubescent: fls. 6–7-merous, pale yellow, in a short, dense, many-fld. panicle, which is 5–4 in. diam.; calyx-segments lanceolate, narrowly glabrous on the back, margins strongly ciliate; petals lanceolate, ¼ in. long, obscurely tricuspidate, margin mucronate, Flat-topped on the 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. Neilebrechti, Schott, Nym. & Kotschy). Rosettes globular, deciduous: lvs. 60–80 to a rosette, obvolute-cuneate, obscurely ciliate, pale bright green, glabrous, outer lvs. slightly tinted red-brown on the back, ¼–½ in. long; cauleine lvs. ovate-lanceolate: fl.-sts. including the inf. 6–9 in. high, crowded, leafy and finely pubescent: fls. 6–7-merous, pale yellow, many in the rosette head, 2–3 in. diam.; sepals lanceolate; petals lanceolate, ½–2 in. long, distinctly tricuspidate with a linear end tooth. Tyrol. Gn. 49, p. 220.

11. hirtum, Linn. (S. Allionii, Nym. S. cornutum, Hort.). Developed barren rosettes 1½–3 in. diam., the new ones not rolled up into balls and breaking away as in S. soboliferum: lvs. about 50 to a rosette, obvolute-cuneate, not distinctly ciliate, pale gray-green, surfaces finely glandular-puberulent, margins glandular-ciliate, outer lvs. faintly tinted red, ¼–½ x ½–1 in.; calulline lvs. crowded, pubescent, the upper corolla-ovate: fl.-st. including inf. 6–9 in. high, densely pilose: fls. usually 6-merous, pale yellow, in a few- to many-fld. panicle which is 1½–2 in. long; calyx-segments lanceolate, hair on their back; petals ½–1 in. long, lanceolate, tricuspidate, the middle tooth conspicuous, keel prominent, tinged greenish red and is densely glandular. S. Eu.

12. Wulfenii, Hoppe. Developed rosettes 1½–2 in. diam., the new ones nearly sessile: lvs. about 50 to a rosette, obvolute-cuneate, ciliate, slightly glaucous, with only a few-tipped round of red-brown at the very tip, outer lvs. ¼–1 x ¼–1 in.; calulline lvs. lanceolate, ¼–1½ in. long; fl.-st. including inf. 6–9 in. high, densely pilius: fls. 12–14-merous, pale yellow, in a short dense panicle which is 2–3 in. diam., its branches densely pilose; calyx short-pilose, segments lanceolate; petals linear, densely glandular-puberulent externally. Mountains of Central Eu.

13. albiflorum, Schnittsp. & Leh. Rosettes large, the young ones 1–3 in. away from the old one: lvs. of rosettes ovate-lanceolate, narrowed at their base, apex rather long-acuminate, glabrous, finely ciliate, dark grass-green, tips reddish brown; cauleine lvs. equally broad, long-acuminate: fls. white, or roseaceous paniculate; petals linear-lanceolate. Hab. (?)

14. Pittonii, Schott, Nym. & Kotschy. Rosettes 1½–2 in. diam., always open, the young ones sessile: lvs. 60–80 to a rosette, ensiform, lilligulate or obovate, apex abruptly deltoid-pointed, pale green with large light red blotches, outer lvs. ¼–½ in. long; calulline lvs. densely glandular-lanceolate, red-blotched and purple-tipped, densely glandular-hairy: fl.-st. including inf. 4–5 in. high, glandular-hairy ending in a 3-branched, dense corymbose infl.: fls. 12–20, small, 9–12-merous, yellowish white; petals linear-lanceolate, about ¼ in. long, glandular-hairy on the margin and back. Styria. Rare in cult.

15. rupicolum, Kern. Rosettes 1½–2 in. diam., the young ones on glandular-hairy peduncles which are 1½–2 in. long; lvs. densely glandular-puberulent, ¼–½ x ½–2 ½ in., narrowed gradually from the upper one-third to the reddish base, ciliate, slightly scattered glandular-hairy; cauleine lvs. ovate-lanceolate, ¼–2 in. long, tip reddish: fl.-st. slender, glandular-hairy: fls. 12–14-merous, pale greenish yellow, striped red; calyx-segments obscurely pubescent, petals narrow linear-lanceolate, acute. Tyrol. Probably a hybrid; S. montanum x S. Wulfenii.

16. globiferum, Linn. in part. excl. synonymy (S. ruthenicum, Koch). Rosette ½–2 in. across, rather flattened, the young ones globular, borne on scaled peduncles which are rather stout and about 1½–2 in. long: lvs. obvolute-cuneate to elliptical, gray-green, ciliate; cauleine lvs. oblong, acute, about 1½–2 in., tip often red-brown: fl.-st. about 1 ft. high, including inf. densely glandular-hairy; fls. 12–14-merous, about ¾–1 in. across; calyx-segments lanceolate, petals linear-lanceolate, acute, externally glandular-hairy and green-striate, margins glandular-ciliate. Russia in Eu.—As Koch points out in Flora 18, part 1:209, 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 Rutheno. D. Gmelin" undoubtedly refer to the 12-merous plant which Besser knew under the name S. globiferum and which he, Besser, sent to Koch in 1834.

17. grandiflorum, Hav. (S. globiferum, Sims, not Linn.). Rosettes about ½ in. diam., the new ones on decumbent peduncles 1½ in. long, which have fall lvs.; lvs. about 40 to a rosette, obvolute-cuneate, obscurely ciliate, pale green, pubescent, only the tip obscurely red-brown tinted, outer lvs. ¼–1 x ¼–1½ in.; cauleine lvs. crowded, lanceolate, ¾–1 in. long; fl.-st. including infl. 3–8 in. high, densely pubescent: fls. 12–14-merous, 1½–2 in. across, pale yellow, sub-elliptical in a dense many-fld. capitule; calyx pubescent, segments lanceolate; petals lanceolate, acuminate, back glabrous. Hab. (?) B.M. 507; 2115(7).

18. heterétrichum, Schott. Rosettes 1½–2 in. diam.: fl.-sts. 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 lf-tips, puberulent at the apex above, glabrous beneath, glaucous; cauleine lvs. jagged-edged, stamina: fl.-st. including infl. 6–9 in. diam., densely short-pilose; fls. 9–12-merous, rose, in a racemose panicle; calyx-segments lanceolate-linear, acute; petals lanceolate, acuminate, ciliate, apex barbulate. S. Eu.—Closely allied to S. Doellianum and S. arachnoides.

19. Moggrudgei, De Smet. Rosettes 2 in. diam.: lvs. about 100 to a rosette, ¾–1 in. long, elongate-cuneate or obovate, green, glabrous, margins minutely ciliate,
tips acute and hairy tufted; cauline lvs., the lower oblong-lanceolate, 3½ in. long, tips bearded, pale green; tips reddish, the upper more oblong: cyme 3–4 times forked: fls. 10–12-merous, 3½ in. diam.; calyx glandular-pubescent, segms. linear, obtuse; petals lanceolate, acuminate, apiculate. S. Eu. B.M. 0610.—Allied to S. arachnoidenum.

20. arachnoidenum, Linn. (S. Häusmannii, Aucrsd., not Lehm. & Schnittsp. S. piliferum, Jord.). Cobweb or Spider-web Houseleek. Fig. 3601. Barren rosettes 1½–3½ in. diam., the new ones crowded and sessile: lvs. about 50 to a rosette, oblong-cuneate, obscurely cuspidate, pale green, tips of nearly all the lvs. connected with long soft white hairs, outer lvs. tinted with red-brown on the back, about 3½ in. long; cauline lvs. oblong-lanceolate, small, tips with a dense tuft of hairs: fl.-st. 3–4 in. long; including the dense few-fld. panicle: fls. 9–12-merous, about 1 in. across; calyx-segms. linear; petals lanceolate, ½–¾ in. long, with a very obscure tuft of short hairs at the tips; fl.-st. including infl. 4–6 in. high: fls. 9–10-merous, bright red, in a compact, few-fld. panicle; calyx densely pubescent, segms. lanceolate; petals lanceolate, ½–¾ in. long, with a very small ciliate-tufted, hairy, terminal, linear-lanceolate ciliate, obtuse, 7–11 mm. long, nearly obscurely pubescent, 5–6 mm. wide, mucro short-ciliate, obtuse, 2–5 mm. long and 1–3 mm. wide, acuminate, nearly obscurely pubescent, 5–6 mm. long and 1–3 mm. wide; calyx very hairy, segms. lanceolate; petals acuminate, very hairy outside. Caucasus.

21. Doelliiimum, C. B. Lehm. Barren rosettes ½–1¼ in. diam., the new ones shortly peduncled: lvs. 40–60 to a rosette, obblanceolate, obscurely cuspidate, pale green, surface slightly hairy, the tips of only the most lower ones connected by a few arachnoid threads, the outer 3½–5 in. long, tinted with red on the back; cauline lvs. lanceolate, ½–¾ in. long, with only an obscure tuft of short hairs at the tips; fl.-st. including infl. 4–6 in. high: fls. 9–10-merous, bright red, in a compact, few-fld. panicle; calyx densely pubescent, segms. lanceolate; petals lanceolate, ½–¾ in. long, with a very small ciliate-tufted, hairy, terminal, linear-lanceolate ciliate, obtuse, 7–11 mm. long, nearly obscurely pubescent, 5–6 mm. wide, mucro short-ciliate, obtuse, 2–5 mm. long and 1–3 mm. wide, acuminate, nearly obscurely pubescent, 5–6 mm. long and 1–3 mm. wide; calyx very hairy, segms. lanceolate; petals acuminate, very hairy outside. Caucasus.

22. Lägleri, Schott (S. arachnoidenum var. Lägleri, Rouy. & Fouc.). Rosettes up to 3½ in. diam., open, the young ones close to the old ones or on peduncles up to 1½ in. long: lvs. green-gray, red-violet at the tip, short glandular-hairy, at least above, lingulate, about 3½ in. long, tips acuminate; cauline lvs. lanceolate, ½–¾ in. long, with a very small ciliate-tufted, hairy, terminal, linear-lanceolate ciliate, obtuse, 7–11 mm. long, rather close, hairy, tips tufted hairy and red or black-violet and red or black-violet-dotted: fls. bright rose, in a rather dense panicle borne on a reddish st.; calyx-segms. ovate-elongated, acute; petals oval-lanceolate with the middlevein darker. Switzerland. Gn. 78, p. 470.—Closely allied to S. arachnoidenum and considered a variety of it by some authorities. The most strong-growing variant of this species offered in the trade under the name S. arachnoidenum var. Lägleri gigantea, Hort.


24. Pömelli, Lamote; also misspelled Poemlili. Barren rosette 1½–1¾ in. diam., the new ones nearly sessile: lvs. 50–60 to a rosette, obblanceolate, with a distinct cusp, a few hairs on both surfaces, the cusp furnished with an inflexed tuft of hairs, outer lvs. 3½–4 in. long, with red; cauline lvs. much imbricated, lanceolate, hairy, the lower 1½–2 in. long; fl.-st. including infl. 6–9 in. high, densely pilose: fls. 10–12-merous, 1 in. across, rose-red, in a panicle 3–4 in. diam., its simple branches 6–12-fld.; calyx densely pilose, segms. linear-lanceolate, glandular; petals linear-lanceolate. France.

25. fimbriatum, Schnittsp. & Lehm. Barren rosette 1½–1¾ in. diam., the new rosettes nearly sessile: lvs. 50–60 to a rosette, obblanceolate, obscurely cuspidate, green, margins deflexed hairy, tip with a tuft of hairs, outer lvs. becoming red-brown, 3½–5 in. long; cauline lvs. pilose, lanceolate, red-tinted, much imbricated, lower ones 1½–2 in. long; fl.-st. including infl. 6–10 in. high, densely glandular-pilose: fls. about 12-merous, 1 in. across, bright red, in an open few-branched panicle; calyx-glandular-pilose, segms. linear-lanceolate; petals lanceolate. Pyrenees and Tyrol. Gn. 78, p. 47.

26. assimile, Schott. Rosettes of barnes lvs. 1½–2 in. diam., the new ones nearly sessile: lvs. 60–80 to a rosette, obblanceolate, cuspidate, pale glaucous green, not red-tipped, margin short-ciliate, surface minutely pubescent, outer lvs. 3½–4 in. long; fl.-st. including the infl. about 6 in. high: fls. 12-merous, about 3½ in. across, bright red, in an open few-branched panicle; calyx-glandular-pilose, segms. linear-lanceolate; petals linear. Transylvania.

27. pumilium, Bieb. (S. anémum, Hort.). Barren rosette at most 1 in. diam., the copious new rosettes shortly peduncled: lvs. 30–40 to a rosette, obblanceolate, cuspidate, green, pubescent, end micro obscure, outer lvs. only tinted red-brown, 3½–4 in. long; cauline lvs. lanceolate, hairy all over, tinted red-brown, the lowest 3½–5 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, glabrous, margin short-ciliate, sessile; calyx very hairy, segms. lanceolate; petals acuminate, very hairy outside. Caucasus.

28. montanum, Linn. Barren rosette 1½–1¾ in. diam., the few new rosettes on red pilose peduncles 1½–1¾ in. long: lvs. closely packed, 60–80 to a rosette, obblanceolate-cuneate, cuspidate, green up to the tip, both surfaces slightly pilose, outer lvs. 3½–4 in. long; cauline lvs. densely imbricated, lanceolate, tinted with red-brown toward the tip, the lower 1½–2 in. long; fl.-st. including infl. 3–6 in. high: fls. 12–14-merous, bright mauve-red, in a very dense panicle, which is 1½–2 in. diam.; calyx very hairy, segms. lanceolate; petals 2½–3½ in. long, linear-aecinum. Alps and Pyrenees. Var. glaciäle, Lagg. (S. Læthmannii, Schnittsp.). Lvs. linear-lanceolate, base somewhat narrowed, apex bluntly pointed, upper surface weakly glandular-pubescent; calyx lvs. similar but shorter and brown-tipped: fls. dirty red-brown, 10–12-merous; calyx-segms. linear-lanceolate; petals linear. Switzerland.

29. flagelliförmе, Fisch. Barren rosette 1½–2¾ in. diam., with the lax new rosettes on long spreading peduncles and the lvs. not aggregated into a dense crenate head: lvs. 60–100 to a rosette, obblanceolate, obscurely cuspidate, surface minutely downy, pale green without a tint of red-brown at the tip, margin ciliate, outer lvs. 3½–4 in.; cauline lvs. imbricated, lanceolate,
SEMPERVIVUM

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 6-8 in a dense head, sessile, or nearly so; calyx densely pilose, segms. lanceolate; petals linear, acuminate, densely glandular-pilose outside. Siberia(?).

30. Schnittspahnii, L. (S. Fünkii, L. J.). 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-ciliate, dark green, tip red-brown, keeled beneath; cauline lvs. lanceolate; segments of the top slightly winged, white-hairy: fls. brown-rose, later rose, more than 6-merous; petals broadly lanceolate. Switzerland.

31. Metteniannum, Schnittsp. & Lehm. (S. parviflorum, Lehm. & Schnittsp.). Rosettes flat, 1½-2 in. diam., the young ones on peduncles 3-4 in. long, which are commonly lyv. below: lvs. ovate-lanceolate, ciliate, base narrowed, glabrous, margin ciliate, gray-green marbled with white; petals tip red-brown; cauline lvs. long, straight-acuminate, appressed: fl.-st. spreading, white-hairy, bearing a racemose panicle: fls. rose; petals linear-lanceolate. Cent. Eu. G.M. 57: 847.—Allied to S. tectorum.

32. blándum, Schott (S. rubicundum, Schur). Sts. 7-10 in. high, they and the branches of the propagations densely puberulent: rosettes ½-2 in. diam.: fls. of the rosette ovophyllum-cuspidate, very stiff, ciliate, glaucous; cauline lvs. spreading, linear-oblong, apiculate-cuspidate, both surfaces softly-puberulent: infl. puberulent and pilose: fls. 12-merous, pale rose; sepals lanceolate, acute; petals lanceolate, acuminate, midnerve deeper colored. Transylvania.

33. Lamóttei, Bor. Barren rosettes 3-4 in. diam., the copious young rosettes sessile: lvs. obovate-cuneate, ciliate, base wide rounded, young lvs. 1¼-1½ x ½-¾ in., green or faintly glaucous, with only the faintest tint of red-brown at the tip: fl.-st. including infl. often more than 1 ft. high, densely glandular-pilose: fls. 12-16-merous, 1 in. across, pale pink, in a panicle with the main branches often bifid; calyx densely pilose, segms. linear-lanceolate; petals narrow. France.—Has been referred to S. tectorum by some authors.

34. tectórum, Linn. (S. robertatum, Jord. & Forr. S. purpurascens, Schott). HOUSELEEK. OLD-MAN-AND-WOMAN. Fig. 3602. Developed barren rosettes 3-4 in. diam., abundantly stoloniferous, the new rosettes crowded and sessile: lvs. 50-60 to a rosette, obovate-cuneate, cuspitate, 1½-2 or finally 3 x ½-¾ in., pale green, with a white midrib; cauline lvs. lanceolate, acute: fl.-st. including infl. about 1 ft. high, densely pilose: fls. 11-15-mostly 12-merous, ¾-1 in. across, pale red, in a scorpioid, 10-12-branched panicle 5-6 x 3-4 in.; calyx densely pilose, segms. lanceolate; petals linear, keeled, the keel deeper red. Eu. and Orient. C.L.A. 23, March, p. 54.—Variable. Var. čhüréum, Horst., is said to have larger rosettes which are glaucous and rose-colored; it flowers rarely. Var. expánsum, Horst., is said to have broader lvs. and more open rosettes than the type. Var. pyrenáicum, Horst., is offered in the trade. Var. rubrórum, Horst., has been grown in botanic gardens. Var. violáceum, Horst., has been grown in botanic gardens.

35. Fúnkii, F. Braun; also spelled Funkii. Barren rosettes 1½-2 in. diam. surrounded by a dense circle of young ones on bright red, succulent peduncles, which are 1 in. or more long and densely rosulate at their tips: lvs. 80-100 to a rosette, ob lanceolate-cuneate, cuspidate, green and glabrous or slightly pilose when young, outer lvs. 3-4 x ½-¾ in., lower cauline lvs. about 1 in. long: fl.-st. erect, 6-9 in. high, with 11-12-merous, about 1 in. across, bright red-purple, in a panicle 2-3 in. diam.; calyx-segms. lanceolate; petals glandular-pubescent outside. S. Eu.—Allied to S. montanum.

36. gláucum, Tenore (S. Comolíi, Rota. S. acuminatum, Schott, not Jaccquem. S. Schötti, Baker, not Schnittsp. & Lehm. S. Schélhanii, Schott). Barren rosettes 2-3 in. diam., the copious young ones sessile or nearly so: lvs. ob lanceolate-cuneate, cuspidate, glabrous, glaucous, with a slight red-brown tip, outer lvs. 1½ x ½-¾ in.; cauleine 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-pilose, segms. lanceolate; petals somewhat keeled. Cent. Eu.—The synonymy is much involved and by some authorities S. Comolíi is said to be a hybrid, S. acuminatum and S. Schötti synonymous and distinct, and S. Schélhanii also distinct, but the differences seem extremely weak.

37. Verlótii, Lamotte. Barren rosettes 1½-2 in. diam., the new ones nearly sessile: lvs. about 50 to a rosette, ob lanceolate-cuneate, cuspidate, glabrous, pale green, faintly glaucous, only the very tip tinged with red-brown, margin stiff-ciliate, outer lvs. ¾-1 x ¾-1¾ in.; cauleine lvs. oblong-lanceolate, acuminate, lowest about 1 in. long: fl.-st. including the infl. 6-9 in. high: fls. 12-14-merous, ¾-1¾ in. across, rose-red, in a panicle 3-4 in. diam., simple glandular-pilose branched, each branch with 8-12 fls.; calyx densely glandular-pilose; petals densely ciliate on the back. Alps of Dauphiné.

38. atlánticum, Baker (S. tectorum var. atlánticum, Ball). Barren rosettes 2-3 in. diam., the young rosettes nearly sessile: lvs. ob lanceolate-cuneate, cuspidate, pale green, glabrous when mature, hardly at all tipped with red-brown, outer lvs. 1-1½ in. long, ¾ in. broad above the middle; cauleine lvs. oblong-lanceolate, noticeably claré-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. 605.

3062. Rosette and offsets of a houseleek.—SEMPERVIVUM tectorum. (X½)

39. trítse, Horst. Barren rosettes 2-3 in. diam.: lvs. ob lanceolate-cuneate, cuspidate, glabrous, margin short-ciliate, lower part dull drab-green, the whole upper part bright red-brown; cauleine lvs. red-brown throughout, lower ones 2-3 in. long; fl.-st. robust as in S. tectorum: fls. about 1 in. across, bright red, in a panicle 6 x 3-4 in.; calyx moderately hairy, deeply tinted with red-brown. Hab. (?).—A rare form allied to S. tectorum. Var. bico lor, Horst., is offered in the trade.

40. Greéníi, Baker. Barren rosette about 1½ in. diam., the new ones nearly sessile: lvs. 40-50 to a rosette, ob lanceolate-cuneate, cuspidate, glabrous, glau cous with a distinct red-brown tip ¾-¼ in. long, margins decurved ciliate, outer lvs. ¾-1 x ¾ in., cauleine lvs. much imbricated, lanceolate, hairy, red-tinted, ¾-1 in. long: fl.-st. including infl. 6 in. high: fls. 11-12-merous,
SEMPER VIVUM

3148

SENECIO

about Hin. across, pale

red, in a panicle 1 ^-2 in. diam.;
calyx densely pilose; petals densely ciliated. Habitat
unknown, possibly the French Alps.
41. calc&reum, Jord. (S. californicum, Hort.). Barren rosettes about 2 in. diam., young ones nearly sessile: Ivs. oblanceolate-cuneate,
cuspidate, very glaucous, with a very distinct red-brown tip, glabrous, outer
Ivs. 1-l^x %in.; cauline Ivs. densely imbricated,
l
in. long: fl.-st. less than 1 ft.
oblong-lanceolate, l-l
high, including the infl. fls. 10-12-merous, %in. across,
pale red in a panicle 3-4 in. long, with 8-12 simple
scorpioid branches; calyx densely pilose, segms. lanceolate; petals greenish down the keel, densely ciliate.
France on the calcareous alps of Dauphine.

A
:

42. arvernense, Lecq.

&

Lamotte.

Barren rosette

1^-23^ in. diam., copiously stoloniferous Ivs. about
same number as in S. tectorum, oblanceolate-cuneate,
:

cuspidate, bright pale green, glabrous, tips of Ivs. with
distinct red-brown blotch
J^-^in. long, outer Ivs.
1-1% 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.

a

43.

2-3

Boutignyanum,

Bill.

&

Gren.

Barren rosette

in.

broad, copiously stoloniferous: Ivs. oblanceolate-cuneate, cuspidate, glabrous, green, with a disin.
tinct, decurrent red-brown tip, outer Ivs. 1-1
long; cauline Ivs. lanceolate, 1 in. or more long: fl.-st.
including infl. 6^8 in. long, short-pilose: fls. 12-14merous, about %in. across, pale rose, in a panicle 2-3
in. diam. which has 8-12 crowded fls.; calyx-segms.
Eu.
lanceolate; petals densely glandular-ciliate.
Botanically probably a variant of S. arvernense.

M

44. alpinum, Griseb.
Ivs. of rosettes

&

Schenk.

Rosettes 2-3

in.

diam.:

oblanceolate, base cuneate,
apex short-acute, glabrous, green, red-tipped; cauline
Ivs. oblong to lanceolate, acuminate,
sparsely pilose
beneath: fls. purple-reddish in a panicle, star-like,
expanded; petals 12, linear-lanceolate, glandular-ciliate,
dorsally obscurely stria te. Eu.
Botanically it is probably only a variant of S. arvernense, though referred by
some authorities to S. montanum.
45. Boissieri, Hort.
in. diam.,

composed

Barren rosette very dense, 2-2 J^
about 100 Ivs.; new rosettes

of

short-peduncled Ivs. oblanceolate-cuneate, cuspidate,
broadest near the middle, glabrous, green, noticeably
red-brown-tinted at the tip, 1-1
in. long; cauline Ivs.
closely imbricated, red-tinted, oblong to lanceolate:
fl.-sts. including the infl. 8-9 in.
high.: fls. pale red,
12-14-merous, about 1 in. across, in a panicle about 2
in. diam. Hab.(?).
:

%

S. affine,

Lamotte, is offered in the trade as having dark green
rosettes marked with rose: fls. red. Eu. The botanical
w not available and the species is not treated in recentdescription
European
floras.
S. atropurpureum, Hort., is offered in the trade as
having
rosettes washed with purple: fls. red.
S. chrysanthoides, Hort., is
offered in the trade as a form with white fls.
S. cilidsum, Craib.
Barren rosettes more or less flat, up to 1
in. diam. Ivs. oblonglanceolate, more or less acuminate, up to %in. long, keeled beneath,
conspicuously long white-ciliate toward the apex, pubescent above,

M

:

outer

Ivs. red-tinted; cauline Ivs. imbricate,
tip red-suffused: fl.about 2 in. high, bearing about 6 subsessile fls. fls. about 1 in.
across, pale green, 9-11-merous; calyx-segms. oblong-lanceolate,
acute, glandular-pubescent; petals linear, glandular - pubescent
externally. Hab.(?). Grown in botanic gardens.
S. c6lchicum,
Hort., is offered in the trade.
S. commutatum, Hort., is offered in
the trade. S. Delp6ntii, Hort., is a trade name. S.
elegans, Lagg.
losettes small, about
J^in. diam., the young ones on short shoots
sts.

:

forming a mat: Ivs. linear-lanceolate, cuspidate, short-villous,
weakly cobwebbed, pale green, slightly ciliated; cauline Ivs.
numerous, slightly separated, oval-lanceolate, brown toward their
tip and tufted ciliate: fl.-st. weak, almost prostrate on the
ground
during flowering and glandular-hairy; petals oval-lanceolate, acuminate. Switzerland. Not treated in
any of the recent Swiss floras but

offered in the trade.
5. hispdnicum, Willd., is a doubtful
species
with subulate, semi-terete, ciliate, imbricated
Ivs.; possibly a
>edum. 6. hispdmcum, Pourr., equals Sedum nicajense. S. hispidulum, Hort., is offered in the trade. S. hispidum, Hort., is a horticultural name.
S. humilum, Hort., is a horticultural name.
S.
kopaomkense.Panc., is said to be related to S. Heuffelii by Pancic,
but is not well known and it is suggested that it is
only a form of
that species by recent authors. Serbia. S.
is

Ldggei, Hort.,

pre-

sumably an error for Laggeri. S. leucdnthemum, Hort., is probably
an error for leucanthum. S. leucdnthum, Pane., is described as a
form with rather small rosettes, 12-merous fls. and white petals,
grown in gardens, now questionably referred to S. tectorum. S.
margindtum, Hort., is offered in the trade. S. pildsum, Hort., is a
trade name.
S. pyrenaicum, Lamotte, is offered in the trade as
having handsomely formed and dark red rosettes. Eu. The botanical description is not available and the recent European floras do

not treat this species.- S. rubens, Hort., is offered in the trade. S.
rubrum, Hort., is offered as having a dark base to the Ivs., possibly
the same as S. tectorum var. rubrum. S. rupestre, Hort., is a
trade name, perhaps a form of S. tectorum. S. Scherzeridnum,
S. specidsum, Lamotte, is offered in
Hort., is offered in the trade.
the trade. Eu. The botanical description is not available and none
of the recent European floras mentions it.
S. spindsum, Hort., is
a trade name. S. spinulifblium, Hort., is offered in the trade and
also occurs in botanic gardens.
S. Th6msonii, Lindsay (S.

X S. tectorum), is offered in the trade; no description
is available.
S. unMcilum, Hort., is a trade name.
Var. spindsum, Hort., is a trade name perhaps the same as the plant
offered in the trade as S. spinosum.
S. urbicum, C. Smith.
Shrubby: st. erect, 3 ft. high, simple, stout, covered with If.-scars:
Ivs. many, rosulate at the top of the st., 4-6 x 1 ]4 in., narrowly
spatulate, cuspidate, very thick, pale green, margins erosely serrulate, sessile or short-petioled panicle very large, pyramidal, 3 ft.
high and nearly as broad, many-branched; fls. 10-merous, pale
yellow, J^in. across: calyx cup-shaped; petals lanceolate, acute.
Canary Isls. B.M. 7893. Belongs to the same group as S. arboreum.
A very showy species but tender. S. violaceum, Hort., is offered in
the trade; possibly the same as S. tectorum var. violaceum. S.
Zelebori, Scnott. Barren rosette more than 2 in. diam., the young
ones borne on densely puberulent peduncles: Ivs. spatulate-oblanceolate to spatulate-lingulate, apex apiculate and purple, shortciliate, both surfaces densely puberulent, glaucous; cauline Ivs.
smaller, linear-lingulate, apiculate and puberulent: fl.-st. minutely
glandular and densely hirsute: fls. 11-12-merous, pale yellowish;
calyx-segms. lanceolate; petals linear-lanceolate, acuminate, viscid
hirtellous dorsally. Serbia. By some authorities referred to S. Pittonii, by others to S. globiferum; apparently distinct from both
arachnoideum
of the hybrid

:

F.

SENEBIERA

TRACY HUBBARD.

Johann Senebier, a naturalist of
Geneva). Cruciferse. Annual or biennial herbs, very
diffusely branched from the ground, hardy: Ivs. alter(after

nate, entire or pinnatisect: racemes short; fls. minute,
white, rarely purple; sepals short, spreading; stamens
free: silique small, didymous, laterally compressed;
valves shut, subglobose, rugose or crested. About 15
species in the temperate and warmer regions of the

world.

The oldest name of the genus and the one now
accepted by those following the International rules is
Coronopus (Greek crow and foot, alluding to the form
and arrangement of the deeply cut Ivs.). C. didymus, Smith (Senebiera didyma, Pers. S. pinnatifida,
DC. Leptdium didymum, Linn. Carara didyma, Brit.).
Plant 6-12 in. high: Ivs. 1-2-pinnately parted: fls.
white, small, numerous: pods notched at the apex,
rough-wrinkled. Widely distributed as a cosmopolitan
weed.

SENECIO

(Latin

name

for plants of this genus, ulti-

mately from senex, "old man;" said to be in allusion to
the hoary pappus). Composite. GROUNDSEL. A various
group, some of the herbaceous members of which are
grown as border plants for their mostly yellow heads
and sometimes for the striking habit; others are climbers, grown mostly indoors, as the so-called German ivy;
the shrubby kinds are little known in cultivation.
Senecio is probably the largest genus of plants, com-

A

some 1,200

species in all parts of the world.
many members and being so widely
distributed is necessarily variable and therefore practically impossible of concise definition.
distinguishing
mark of the senecios lies in the character of the involuor
scales
bracts
in
one
and
cre,
series,
usually reinforced at the base by shorter scales or bracteoles that
give the head the appearance of having a small calyx.
Heads usually radiate, the ray-florets pistillate and
prising

genus comprising so

A

fertile,
head is

but sometimes the rays absent and then the
homogamous (florets all of one kind, i. e., per-

fect); disk-florets tubular, 5-toothed; style-branches
subterete, truncate, rounded-obtuse, occasionally terminated by a small penicillate tuft of hairs; receptacle
usually naked: achenes mostly terete and ribbed;
pappus of soft whitish, often copious bristles. Most of


the senecios are yellow-rayed. Of the vast number of species, very few have gained prominence in horticulture.

To Senecio belong the genera known to gardeners as Jacobea, Kleina, 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 Cacalisa, which is kept distinct by American botanists. Hoffmann (in Engler & Prantl’s Natürl. Pflanzenfamilien) refers the garden genus Emilia to Senecio, but keeps Ligularia (including Furtigium) and Cineraria (not the florist’s cineraria) distinct. See also Ligularia.

If the greenhouse cineraria (which is technically a Senecio as understood by Bentham & Hooker) is omitted, the most popular species are S. mikanoides or German ivy, S. elegans or purple ragwort, S. pulcher, and S. Cineraria, one of the plants commonly known as dusty miller. Various other plants are known as dusty miller, and one of them, Artemisia stelleriana, 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 species that has been separated as Kleina, distinguished mostly by their habit, being for the most part fleshy 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; the hardy species may be divided. Most of the tender species require coolhouse conditions.

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**KEY TO THE SPECIES.**

**A. St. and lvs. more or less fleshy: heads rayless.**

**B. Lvs. flat, laciniate.**

1. **articulatus.**

2. **radicans.**

**AA. St. and lvs. not fleshy: heads rayless or radiate.**

**B. Habit climbing.**

3. **mikanoides.**

**C. Heads rayless.**

**CC. Plants pubescent.**

4. **scandens.**

**DD. Plants glabrous.**

5. **macroglossus.**

6. **auriculatissimi.**

**BB. Habit not climbing.**

**C. Annuals.**

7. **elegans.**

8. **pulcher.**

**CC. Perennials.**

9. **grandiflorus.**

**FF. Rays yellow.**

10. **Doria.**

11. **macrophyllus.**

12. **Doronicum.**

13. **lutescent.**

14. **exaltatus.**

15. **saxifragoides.**

16. **Bolanderi.**

17. **aureus.**

18. **Fabi.**

19. **tanguticus.**

20. **Jacobea.**

E. _**St.**_ 5 Pinnate.**

21. **uniflorus.**

**FF. Heads several to many.**

22. **fastigiatus.**

23. **Palmeri.**

24. **Greyii.**

25. **Kirkii.**

26. **elegans.**

27. **Bolanderi.**

28. **Kirkii.**

29. **grandiflorus.**

30. **Prainiana.**

31. **S. vulgaris.**

32. **Habit solitary.**

33. **Clarkii.**

34. **Bolanderi.**

35. **Doronicum.**

36. **Douglasii.**

37. **elegans.**

38. **erectus.**

39. **Cineraria.**

40. **Sancti.*
(Kleinia) Anteuphorbium, Schiz. 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 fleshy stt. constricted at the joints, small, erect, fleshy, entire lvs. that are decurrent on the st., and solitary cylindric yellow-fld. 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 Dodonaeus, 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 Euphorbium.” The names Kleinia spinulosa, K. pendula, and K. suspensa have appeared in the American trade, but they are unidentifiable.

2. radicans, Schiz. Bip. (Callicia radicans, Linn. f. Kleinia radicans, Haw.). Fig. 3603. Sts. prostrate, readily rooting from the nodes; lvs. fleshy, 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 fleshy plants.

3. mikanioideae, Otto (S. setadens, DC.). German Ivy. Fig. 3604. Slender and glabrous, tall-twining; lvs. 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. setadens, Buch.-Ham., not DC. A hardy plant with woody climbing stts. reaching a height of several feet; branches slightly hisure; lvs. short-petiolate, elliptical-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, rays commonly 8, yellow. China. R. H. 1900, p. 407.—Intro. by de Vilmorin, Verrières-le-Buisson, France.


6. auriculatissimus, Brit. A perfectly glabrous climbing perennial, freely branching with divaricately spreading branches; lvs. petiolate, transversely oblong to suberiform, 2–3 in. broad, coarsely crenate-dentate, bright green above, paler beneath; petioles 1–2 in. long, slender, clamped above, abruptly dilated at the base into 2 broad auricles completely clasping the st.: heads radiate, about 1 in. diam., disposed in loose terminal corymbose cymes; ray-fls. about 13, rays yellow: achenes 5-ribbed, puberulent along the ribs. Brit. Cent. Afr. G. C. III. 27:133, desc. B. M. 7731.—On account of the peculiar foliage and bright yellow fls. it is a striking plant and well worthy of more general cult.

7. elegans, Linn. (S. purpureus, Hort. Jacobia elegans, Moench). Purple Ragwort. Annual, viscid-pubescent, erect or diffuse, 1–2 ft. high: lvs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinuses chiefly broad and rounded, clasping at the base. heads in loose corymbs, the rays purple; disk-fls. yellow. S. Afr. B. M. 235. Var. arcteus, Harv. St. slender but erect: lvs. pinnate or 2-pinnatifid.—S. elegans is an old garden plant. A common form of it has double fls. Var. albus, Hort., has white fls.


9. grandiflorus, Berg. (S. tenastus, Ait.). An herbaceous perennial 4–5 ft. high: st. simple or sparingly branched, virgate, striate, glabrous or nearly so, rather leafy except toward the infl.: lvs. sessile, pinnately parted into linear divisions with revolute margins, glabrous or sparingly pilose; heads numerous, radiate, strongly calyculate, disposed in a loose nearly naked corymbose cyme; rays purple; disk-fls. yellow: achenes striate, glabrous or puberulent in the furrows. S. Afr. B. R. 901. Var. albidus, Harv. (S. dildibis, Mey.). Both ray- and disk-fls. pale or whitish.

10. Döria, Linn. Erect, 3–4 ft. high: radical lvs. oval-oblong or oblong-lanceolate, 6–15 in. long, dentate, glabrous and glaucous, gradually narrowed into a winged petiole; st.-lvs. oblong-lanceolate, sessile and somewhat decurrent: heads yellow, with 5 or 6 rays. Eu.—Hardy perennial.

11. macrophyllus, Bieb. (Jacobea macrophylla, Mey.). A stout herbaceous perennial, 3–4 ft. high, glabrous or nearly so: lower lvs. obovate-oblong or oblong-lanceolate, 6–18 in. long, 1–4 in. broad, gradually narrowed into a winged petiole, pale green, not glaucous; upper st.-lvs.
12. Doronicum, Linn. LEOPARD'S BANE. A hardy herbaceous perennial, floccose-tomentulose to glabrous: lvs. thickish, ovate to lanceolate, 2-7 in. long, ¼-1½ 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 rays 1-2½ in. diam.; bracts of the involucre as well as the bracteoles attenuate, black-tipped: achenes striate, glabrous. S. B.M.—Frequently offered by European dealers, but seldom grown in American gardens.

13. luiges, Richards. An herbaceous perennial, floccose-woolly when young but becoming nearly or quite glabrous: st. practically naked above: lvs. oblong-ovate to lanceolate, ½-1 in. long, ½-1 in. broad, entire to unequally dentate, glabrous or more or less crisped-hirsute; upper st.-lvs. much reduced, sessile: heads nearly ½ in. high, few to many, radially pubescent with yellow rays. Mont. to Ore., Wash. and adjacent Canada.—Little known in horticulture.

14. exaltatus, Nutt. An herbaceous perennial: st. simple, erect, 8 in. to 3 ft. high, striate, glabrous, or somewhat pubescent with long flaccid jointed white hairs: lower lvs. oblong-ovate to lanceolate, including the narrowly winged petiole 3-8 in. long, ½-2 in. broad, entire to unequally dentate, glabrous or more or less crisped-hirsute; upper st.-lvs. much reduced, sessile: heads nearly ½ in. high, few to many, radially pubescent with yellow rays. Mont. to Ore., Wash. and adjacent Canada.—Little known in horticulture.

15. saxifragoides, 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 lvs. petiolate, oblong-elliptic to nearly orbicular, 3-5 in. long, 1¾-4 in. broad, dentate, appressed-villos, setose near the margin, and more or less glabrous above, hoary-woolly beneath: heads several, corymbose, radiate; rays 18-20, yellow; disk-fls. numerous: achenes glabrous. New Zeal. B.M. 5394.—Intro. into England in 1908 and brought to flower two years later at Kew; it is a strikingly beautiful plant worthy of culture.

16. Boisanderi, Gray. A slender herbaceous perennial: st. ascending or erect from a creeping rootstock, 6-20 in. high: radical and lower st.-lvs. undivided and crenately lobate-dentate to pinnately divided into oblance-obovate to almost rotund divisions, glabrous above, usually pubescent beneath, including the petiole 2-6 in. long, ⅞-1⅛ in. broad: heads few, radiate, disposed in a corymbose 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. abreus, Linn. GOLDFIELD. Fig. 3607b. An herbaceous perennial: sts. 1 to several from a rootstock, 1-2 ft. high, glabrous or not infrequently white-tomentulose in the fl.-axes, along the margins of the petioles, and in the infl.: lower lvs. petiolate, un- divided and rotund-ovate, somewhat triangular-ovate to oblong-ovate, ⅛-6 in. long, two-thirds to nearly or quite as broad, crenate to doubly serrate-dentate, usually deeply cordate at the base, green on both surfaces or tinged with purple beneath, glabrous or occasionally slightly tomentulose and soon glabrate; petioles ¼-10 in. long: st.-lvs. variable, petiolate to sessile and amplexicaul, lyrate or pinnatisect, reduced toward the infl. sometimes to linear entire bracts: infl. a terminal several to many-headed corymbose cyme; heads ½-⅔ in. high, radiate; involucre campanulate, calyculate, glabrous or occasionally slightly tomentulose; bracts of the involucrè 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.

18. Fäberi, Hemsl. A stout coarse herb, glabrous or glabrescent: sts. several, 4-5 ft. high, striate-angled, hollow: lvs. pinnatifid, coarsely dentate, expanding at the base into 2 large auricles partially clasping the st.; the lowermost lvs. becoming 2 ft. in length: infl. a many-headed corymbose cyme 6-8 in. diam.; heads radiate with 9-5 deep yellow rays; disk-fls. 8-12, yellow. W. China. G.C. III. 40:43, desc.—Originally intro. by Veitch & Sons, and more recently by E. H. Wilson, who has traveled in China.

19. tanguticus, Maxim. (S. henryi, Hemsl.). A tall stout herbaceous perennial, glabrous or nearly so: st. 6-7 ft. high, branched above, leafy: lvs. 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; petioles of the lower lvs. long and dilated below into an amplexicaul base: heads very numerous, radiate, disposed in a terminal pyramidal panicle; ray-fls. 3 or 4, rays yellow; disk-fls. 3 or 4, corolla-lobes revolute. W. China. B. M. 7912. Gn. 64, p. 237.—A con-
spicuous and attractive species; flowers in Sept. and Oct. Frequently offered by American dealers.


21. *uniflorus*, All. A low herbaceous perennial, densely white-tomentose throughout: st. 2–6 in. high, usually terminated by a solitary head: lvs. mostly radical, spatulate to oblong, entire to incised-dentate, 1–2 in. long, ¾ 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 herbaceous perennial, floccose-tomentulose throughout, somewhat glabrate: st. 1–2 ft. high: lower lvs. narrowly oblong-oblancocele, including the long slender petiole 3–5 in. long, ¾ in. or less broad, entire or nearly so, usually with revolute margins: upper st.-lvs. much reduced: heads radiate; commonly several in a terminal corymbose cyme; ray-fls. about 8, rays yellow. Idaho, Ore., and Wash.

23. *Pâlmeri*, Gray. Sulfurificose, about 3 ft. high, branching, densely white-tomentose throughout: lvs. oblong-oblancocele, 1½–4 in. long, ¼–1 in. broad, entire to slightly sinuate-dentate, narrowed below into a more or less winged petiole: heads about ½ in. high, radiate, disposed in terminal subcorymbose cymes; ray-fls. 12–15, rays yellow. Guadalupe Is., Low. Calif.—Intro. by Franceschi, Santa Barbara.


25. Cineraria, DC. (Cineraria marítima, Linn. Senecio acanthifolius, Hort.). Figs. 3606, 3607. Perennial, 2½ ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obtuse segms.: heads usually radiate, ¾–1½ in. high, disposed in small, compact cymes. F.M. 1872:52. Var. *candidissimus*, Hort., has very white foliage. Var. *abro-marginatus*, Hort., has lvs. bordered with orange-yellow.—*S. Cineraria* 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-beds and margins; the commoner "dusty miller" is *Lychnis Coronaria*, and still another one is *Artemisia Stellaerana*.

26. *Douglasii*, DC. Fig. 3608. A tufted perennial, white-floccose 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 ½ in. high, radiate; involucre campanulate, composed usually of 21 bracts subtended by numerous attenuated bracteoles; ray-fls. commonly 13, rays yellow; disk-fls. 50–70: achenes pubescent. S. Utah to Ariz., west to Calif., and northern Lower Calif.—First collected in Calif. by Douglas in 1833.


28. *Kirkii*, Hook. f. (S. glastifolius, Hook. f. Solidago arboréseens, A. Cunn.). An erect stoutly branching shrub, 7–15 ft. high, glabrous throughout: lvs. variable, narrowly oblong-lanceolate to oblong-obovate, 2–5 in. long, ¼–2 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 ¾–1 in. long, white; disk-fls. yellow. New. Zeal. 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.


3609. The florist’s cineraria, a very large show specimen.—Supposed to have been developed from Senecio cruentus.

(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. *Petasitis*, DC. (Cinerária Petasitis, Sims). VELVET GROUNDSEL. CALIFORNIA GERANIUM. A robust perennial 3–8 ft. high, somewhat hirsute-velutinous on the younger parts: lvs. petiolate, broadly ovate to suborbicular, 2–7 in. broad, cordate to subtruncate at the
base, sinuate 9-13-lobed, callous-denticulate, hirtellous above, more or less grayish-tomentose beneath: infl. a terminal many-headed panicle; heads radiate, about 1½ in. high; ray-fls. usually 5, rays yellow; disk-fls. about 15: achenes glabrous. S. Mex. B.M. 1536. G.W. 9, p. 137.—A useful plant for winter decoration, and rather common in greenhouse cult.

32. Heritiera, DC. A low suffruticosce perennial, seldom more than 1 ft. high: st. ascending or erect, at first white-tomentose, later glabrate: lvs. petiolate, suborbicular, ⅓-⅓¼ in. broad, 5-7-lobed, araneous-tomentulose in the young stages above but soon gla
brate, densely and permanently white-tomentose be

33. crucatus, DC. (Cineraria crucenta, Mass.). Short
stemmed perennial, floccose-woolly: lvs. large, cordate
ovate to cordate-triangular, angled or undulate and
sinuate-toothed, rather long-stalked: fls. purple-red.
Canary Isls. 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 Isls. by Mas
son. Whether the present highly improved races of cinerarias are direct descendants of S. crucatus or the result of hybridization is not now determined. The garden or modified race began to develop very early. Fig. 3610 is Cineraria Webberiana, Puxt. (Senecio cru
catus var. Webberiana, Hort.), copied from The Gar
den, 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, certificate 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 Liguaria. Among those appearing to be of considerable importance from a horticultural standpoint are the following: Liguaria cichorum, Maxim. (Senecio cichorum, Maxim.). A robust herbaceous perennial, 4 ft. high, at first tawny-pubescent, glabrate: radical lvs. long-petiolate, reniform ovate, sometimes marcescent, 3½ in. long; heads large, many-fl., radiate with orange-yellow rays: disk-fls. dark brown. Japan and China. G.M. 51:675. Flowers Aug. and Sept.

Liguaria macrophylla Ledeb. — (Senecio Lede
bourii, Schloep., Bp.); for description see p. 1859, Vol. I. Of the species: L. Panamenta, Carril. St. erect, succulent, deep green, with some reddish; infl. subumb. deep red-pubescent; radical lvs. long-petiolate, broadly ovate, about 1¼ in. long, 1½ in. broad; infl. paniculate: heads rayless. China. Intro. into England in 1814 by Veitch & Sons. Not so well known as the preceding one is a desirable plants for ditches-borders and bog
devices. Needs further study.

ssoniana, Greenm. comb. nov. (Senecio Wilsonianus, Hemsl. G.C. III. 38:212. 1905). GREAT GROUNDSEL. A robust herbaceous per
nial with a flowering at 3-5 ft. high: radical lvs. long-petiolate, the blade reniform-cordate, 10-20 in. long, 9-10 in. broad, sharply dentate: infl. an elongated columnar-like spike, branched at the base: heads very numerous, radiate, about 1 in. diam.; ray-fls. 6-8, rays yellow. China. G. 34:113. G.C. III. 42:301. This and the preceding one are desirable plants for ditch-borders and bog
devices.

J. M. Greenman.

SENNA: Cassia. S., Bladder: Colutea.

SENSITIVE FERN: Onoclea sensibilis. S. Plant: Mima
paudica.

SEQUOIA (after Sequovah, otherwise George Guess, a Cherokee half-breed of Georgia, about 1770-1843, originator of the Cherokee alphabet). Pindaceae. Big 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 840 feet, according to Sargent. Greatest height assigned to species of Eucalyptus were erroneous (see note under E. amygdalina var. regnans, Vol. II, 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, alternate, linear or awl-shaped or scale-like, often dimorphic: fls. monoeccious; staminate catkins axillary and terminal, each of the numerous spirally arranged stamens bearing 2-5 pollen-sacs; pistillate catkins ter
tinal, composed of many spirally arranged scales, each with 4-7 ovules at base: cone woody, persistent, the divergent scales widened at summit which is rhombi
xal, wrinkled, and with a depressed center; seeds flattened; cotyledons 2.

sempervirens, Endl. CALIFORNIA REDWOOD. Fig. 3611 (adapted from Amer. Foresty xx:323). Tree very 100 to 340 ft. high, with trunk 10-25 ft. in diam. and often clear of limbs for 100 ft. in mature speci
mens, the narrow crown with horizontal or downward

sweeping branches: lvs. linear, mostly ⅓-1 in. long, 1-1¼ in. wide, movie in flat swaying rays upperwise, and those on main st. of the branches often only 1-5 lines long and awl-shaped: cone oval, ⅓-1½ in. long, ¾-3½ in. broad, maturing at the first autumn; scales 14-26; seeds elliptic, narrowly margined, 2 lines long. Confined to northern and central coast ranges of California. This species is supposed to sea influence. On July 7, D. G.W. 13, p. 331: 14, p. 511.—Reproduces by seeds and by stump-sprouts, the latter numerous and remarkably persistent, often producing merchantable lumber. Var. glauca, Hort. Foliate with a decidedly bluish cast.
The sequoias.

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 Sequoia 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. angustifolia, S. Heeri, and S. Langsdorffii, 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 S. sempervirens seems to be a descendant of the fossil S. Langsdorffii; S. gigantea appears related to the S. Angustifolia and S. Sterneberghi. 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 day and the age of the 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 durable 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 thrive farther inland than the limits of the sea-fog, and a large part of the original area covered by this noble tree has been denuded by successive fires and destructive lumbering methods. Small redwood forests occur in Monterey County, but the most southern forests of commercial importance are in Santa Cruz. The belt, broken by the Bay of San Francisco, extends north through Marin, Sonoma, Mendocino, Humboldt, and Del Norte, and few miles across into the southern borders of Oregon, which state contains about 400 acres of redwoods. The real redwood forests are all contained within a strip of coastlands 450 miles long and rarely more than 20 miles wide. The actual bodies of redwood within this region are usually a chain of isolated groves separated by clearings or by large areas on which redwoods never grow. A small grove, now practically destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda County. Well-borers have found redwood logs in a perfect state of preservation in various parts of the Coast Range far south of where the trees now grow, even to Los Angeles and San Diego, showing that in some former period of greater rainfall and more sea-fog, redwood forests extended much farther down the coast.

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 Nevada.
SEQUOIA species, and it is probable that trees exist which rise to nearly 400 feet, and therefore deserve to take first place among the conifers. Many trees of 20 and even 22 feet in diameter at 5 feet from the ground, and from 300 to 325 feet in height, are still standing in the redwood forests. The finest grove of old-growth redwood is known at Big Tree, near the world's range, and have a diameter of 12 to 18 feet. In such forests the trunks rise in clear red-brown shafts to a height of 75 to 150 feet before they branch; they stand so close that the masses of timber that exist on the area are found in any other known forest, and through their far-distant tops the sun seldom reaches the warm sheltered soil of the Coast Range canons. With proper management, under the principles of scientific forestry, the redwood region as it exists today could be maintained, and its future yield greatly increased, but otherwise in forty or fifty years the commercial value of the entire area will be practically destroyed.

The annual output of the redwood forests of California has steadily increased in recent years until now (1916) it approximates 25,000,000 feet, board measure (The Pioneer Lumberman statistics). Stands of 250,000 feet, third measure, to the acre are not uncommon. One tree is on record as having yielded 450,000 feet of merchantable lumber.

Nearly all of the coast redwood is in private hands, but the state of California in 1901 appropriated $250,-000 to create a "redwood park" in the famous Big Basin of Santa Cruz County. Here, at the present time (1916) the state owns and cares for 3,800 acres, 1,500 of which are dense virgin forest, and much of the rest is thinly timbered. The possibilities of this superb and easily accessible park are very great. It was secured for the people by the efforts of many organizations and individuals, chief among which were the Sempervirens Club and the late Professor Dudley (Stanford).

The Muir Grove of 295 acres is a fine forest in Redwood Cañon, Marin County, on the south side of Tamalpais, which was the gift of the Hon. William Kent to the nation. The Bohemian Club Grove on Russian River will probably remain uncult for generations. The beautiful Armstrong Club Grove on the same river will be protected as a part of the state of California, but have not yet been purchased.

The S. sempervirens, even more than S. gigantea, is connected historically with many and great names. Not only Haenke, Menzies, and Douglas, but also Coulter and Hartweg aided in its introduction to Europe, where numerous forms in cultivation exist. The S. sempervirens var. odyressa, Carr., is a smaller tree than the type form, with creamy white younger leaves and more glaucous older leaves. It is called in California the "white redwood" and the "silverleaf redwood." Other horticultural varieties in cultivation are known as S. gracilis, S. lavoifolia, S. picta, S. albo-spica, and S. glauca. The golden forms found in many other conifers occasionally appear, but cannot yet be called fixed. No really dwarf redwood is yet extant. Larger-leaved or more compact forms can be selected from the forest, and the tree responds easily to selection and culture. It thrives in gardens in the Sacramento Valley, in the Sierra foothills, and in many parts of southern California, so that its range for ornamental uses can be greatly extended on the Pacific coast. It has been largely planted in Europe, particularly in English parks, and, as was to have been expected, does best in well-drained rich soil near the ocean but sheltered from cold winds.

The most famous of the sequoias and certainly the most widely known of all living conifers is the great redwood of the Sierras, S. gigantea. It is undoubtedly one of the rarest of all living species of trees and one of the most easily visited and studied. It is the best living representation in the whole world of a past geologic age, 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 "Silva of California," 1910, lists thirty-first degree groves of big trees in the California Sierras, containing 58,499 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 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 measurements 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, 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 circumference. The famous Boole tree, in Fresno County, girt 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 reveled in 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, 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 reforested 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 possibles by-products make care in reforesting eminently desirable. Penell manufacturers are beginning to use the wood of selected trees of *S. gigantea*. The rapidity of growth of both species when young, irregular in favorably situated, is so great that the forestry of the future is likely to extend rather than diminish these forests.

**Charles Howard Shinn.**

**SERAPIAS** (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 large undivided, middle lobe; pollinia with a common viscid disk; rostellum laterally compressed. —Four or 5 species are known from the Medit. region. Keep the plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot in leaf-mold, loam, and sand.

The above is 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 known in the genus *Serapias* strum, taking the names *S. cordigerum*, *A. Eaton*, and *S. Lingua*. A. Eaton. See Vol. III, p. 1357.


*S. Helloborinae*, Linn., of Eu. and very local in this country, is not a horticultural subject.

**HEINRICH HASSELBRING.**

**SERENÓA** (after Sereno Watson, distinguished American botanist, 1826-1892). Also written *Serenáda*. *Palmaeae*. Low shrubby or tree-like, more or less arborescent palms.

Caudex creeping, branched, clothed with the fibrous bases of the If.-sheaths: lvs. terminal, orbicular, coriaceous, deeply plicate-multifid, glaucous beneath, with narrow bird infolded segms.; rachis none; ligule short; petiole plano-convex, dentate on the margins: spadix long, tomentose, the flexuous rachis covered with deeply obliquely fissured, tubular sheaths, the spreading branches forked, the alternate branchlets very slender: spathes many, sheathing the peduncle; bractlets minute: fls. white: fr. ovoid, black, an inch long.—Species 2. Fla. to S. C. Cult. in the temperate house, or outdoors from Charleston southward.

Pot saw palmetto is the name given to the creeping fan-leaved palm. Those who are clearing land in Florida consider it a nuisance. It is, however, of great interest to northern tourists, many of whom like to take home a small Florida palm in a pot or tub. This species does very well in pots, though it is of slow growth. Relatively speaking, it is very hardy, as it will stand a temperature of 10°F. The leaves of the saw palmetto, both fresh and dried, are sent north in great quantities for Christmas decoration. The "crowns" are also largely used for the same purpose and deserve a greater popularity. Crowns are whole tops cut off; they have no roots, and only a part of the stem. They give the effect of the whole palm and are therefore much more desirable for some purposes than cut sections, which they will last for weeks, if kept moist, in the shade and free from drafts. Crowns 3 to 5 feet high are considerably used for large drafts. (E. N. Reasoner.)

**SERGÁNIA**

**Serrulata**, Hook. f. Saw Palmetto. A shrub: st. creeping, branching, 4-8 ft. long: lvs. 2-4 ft., erect, circular in outline, fan-shaped, shorter than the slender, spiny-edged petiole; segms. slightly cleft at the apex, without thread-like filaments: spadix densely tomentose, shorter than the lvs.: drupe black, 1/2-3/4 in. long. Summer.

**arbon vacans**, Sarp. Tree, 30-40 ft. high, with 1 or several erect or decumbent sts.: lvs. semi-oblanceolate, truncate at base, yellowish green above, bluish green below, 2 x 2 ft., divided nearly to the base into narrow linear-lanceolate lobes: spadix drooping, about 3 ft. long, the fls. yellow-green. S. Fla.—Differs from foregoing in arborescent habit, more elongated spadix, much smaller fls. and smaller, globose fr. and seeds.

**SERICOCÁRPUUS** (Greek, *silk’en fruıt*). *Compósito*. Five species of perennial herbs from N. E. U. S. closely allied to Aster and scarcely distinguishable from the section Biota of that genus. The achenes are not so strongly compressed as in Aster. The fl.-heads have white rays and pale yellow disks which sometimes become purplish. They are erect perennials with alternate lvs. and medium-sized heads of white ray- and disk-fls. *S. rigidus*, Lindl., the only western representative of the group (Brit. Col. to Calif.) was once offered.

**SERICOGRAPHEIS**: Jacobinia.

**SERÍSSA** (from the Indian name). *Rubiacae*. Branched shrub, glabrous or the branches puberulent, fetid when bruised, adapted to the greenhouse: lvs. rather small, opposite, subsessile, ovate; stipules persistent: fls. rather small, axillary or terminal, solitary or fascicled, white; calyx-tube obconical, limb 4-6-partite: bilanate, ovate-elliptic, pilose, plano-convex, tube and throat pilose inside, limb 4-6-lobed, short, the lobes obtusely 3-lobed; stamens 5-6: ovary 2-celled: fr. subglobose.—One species, S. E. Asia.

**Fédida**, Lam. (S. japónica, Thunb.). About 2 ft. high: lvs. rather leathery, ovate, acuminate; fls. white. Japan. B.M. 361 (as *Lycium japonicum*). Var. *variegata*, Hort., has yellow-margined lvs. F. TRACY HUBBARD.

**SERJÂNIA** (named in honor of Paul Serjeant). *Sapindaceae*. Climbing or twining shrubs adapted to the warmhouse, and grown in the open in warm countries: lvs. alternate, without stipules (or with minute stipules), ternate, twice-ternate or odd-pinnate, frequently pellicle-punctate; racemes or panicles axillary, frequently bearing 2 or 3 tendrilis; fls. yellowish, polygamous; segmas 5 (or 4, 2 connate), imbricate, the outer ones smaller; petals 4, the fifth seat vacant; disk undulate, swollen into 4 glands, 2 larger and 2 smaller, sometimes obsolete; stamens 8; ovary 3-celled, sessile or short-stipitate: samare 3, indehiscent.—About 190 species, Trop. and Sub trop. S. Amer. Probably very little cult.

**Cuspidáta**, Cambess. (Urvílía serrúgnea, Lindl.). Climbing: branches acutely triangular, the angles densely brown-pilose: lvs. ternate; lfts. somewhat coriaceous at base, generally ovate in outline, somewhat 3-lobed, irregularly and coarsely toothed, the terminal lft. somewhat dentate on the petiole: fls. rather large for the genus; petals usually glabrous: fr. large, ovate, 3-winged. Brit. B.R. 1077. Gt. 63, p. 325.

**Fuscifólia**, Radl. Tall climbing rufous-pubescent shrub with costate branches: lvs. biternate, the lfts. ovate or ovate-lanceolate, acute or somewhat obtuse, simply or double serrate, more or less rufous pubescent beneath and on the nerves above, minutely pelti-ulate-punctate, the terminal one contracted into a petiolule and the lateral ones: fls. small, somewhat pedicellate, segmas tomentose: fr. ovate-elliptic, mostly puberulent or velutinous. Brazil.—Cult. in Calif.

F. TRACY HUBBARD.
SERRADELLA

SERRADELLA is an annual leguminous plant valuable as a fodder crop on dry and sandy sterile soils. See *Orobanche*.

SERRATULA

(Setaria, alluding to the roughly toothed leaf-margins.) *Compositae*. A horticulturally unimportant *Setaria* species of herbaceous thistle-like perennials grown for their purple or violet fls.; stts. simple or branched; lvs. alternate, dentate, or much cut into sharp but usually unarumed segms., green both sides or sometimes pale and canescent beneath: infl. of a single pedunculate head only, as in the following or of a lax corymb, heads equal-fl., the involucral bracts in many series, nar- rowly acuminate at the apex, but not as in many thistles, spiny; lvs. purple, but not very showy. Cult. in open border, but perhaps not in Amer. outside botanical garden collections. Eu., N. Afr., to China and Japan.

**Tinctoria**, Linn. A much-branched, freely flowering perennial, about 2-5 ft. tall; lvs. very variable, usually deeply pinnately divided in the following; heads globose to subglobose, containing about 3 ft. of fls. purple. Cent. China. S. TAYLOR.

SÉSAMUM

(Greek name taken by Hippocrates from the Arabic.) *Pedaliaceae*. Herbs, erect or prostrate, scabrous or rarely glabrous, suitable for the warmhouse, and for the open in the S.: lowest lvs. opposite, the upper and almost all alternate, petioled, entire, incise- dentate, 3-cleft or pedately cut: fls. pale or violet, solitary in the axis; calyx rather small, 5-parted; corolla- limb 2-lipped and 5-lobed; stamens 4, didynamous; ovary 3-celled: caps. oblong or oval.—About 20 spe- cies, 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*, *pingüi*, etc.) which is generally lancedo- late in outline; the upper sometimes undivided and petioled, the basal usually divided and nearly sessile: fls. in a dense corymbose infl. on or, thick, rarely sparse and lax, purple. Cent. Eu. July and Sept.


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. Erect and branched, with lvs. decomp- osed or 2-3-pinnate, or of small white fls., the involucres of few or many bracts or sometimes wanting; calyx-teeth either prominent or minute; petals notched; styles very short: fr. rarely terete, ovoid or oblong. S. Libanotis, 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.

SÉSÉVÚM

(derivation unknown). *Aizozéa*. Erect or prostrate, branched, succulent herbs or subshrubs, adapted to the warm- or cool-house: lvs. opposite, somewhat leathery, linear or oblong; lvs. pinnately parted or pinnate, solitary, or rarely subcorysymbose, frequently flesh-colored or purple, with 2 bracts or bracteol; calyx-tube turbinate, the lobes 5, oblong, obtuse, colored inside; petals none; stamens 5; ovary free: caps. oblong, membranaceous, the lobes 3-celled, circumcissally dehiscent. About 13 species, winter temperate and tropical regions of the world, usually litoral. S. Portulácosstrum, Linn. A diffuse procumbent or prostrate herb often wholly blood-red or purple: lvs. succulent, linear to oblancoate or obovate-oblong, much narrowed at the base: fls. axillary, purplish or rose, peduncles equaling or shorter, rarely longer than the fls.; calyx deeply 5-lobed, the lobes ovate-lanceolate, obtuse with a mucro just below the apex behind; ovary usually 3-celled. Tropics and warmer regions of both hemipheres.—Sometimes used as a pot-herb.

**SETARIA** (Latin, *seta*, a bristle). *Gramineae*. Annual or sometimes perennial grasses with bristly spike-like panicles: spikelets as in Panicum, but subtended by 1 to several bristles that extend beyond the spikelet and persist after the spikelet falls: the fr., that is, the mature fertile floret, usually transversely wrinkled.—Species about 40 in the warmer regions of the world.


punecea, Benth. (Daubentonia punecea, DC.). Shrub or small tree, several feet high, somewhat glaucous and glabrous: lfts. commonly 8-9 pairs, 2½-3½ in. long, nar- rowly oblong; stipules small: fls. 8-10 lines long, bright red-purple, in lax racemes; calyx truncate, teeth small; standard broadly rotundate: pod 2-4 in. long, thick, 4-edged, wings leathery, about 2 lines broad. Brazil.—Intro. into S. Cali.

Tripétia, Hort. (Daubentonia Tripétia, Poit. D. Tripétiana, Poit.). Shrub or small tree, about 6 ft. high: lvs. pinnately compound, dull green above, glaucose beneath: fls. orange-red, rather large, in drooping racemes; standard scarlet, much paler on the inner face, with a yellow spot on the claw; wings and keel paler. Argentina. F. TRACY HUBBARD.
Several species are annual weeds, such as **Yellow Fox-tail** (*Setaria 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 spikelets and 1–3 bristles below each spikelet. Many American botanists use the name Chelochloa 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.

*Setaria* macrostachya, HBK. (*S. Alopechus, Fisch. S. alopecuroides var. nigra, of the trade*). An erect or ascending perennial; spike slender, tapering at apex; bristles 1 or sometimes 2, ½–1 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 about the base of the spikelet. Texas to S. Amer.

### a.a. Plants annual.

*Setaria* magna, Griseb. A coarse stout native, resembling common millet; spike ½ in. thick, as much as a foot long, tapering to a point; bristles 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.

*Setaria italica*, Beauv. **COMMON MILLET** of the U.S. (but not of Eu., this being *Panicum miliaceum*); also called **GERMAN MILLET** and **HUNGARIAN GRASS**. Culm 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. millet is raised for fodder. The “Japanese millets” belong to *S. italica*, while the “Japanese barnyard millets” are *Echinochloa Crusgalli* 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; in *S. viridis* the fruit falls away surrounded by the glumes. The varieties of *S. italica* have been classified by Hubbard (Amer. Journ. Bot. 2:187.1915) as follows:

**A.** Fr. yellowish to straw or light brown. (Straminofructa.)

**b.** Bristles green.

- **c.** Panicle more or less open-lobose.

Subsp. stramineofructa, 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 breviseta, Hubbard. Bristles shorter than the spikelets or barely exceeding them. Cult. as Golden Wonder millet.

- **cc.** Panicle dense or slightly lobulate at base.

Subvar. germanica, Hubbard. Bristles noticeably longer than spikelets: head usually 2–3 in. long, ½–2½ in. broad. One of the forms cult. as common millet.

- **bb.** Bristles purple.

**c.** Panicle more or less lobulate.

Var. Höstii, Hubbard. Head large, lobulate, purple. Cult. as German millet.

- **cc.** Panicle dense or slightly lobulate at base.

Subvar. Metzgeri, Hubbard. 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.a. Fr. reddish or orange. (Rubrofructa.)


### a.a.a. Fr. blackish, brownish black or purplish black with pale yellowish straw tones intermingled, these sometimes predominating. (Nigrofructa.)

Subsp. nigrofructa, Hubbard. The common form cult. in U.S. is var. atra with small dense heads, 1–3 in. long, with purple-brown bristles. Commonly cult. as Hungarian grass.

Many other varieties are cult. in the Old World.

A. S. Hitchcock.

**SEVERINIA** (named for M. A. Severino, a Neapolitan), *Rutaceae*, tribe Monimiaceae. Small woody plants distant related to the orange.

Spiny shrubs or small trees with short and stiff branches: spines simple, at one side of the bud in the Ivs.: lvs. simple, continuously veined, borne on short apertural 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 globular berry, black when mature.—Only one species is known, usually called *Atalantia b兹zfolia*, native to S. China and Formosa. See Swingle, in Journ. Wash. Acad. Sci., Vol. 6, No. 19, 1916.

*buзzfolia* Ten. *Citrus buзzfolia*, Poir. *Limbбomnia biloblllaria*, Roxbg. *Secerбstylб b兹zfolia*, Benth. *Atalantia buзzfolia*, 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 fruit ripens: lvs. simple, ovate or oblong, very obtuse or emarginate, ½ in. long, having numerous fine veins; spines solitary; fls. axillary, in fascicles or solitary, small, subsessile; 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. Ill. 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 and 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 forms as *Triphasis monophylla*. 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 frs., as it is able to thrive in soils too salty to permit Citrus to grow.

WALTER T. SWINGLE.

**SEYMÉRIA** (named in honor of Henry Seymer, an English naturalist). *Scrophulariaceae*. Erect branched annual or perennial, mostly hardy herbs, used for bedding on account of their lvs.: lvs. mostly opposite, inescentate or dissected, the uppermost floral ones reduced
to entire bracts; fls. in interrupted racemes or spicate, the pedicels solitary and without bracts, yellow; calyx campanulate, with 5 narrow, entire or denticulate 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; filaments finely-toothed or entire; filaments, 9 from N. Amer., Texas-Mex. region and 1 from Madagascar. Seeds are sown in a well-drained bed of rather light rich soil. *S. petindia*, Pursh. About 1 ft. high, minutely viscid-pubescent or glabrate; lvs. pinnately parted into rather few short- or oblong-linear divisions or the leaflets entire; calyx-tube linear; corolla hairy outside. N. C. to Fla. and Ala., perhaps to Texas. *S. tenuous*, 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 petioles 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 Pummelo (page 2857, Vol. V).

**WALTER T. SWINGLE.**

**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 are garlics (see Garlic), the bulbs or cloves being separated and planted early in spring in any good garden soil. Each bulb produces several, all cohering by the base. The main bulb is 5 to 6 inches and usually 1½ inch thick half that in diameter. The leaves are small, tereete, 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, the question is: 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. Pea*: *Parochetus communis.*

**SHEPHERDIA** (named for John Shepherd, an English botanist). *Elaeagnus.* Shrubs, or small trees with scurvy scales, 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, dizeious, in very short spikes or racemes, opposite to small branches, male spikes many-flowered, female 2-flowered, in the axis of lvs. or often sessile, leafless nodes; calyx of male fls. 4-parted, of female fls. urn-shaped, 4-cleft; stamens in male fl. 8, alternating with 8 lobes of a thick disk; ovary becoming a nut or achene and invested by the fleshy calyx, forming a drupe-like fr.—The genus Shepherdia was founded by Nuttall in 1818. Richard’s *Leparytrea*, 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 fr. 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 of 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 color affords excellent contrast. The genus is 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. Stamine and pistillate plants of it have different forms of buds.

**A. Lvs. green above.**

**canadensis**, Nutt. (*Leparytrea canadensis*, Greene). Spreading twiggy bush 3–6 or even 8 ft. tall, the young branches brown-scurvy: lvs. ovate, oval, or elliptic, rather thick, green above but rusty beneath: fls. yellowish, in short clusters at the ends of branches (¼ in. 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 in the mountains to Utah.—The yellow-fruited form has been distinguished as *S. xanthocarpa*, Reich.

**A. 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: lvs. oblong, cuneate-oblong or long-lanceolate, 2–4 in. long (¼ in. 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 in the mountains to Utah.—The yellow-fruited Bush has been distinguished as *S. rotundifolia*, Parry, from Utah, is a silvery tomentose and scurvy evergreen bush; lvs. round-ovate or ovate, mostly somewhat cordate, short-petioled; fls. stalked in the axil of the lvs. or ovate, the stamine mostly in 3’s and the pistillate solitary: fr. globular, scurvy, ripening in July.

**L. H. B.**

**SHERWOODIA**: *Shortia.*

**SHÓRTIA** (named for Dr. Charles W. Short, a botanist of Kentucky). *Diapensia*. Two aseculent herbs, with the habit of galax.

Rootstocks creeping: lvs. evergreen, round-cordate: fl. solitary on a slender leafless scape, the calyx with scaly bracts, the corolla bell-shaped and 5-lobed; stamens 5, the filaments adnate to the corolla, alternating with 5 scale-like staminodia; pistil 3-angled and 3-loculed; style filiform and stigma 3-lobed: fr. a globular caps. From this, Schizocodon is distinguished by linear-elongated staminodia and fringed corolla. Allied genera mentioned in this *Cyclopedia* are Galax, *Pyxidanthera,* and *Shepherdia*. *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 Thibet, not in the American trade. *Shortia californica* of seedsmen
will be found under *Actinolepis*. Of the little family Diapensiaceae, with its 6 genera and 9 species, *Shortia galacifolia* is historically the most interesting. Michaux collected the plant in 1788 in the high mountains of Carolina, but as his specimen was in fr. rather than in fl., Richard, the author of Michaux's *Flora Boreali-Americana*, did not describe it. Asa Gray examined Michaux's specimen, preserved in Paris, in 1839, and afterward founded the genus *Shortia* on it. Great search was made for the plant in the mountains of Carolina, but it was not rediscovered until 1877. The history of the efforts to find the plant is one of the most interesting chapters in American botany. For historical sketch, see Sargent, Garden and Forest, vol. 1, p. 506 (1888). Torrey & Gray founded the genus *Shortia* in 1842. In 1843, Siebold & Zuccarini founded the genus Schizocodon, from Japan. In this genus Maximowicz added a second Japanese species, *S. uniflorus*; the fls. of this plant, as of *Shortia*, were unknown when the plant was first recognized. It transpires, however, that *S. uniflorus* is really a *Shortia*, thus adding another instance to the growing list of botanic genera that are endemic to Japan and E. N. Amer.

*Shortia*, like most plants considered rare, is really not so rare as local, though the few stations where it is found abundantly do not seem to present special conditions not to be found elsewhere, and it is hardly understood why it should, in common with certain other plants, have remained strictly local, in an indigenous state. For the successful culture of *shortia*, humus and leaf-mold seem to be absolutely required, and this should either be planted where these conditions are natural or else be constantly supplied with this food. This suggestion, if carried out with many plants, such as galax, pyrola, chimaphila, and probably *Epigaea repens*, will ensure success, where ordinary garden treatment only is given the entire disappearance of the plants may be expected in a season or two. Semi-double and pink-flowering plants are not rarely found, and it seems likely that cultivation may bring out several worthy varieties. In England *shortia* is often grown successfully as a pot-plant, and is far more appreciated than in America. It is difficult to procure seed, as the flowering stem usually withers away before maturing, though *shortia* is readily propagated by division and runners. It is a shade-loving plant and is a choice addition to the ericaceous bed, where it will thrive under rhododendrons and kalmias. (Harlan P. Kelsey.)

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*3613. Shortia galacifolia. (X 1/3)*

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*SIBIRIAN* (named for the habitat of the plant, Siberia). *Roscæe, subgen. Spiræa, shrubs* from N. E. Asia and W. China closely allied to *Laevigata*. The most differing in the narrow entire lvs., the polygamodioecious fls. disposed in panicle racemes and in the 2-seeded carpels coninate at the base. *S. lewigata* 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. lewigata*, Maxim. (S. angustata, Schneid.; *Svobéªâ lewigata*, Linn.). Shrub, 5 ft. high, with stout upright branches. Mtt. oblong, bluish green, glabrous, 1 1/2-3 1/2 in. long; fls. polygamous, greenish white, in terminal panicles, 3-5 in. long, those of the staminate plant somewhat showier. May. Siberia. G.O.H. 89. Var. angustata, Rehd. Lvs. narrow-lanceolate, 1-4 in. long and rarely more than 1 in. broad; inf. pubescent. W. China. Var. ericáta, Schneid., from S. E. Eu., is similar to the preceding variety, but the lvs. are obtuse and the inf. not pubescent. It is not yet intro. *S. tomentosa*, Diels. Low shrub, to 2 ft.: lvs. oblong-obovate to obovate, acutish and mucronate, with silky silvery white tomentum beneath while young, glabrous above, 2-3 in. long; fls. greenish yellow in dense panicles about 2 in. long. S. W. China.

ALFRED REIDNER.
SIBTHORPIA (named in honor of John Sibthorp, 1755–1796). *Scrophulariaceae*. Hardy or greenhouse perennial herbs, often rooting at the nodes, grown mostly for the flowers.

Leaves petiolated, fascicled, petijointed, orbiculate-reniform, coarse-crenate or incise-pinnatifid: pedicels axillary, solitary or fascicled: fls. yellow, yellowish rose or red; calyx campanulate, 4–8-cleft, the lobes slightly unequal; corolla-tube short or very short, rotate, limb spreading; anthers sagittate: caps. membraneous, compressed, locally pubescent, the valves splitting to the middle. About 7 species. E. Eu., Trop. and N. Afr., mountains of India and S. Amer.

*S. europaea*, Linn. A hardy trailing perennial with very slender sts.: lvs. orbicular, less than 1⁄2 in. across, 7–9-lobed: fls. small, on rather short pedicles, 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.

*S. peregrina*, Linn. Tender trailing greenhouse perennial: lvs. much crenated: peduncles frequently fascicled, 2 in. long: fls. yellow, 5–8-parted; stamens slightly shorter than the corolla. June. Mauritius. B.M. 218 (as *Disandra prostrata*).

H. S. HUBBARD.

SICANA (Peruvian name). *Cucurbitaceae*. Annual slender subglabrous tall-climbing vines, used out-of-doors in the S. for ornament: lvs. palmately 5–9-lobed, glabrous and shiny; tendrils 3–5-cleft, the branches adhering at the tip: fls. rather large, yellow, monocious, 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; stamens 3 in the male fl.: fr. large, fleshy, many-seeded, fragrant and edible.—Three species. *Trop. Amer.*

Allied to *Curcubita*, but differing in having wide-spreading or reflexed calyx-lobes and the anthers not united.

*S. odorifera*, Naundin, the *Curuba* and *Pepino Angolo* of the tropics, has been intro. in the U. S. as the *Cassabanana*. Fig. 3614. It is a very quick-growing and interesting ornamental vine: plant glabrous, the sts. angled: lvs. large (often 1 ft. across), nearly orbicular in outline, deeply cordate at the base, strongly about 5-lobed and the lobes repand-toothed or angled: fls. solitary, monocious, the corolla small and yellowish, urn-shaped, with small reflexed lobes; stigmas 3, each 2-lobed: fr. like a slender vegetable marrow, 1–2 ft. long, smooth, nearly cylindrical, orange-crimson, with a. R. H. 1890:516. Probably native to Brazil, but occurring also in Mex. and the W. Indies. The curuba seems to be grown in the tropics as an ornamental plant, although it is said to afford edible preserves. The plant climbs 30–50 ft. It is well worth growing on summer arbors, or under glass if one has room for it. The frs. are very interesting, fragrant, and ornamental. Perennial.


L. H. B.

SICYOS (Greek name for the cucumber). *Cucurbitaceae*. Climbing or prostrate annual herbs useful for ornamental purposes, one especially for covering walls and the like: lvs. membranaceous, angulate or lobed, rarely deeply 3–5-lobed; tendrils 3-cleft: fls. small or minute, whitish, monocious, the sterile and fertile mostly from the same axis, the former covered by the latter in a capitular cluster, long-peduncled; petals 5, united below into a bell-shaped or flattish corolla; ovary 1-celled: fr. ovoid, dry, and indehiscent, 1-seeded.

—About 50 species, warmer parts of N. and S. Amer., Pacific islands, and Austral.

ANGULATUS, Linn. *Bur Cucumber*. Annual climbing herb: lvs. very broadly rhombic-ovate, more or less shallow, 5-angled or lobed, palmately veined; the lobes rather broad-deltoid, the midlobe abruptly and narrowly acuminate, the lateral lobes apiculate, base somewhat halberd-shaped with a rounded rather narrow sinus; the petiole slender and glandular-pilose. S. Maine and W. Que. to Fla. and west to Minn., E. Kans., and Texas.—Used on account of its rapid growth for screening walls, lattice-work, and the like.

SIDA (from the old Greek name for *Nymphæa 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 whitish; calyx 5-toothed or 5-cleft; staminal column divided at the top into numerous filaments: carpels 5 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.

3614. *Sicana odorifera*, the cassabanana. (x 1/2)

*a*. Lf.-blades palmately lobed: fls. white.

*hermaphrodita*, Rusby (S. *Naphea*, Cav. *Naphea hermaphrodita*, Linn.). A hardy herbaceous perennial 5–8 ft. high, from a stout root: lvs. 3–8 in. long, 3–7-lobed; lobes triangular, long-acuminate, irregularly serrate: fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June–Aug. S. Pa., W. Va., and Va. B.B. 2:422.—Cult. same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to *Naphea 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. *Naphea dioica* is a strong-growing perennial 5–9 ft. high, with large radical lvs. often 1 ft. across and 9–11-awned, the segments cut into lanceolate serrate lobes: fls. dioecious, white, smaller than in *Sicana*. For pictures of the two plants, see B.B. 2:420, 422.

AA. Lf.-blades merely toothed: fls. of various colors.

*b*. Lvs. ovate to cuneate or lanceolate.

*rhombifolia*, Linn. Shrubby or subshrubby: lvs. very variable, rhomboid-lanceolate to lanceolate, lower surfaces usually more or less 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.
SIDÉRAL (Greek, iron; the plants were supposed to have a healing power for wounds caused by iron. Dioscorides also used the name for other plants credited with the same ability). Labiatae. Herbs, subshrubs, or shrubs frequently lunate 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 calyceal: 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, bare or with a pilose ring inside, the limb 2-lipped, the posterior somewhat flat, entire, emarginate or 2-lobed, the anterior spreading, 3-lobed; stipules 4, didynamous; nutlets ovoid, smooth, obtuse, not truncate at the top.—About 60 species, Medit. region, Canary Isls., and the Orient. Probably the commonest is S. scordoides, Linn., a hardy subshrub, about 1 ft. high, with white-woolly, or, oroblanco, or suboblanco, incised-toothed lvs., spikes which are 1-3 in. long of yellowish fls. with the upper lip of the corolla paler or white. S. Eu. Variable.

Other species which have been mentioned are: S. conspersata, Linn. A greenhouse shrub about 3 ft. high, with ovate, crenate lvs. which are cordate at the base, and subglobose whorls of 20-30 fls. Canary Isls.—S. cordifolia, Linn. A hardy subshrub about 1 ft. high, covered with white wool, with ovate lvs., which are truncate-cordate at the base, whorls of about 10 sub-sessile fls., the lower ones distant. Madeira and Canary Isls.—S. scordoides, Linn. A hardy shrub about 1 ft. high, with white-woolly branches, sessile, oblong-linear, obtuse, white-woolly lvs. and distant whorls of about 6 fls.

SIDÉRALOXYLON (Greek, iron and wood, referring to the hardness of the wood). Sapotaceae. Trees and shrubs, with simple lvs. and small fls. in axillary clusters: fls. 5-merous or rarely 6-merous; calyx-lobes roundish or ovate, usually obtuse, nearly equal; corolla more or less bell-shaped; stamens attached to the tube at the base of the lobes and opposite to them; staminodia scale-like or petaloid; ovary usually 5-locular, berry ovoid or globose.—About 110 species, mainly tropical, a few extra-tropical. S. Afr., Austral., and New Zeal.

Masticodendron, Jacq. Tree, to about 50 ft., with somewhat variable lvs. usually oval or ovate-oblong, 2-8
SILEROXYLON 3163

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). Orchidaceae. Pseudobulbous orchids suitable for the warmhouse. About 3 species.

Pseudobulbs usually clustered, 1-lvd.: if. usually petioled; labellum immobile, angled with the column, ventricose, either simple or tridentate at the apex. — About 3 species, natives of Cent. and S. Amer. Allied to Lecana.

Reichenbachiana, Hook. f. Pseudobulbs clustered, 1 in. long, ovoid or obpyriform, biotech with blood-red waxy liquid; if. single, 2½–5 in. long, petioled, elliptic-lanceolate, acuminate at both ends, dark green, strongly 5-ribbed: fls. about 6 in a pendulous corymb, about 1¼ in. across; sepals subequal, ovate, pale straw-colored; petals linear, acute, golden yellow, they and the lip margined with long flexuous golden hairs; lip spread out, side lobes large, divided in 2; subulate, falcate, golden yellow, bilobed with blood-red midlobe small, linear, laericate. Ecuador. B.M. 7576.

suavis, Reichb. f. Pseudobulbs pyriform, approxi- mate: if. petioled, cuneate-oblong, acute, plicate: fls. about 3 in a pendulous raceme; sepals greenish yellow, ovate; petals and lip deep yellow, the latter with a few minute blackish dots inside and some larger ones on the basal crest. Costa Rica.

There is a third species in the trade, S. peruviana, Rolfe, but while mentioned in Orchid Review it seems never to have been described. A native of Peru.

F. TRACY HUBBARD.

SIGMATOSTALIX (Greek S and female, referring to the S-shaped gynostemium, the peculiar column of the Orchidaceae). Epiphytic herbs with compact, stiff, recurved labellum. Pseudobulb 2-lvd., small pseudobulbs: Ivs. perennial, membranaceous: scape various-fl.d. (?), rising below the pseudobulb, 1-fl.d.: fls. perfect, small, diaphanous; perianth spreading, up side down, withering; sepals 3, free, the dorsal keeled, the lateral almost straight forward and symmetrical; petals 2, rather similar to the sepals; labellum free, inserted at the base of the S-bent rather broad gynostemium, somewhat mobile; column broad, thick, much shorter than the labellum; pollinia 4, in pairs; rostellum (beak) little bent down: caps. unknown.

Two species, Himalayas. S. Panditlingi, Pfitz. Plant small: scape scarcely exceeding the narrowly ovate pseudobulb: sepals scarcely 2½ in. long, oblong, the dorsal carinate, acute, the lateral one concave at base; petals similar, narrower; labellum entire, obtuse, slightly dilated toward the apex. Assam.—The color of the fl. is not described and the scape including the fl. is only about 1¼ in. long.

F. TRACY HUBBARD.

SIGMATOSYNE (Greek S and female, referring to the S-shaped gynostemium, the peculiar column of the Orchidaceae). Epiphytic herbs with compact, stiff, recurved labellum. Pseudobulb 2-lvd., small pseudobulbs: Ivs. perennial, membranaceous: scape various-fl.d. (?), rising below the pseudobulb, 1-fl.d.: fls. perfect, small, diaphanous; perianth spreading, upside down, withering; sepals 3, free, the dorsal keeled, the lateral almost straight forward and symmetrical; petals 2, rather similar to the sepals; labellum free, inserted at the base of the S-bent rather broad gynostemium, somewhat mobile; column broad, thick, much shorter than the labellum; pollinia 4, in pairs; rostellum (beak) little bent down: caps. unknown.

Two species, Himalayas. S. Panditlingi, Pfitz. Plant small: scape scarcely exceeding the narrowly ovate pseudobulb: sepals scarcely 2½ in. long, oblong, the dorsal carinate, acute, the lateral one concave at base; petals similar, narrower; labellum entire, obtuse, slightly dilated toward the apex. Assam.—The color of the fl. is not described and the scape including the fl. is only about 1¼ in. long.

F. TRACY HUBBARD.
SILENE

KEY TO THE SPECIES.

A. Duration annual or biennial.
B. Plants glabrous, although viscid above in No. 4.
C. All except the lowest lvs. ovate or ovate-lanceolate from a subcordate, clasping base.

D. Fig. sessile, white. 4. dichotoma
E. St. simple. 3. viscosa
C. All except the lowest lvs. oblong or oblong-lanceolate from a connate base.

D. Sts. pendulous, usually flesh-colored to purple but while in one variety. 5. pendula

BB. Plants pubescent or tomentose.
C. Sts. dichotomously branched, at least above. 2. compacta

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. Sts. erect: base of lvs. cordate. 6. fimbriata
D. Sts. procumbent or ascending: base of lvs. narrowed.
E. Fls. several to a st.; sts. ascending. 7. latifolia
EE. Fls. 1 or few to a st.: sts. procumbent. 8. maritima

CC. Nerves of the calyx 10.
D. Plants glabrous.
E. Lvs. linear-oblong. 9. tatarica
EE. Lvs. lanceolate-spatulate. 10. Asterias
DD. Plants pubescent or at least puberulent or pruinose-squamose.
E. The lvs. in whorls of 4 (the uppermost and lowest sometimes opposite). 11. stellata
EE. The lvs. not in whorls of 4.
F. Blades linear or narrowly lanceolate or oblongate. 12. multicaulis
G. Sts. more or less decumbent or pendulous at the base.

Hi. Fls. solitary on the peduncles. 15. Fortunei
HH. Fls. nodding. 16. Scouleri

FF. Blades broader, usually ovate or obovate, sometimes broadly lanceolate or oblanceolate.
G. Sts. more or less decumbent or procumbent.
H. Inf. leafy and borne in the forks of the branches. 17. Menziesii
HH. Inf. not leafy, usually at least partly terminal.
I. Petals orbiculate: fls. rose. 18. rosaliora
II. Petals 4-lobed or 4-lobed: fls. scarlet. 19. californica

GG. Sts. erect, usually stout.
H. Fls. crimson or scarlet.
I. Lvs. thin, ovate-lanceolate or oblanceolate; apex blunt or abruptly acute. 20. virginica
II. Lvs. thick, ovate-lanceolate; apex acute or acuminate. 21. regia

HH. Fls. white, greenish white, or bright green.
I. The fls. erect: lvs. pubescent but not tomentose. 22. gigantea
II. The fls. nodding: lvs. pubescent but not tomentose.

BB. Height 2–10 ft. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high. No. 9 may belong here but is probably taller than 1 ft.).
C. Nerves of the calyx 20.
D. Plant not cespitose. 25. Zawadskii
DD. Plant cespitose.
E. Lvs. linear; plant dwarf, 2–4 in. high. 26. pumilio
EE. Lvs. lanceolate or ovate-lanceolate; plant 8–16 in. high. 8. maritima
CC. Nerves of the calyx 10.
D. Blades linear or narrowly lanceolate (the lowest lvs. of No. 10 are somewhat spatulate, the others linear).
E. Species strictly glabrous.

FF. Peduncles 5–11-ftd. 27. Lerchenfeldii
GG. Peduncles 1–2-ftd. 28. aculis

EE. Species more or less pubescent or at least viscid above.
F. Petals 4-lobed.
G. Fls. solitary or in 3s. 30. quadrifida
GG. Fls. in panicles. 31. alpestris

HH. Color of fls. white. 32. viridiflora
III. Color of fls. cardinalis. 33. odontopetalum

HH. Tube of calyx campanulate. 34. Elizabethe
II. Fls. rose. 35. dianthiflorum
I. Fls. white. 36. repens

DD. Blades broader, when lanceolate, relatively broad as compared with the length.
E. Plant glabrous. 38. rupestris
EE. Plant pubescent or at least velutinous.
F. Lvs. lanceolate, oblong-lanceolate, or obovate-lanceolate, blade broadest at or below the middle.
G. Fls. white.
H. Inf. leafy, borne in the forks of the branches. 39. caucasica
II. Fls. erect. 37. Reichenbachii

BB. Height 2–10 ft. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high. No. 9 may belong here but is probably taller than 1 ft.).
C. Nerves of the calyx 20.
D. Plant not cespitose. 25. Zawadskii
DD. Plant cespitose.
E. Lvs. linear; plant dwarf, 2–4 in. high. 26. pumilio
EE. Lvs. lanceolate or ovate-lanceolate; plant 8–16 in. high. 8. maritima
SILENE

1. Armëria, 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 oblong or oblong-lanceolate from a conate base: fls. pink, crowded in dense, sessile heads, with the uppermost lvs. involucrate; calyx lanceolate; petals obvate-cuneate, subacute: caps. oblong. July–Sept. S. Eu. B.B. (ed. 2) 2:66. Var. álba, Hort., is a white-fl'd. form.

2. compacta, Fisch. Biennial. Glabrous, glaucous: sts. about ½ ft. high, stout, simple or slightly short-branched: lowest lvs. spatulate-lanceolate, the others oblong or oblong-lanceolate from a conate base: fls. white, in short-peduncled, opposite cymelets, forming a long verticillate raceme; calyx very viscid, long-cylindrical, 10-nerved, in fr. clavate; petals deeply 2-parted into obvate-oblong segms.: caps. oblong. June, July. Eu., N. Asia. Var. pléna, Hort., is said to grow 1 ft. high and to have bright rose double fls.—Use basal cuttings.

3. viscosa, Pers. Biennial, somewhat tomentose, very viscid: sts. stout, leafy, simple: lvs. somewhat undulate, radical oblong: cauline lanceolate, acute: fls. white, in short-peduncled, opposite cymelets, forming a long verticillate raceme; calyx very viscid, long-cylindrical, 10-nerved, in fr. clavate; petals deeply 2-parted into obvate-oblong segms.: caps. oblong. June, July. Eu., N. Asia. Var. pléna, Hort., is said to grow 1 ft. high and to have bright rose double fls.—Use basal cuttings.

4. dichótoma, Ehrl. Annual or biennial, minutely pubescent: sts. strictly dichotomous: lower lvs. spatulate, the others lanceolate, acuminate: peduncles very short, racemes in pairs, many-fl'd.: fls. white, sessile; calyx 10-nerved, the nerves green, more or less hisitate, oblong-cylindrical; petals 2-parted to the middle or more, the segments obovate-oblong: caps. oblong. Eu., also intro. in N. Amer. and extensively escaped. B.B. (ed. 2) 2:67.

5. pénulada, Linn. (S. gréca, Hort., not Boiss. S. robusta, Hort.) Fig. 3617. Annual, crisp-pubescent: sts. 6–10 in. high, decumbent at base, dichotomously branched above: lvs. oblong-spatalate to lanceolate; floral lvs. oblong-lanceolate: fls. flesh-colored or rosy, in lax racemes, finally pendulous; calyx hisrate, reddish, 10-nerved, somewhat inflated after anthesis; petals large, obvate or 2-parted: caps. ovate. May–Aug. Medit. 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. álba, Hort., is a white-fl'd. form. Var. Bonnetti, Hort. (S. Bonnetti, Hort.), has brownish red sts. and lvs.: fls. shiny purple-red or dark purple. Var. cárnea, Hort., is a flesh-colored form of which there is a double variant known in the trade as cárneá pléna. Var. compacta, Hort., is probably a compact-growing strain rather than a true variety; occurring in several color variations and both single and double.

6. fimbrítá, Sims. Perennial, about 2 ft. high, pubescent: sts. erect, leafy and sometimes branched from the axis: lvs. large, ovate, base more or less cordate, margin undulate; the upper lvs. lanceolate, all dark green: infl. a dichotomous panicle: fls. white; calyx whitish, inflated, ovate-campanulate, teeth short-triangular; petals ciliate at base, ovate above, deep red; many-nerved and fringed. Caucasus. B.M. 908.


8. marítima, With. Perennial, cespitose, gray-green, 8–16 in. high: sts. numerous, the barren shoots procumbent, the flowering ascending: lvs. lanceolate or ovate-lanceolate, margin cartilaginous or crenate: fls. 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. Gm. 57, p. 372. G.M. 52:273.—The seaside form is said to be more glaucous than the mountain form. Allied to S. latífolia, but fewer and larger-fl'd. Var. pléna, Hort. (S. marítima var. flóre-

3616. Silene Armeria. (X½)

3617. Silene pendula. (X¾)
SILENE

Silenus, Hort.), grows 4-10 in. high and has fewer fls. than the type, but they are much larger, extremely double and remain in bloom longer. Niven says, "This variety makes a lovely rock-plant, and ought always to be placed in such a position that its stems, borne down by the weight of blossoms, may hang over the ledge of a rock; otherwise, if planted in a border, they get besprinkled with soil after every shower of rain." Niven adds that this variety produces no seed and is more easily prop. by cuttings than by division. Gn. 11, p. 12; 57, p. 126. R.H. 1906, p. 181. Var. rosea, Niven, grows about 6 in. high and is said to have a less rambling habit and rose-colored fls. Origin unknown. This desirable form seems unknown in Amer.


3618. Silene virginica. (X½)

in second racemose panicles; peduncles opposite, 1-3-ft.; calyx subclavate, obscurely 10-atriate, glabrous; petals 2-cut, the segms. oblong-linear, obtuse: caps. elliptical. E. Eu., W. Asia.

10. Astérias, Griseb.; also misspelled Asteria. 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: fls. purple, suboblong, in a many-fl., capitulate cyme; calyx membranaceous, reddish, obconic-cylindrical; petals oblong, entire: caps. oblong. Macedonia and Roumania. Var. grandiflora, Hort., is about 3 ft. high and has the crimson-scarlet fls. in globose heads. Balkan Mts.

11. stelláta, Ait. Starrv 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; fls. white, nodding, in an open panicle; calyx campanulate, pubescent, inflated; petals laciniate, cleft, unappendaged.

SILENE


15. Fortunae, Vis. Perennial, 1½-3 ft. high, woody at base, scaberulous-pubescent: sts. numerous, erect: lvs. linear-lanceolate, acute, attenuate to a ciliate petiole: fls. racemose with short cymose or approximate single-fl. branches, rose or white; calyx elongate-tubular, glabrous, striae netted above, teeth ovate, broad white-margined; petals with 2-auricled claws, base 2-parted, the lobes more or less deeply incised: caps. oblong. China. B.M. 7649. Var. nána, Hort., is a dwarfer form with more deeply colored fls. Var. rosea, Hort., has more brilliant pink fls. than the type.

16. Scouleri, Hook. Perennial, 1½-2½ ft. high, pubescent, glandular-viscid above: root stout: sts. simple, erect; lvs. narrowly oblanceolate or lanceolate-linear, acuminate: fls. white or purplish, verticillately spiraled or the lower ones in short appressed cymes; calyx clavate, nerves definite, teeth membranous and ciliate margined; petals auricled-clawed, bifid. Mountains of Ore., Idaho, and Mont., northward to Vancouver Is.

17. Méntzeisii, Hook. Perennial, 6 in. to 1 ft. or more high, finely glandular-pubescent: sts. weak, leafy, dichotomously branched above: lvs. ovate-lanceolate, acuminate at both ends, thin: fls. white, very small for the stems, borne in the forks of the branches and forming a leafy infl.; calyx obovate, obovate, or oblong, 2½-4 lines long; petals 2-cleft, commonly appended: caps. small. Mo. and Neb. to Assiniboia, westward and southward to Vancouver Isl., S. Calif. and New Mex. B.B. (ed. 2) 2:68.

18. rosíflora, F. K. Ward. Perennial, 6-12 in. high, branched: sts. suberect to procumbent, densely pubescent: lvs. scarcely petioled, up to 1 in. long, lanceolate, base slightly attenuate, apex acute, sparsely puberulous above, densely so beneath, margin ciliate: infl. terminal, laxly dichotomously cymose-corymbose: fls. rose; calyx tubular, 10-nerved, purple-saturated, densely glandular-pubescent; petals about ¾ in. long, clawed, blade broad, obovate.

19. califónica, Durand. Perennial, 1-4 ft. high, hirtellous-pubescent: root vertical, simple, 2-3 ft. long: sts. procumbent or suberect, leafy: lvs. lanceolate or
ovate-elliptic, more or less narrowed at base, acuminate, rarely obtuse; fls. scarlet, large, 1 in. or more across, scattered; calyx funneliform-clavate; petals 4-lobed, commonly with 2 broad ones flanked by 2 narrower ones: caps. ovoid, concealed until aftercence by the rather broad calyx. Coast Range, Ore. to N. and Cent. Calif.—Doubtful whether in cult.

20. virginica, Linn. Fras. Pink. Fig. 3618. Perennial, 2 ft. high, viscid-pubescent; sts. striate, simple; lvs. spatulate or oblongate, the lower narrowed to ciliate-fringed petioles, 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. G. 22, p. 375. G. 8:417. B.B. (ed. 2) 2:64.

21. régia, Sims (S. Bérgeri, Hort., not Schott). Royal CATCHFLY. Perennial, 3–4½ ft. high; st. erect, stout, slightly viscid and rough-pubescent; lvs. sessile all but the lowest, the upper sessile-lanceolate, acute, 2–3 in. long. lvs. pubescent, simple, in a single leafy sheath subtending the panicle, about 1 in. across; calyx oblong-tubular; petals emarginate or laciniate, crowned. July. Ohio to Ala., Tenn., and Mo. B.M. 1724. B.B. (ed. 2) 2:65.

22. gigantea, Linn. Perennial, 3–4 ft. high; st. tall, stout, 4-angled below, viscid-pubescent; lvs. tomentose, the radical densely rosulate, thick, obovate, mucronate; the floral lvs. minute, linear-lanceolate; panicle long, raceme-like, with the cymes densely many-fl.-d., remotely whorled and the uppermost sessile: fls. white; calyx hairy, obconical, 10-nerved; petals 2-parted into oblong segms.: caps. large, ovate. E. Medit. region.

23. viridiflora, Linn. Perennial, 1–2 ft. high; sts. simple or branched above, soft-pubescent, very viscid above; lvs. petioled, ovate-oblong, acute; fls. greenish white, in loose, elongate panicles, few, nodding; calyx glabrous, reticulately green-nerved, narrowly cylindrical; petals deeply 2-cut into linear segms.: caps. oblong. S. Eu.

24. mellifera, Boiss. & Reut. Perennial, cespitose, 1½–2½ ft. high; sts. erect, stout, very short-puberulent below, very viscous above: lvs. acute, pubescent, the lower and rosette lvs. oval or spatulate-lanceolate, attenuate to a long petiole; the upper lanceolate or linear-lanceolate lvs. small, bright green, in long lax cymose panicles; calyx umbilicate, clavate, green-striate; petals clawed, the limb deeply 2-lobed, cuneate: caps. ovate-conical. Spain, Portugal, and Algeria.

25. Zawadski, Herbsch. Perennial, 4–8 in. high; sts. rather erect, hirtellous-pubescent, densely villous above: lvs. rosulate, lanceolate, acuminate, narrowed to the ciliate base, densely punctulate-ciliate; cauline lvs. few, linear-lanceolate; fls. white, in a few-fl.-d. raceme; calyx broadly ovate-campanulate, densely pubescent; petals bifid: caps. ovate. Austria.

26. pumilio, Wulf. Dwarf perennial; sts. a few inches high, cespitose, glabrous: lvs. linear, obtuse, ciliate; fls. solitary, rose, 1½ in. across, on slender pedicels; calyx faintly 20-nerved, oblong-campanulate, pubescent, somewhat inflated after anthesis, green or violaceous, green pedicel: peduncle: calyx obturately 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. Lerchenfeldiana, Baumg. Low cespitose perennial, glabrous and glaucous; sts. decumbent ascending; lvs. rosulate below, long-lanceolate, acute; terminal at base; cauline lvs. oblong: fls. 5-11, in terminal corymbose cymes, rose; the peduncles short; calyx glabrous, hyaline-membranaceous, cylindrical-clavate; petals narrow-longate, linear, retuse: caps. ovate. S. E. Eu.

28. acutus, Linn. Cushion Pink. Moss Campion. Fig. 3619. Moss-like tufted perennial, about 2 in. high, glabrous: sts. almost lacking: lvs. clustered at the end of the much-branched rootstock, green, short, linear-subulate; peduncles 1-fl.d.; fls. reddish purple, ½ in. across; calyx campanulate, 10-nerved, glabrous; petals slightly notched, obovate, with a small scale at the base: caps. long-cylindrical or oval. May–Aug. Eu. L.B.C. 6:568. G. 75, p. 285; 76, p. 614. B.B. (ed. 2) 2:63.—According to Niven, this species is readily increased by division or by seeds, which it produces sparingly. The fls. have a tendency to become dicotyl. Var. albic. the white form has snow-white fls. somewhat smaller than the type. Var. aurea, Hort., has golden foliage and bright rose fls. Var. excelsa, Koch (S. excelsa, All.), has dense bright green cushions and paler pink (according to the trade sometimes white) fls. Var. grandiflora, Hort., forms moss-like tufts with crimson fls. June, July. Var. plena, Hort. (S. acutus var. flava-plena, Hort.), has dense cushions of light green foliage and double bright rose fls.

29. dianthifolia, J. Gay. Perennial, densely cespitose, 4–6 in. high, glabrous: sts. erect, 1 (rarely 2) -fl.d.: lvs. ciliate at the broadened base, narrowly linear, acute, the lower congested, the upper shorter; calyx reddish nerve, short obconical-cylindrical, teeth ovate; petals 2-parted above the middle into oblong-oblong segms.: caps. ovate. Asia Minor.

30. quadridáda, Linn. (S. quadridentata, Pers.). Perennial, 2½–4 in. high, rather glabrous, cespitously many-stemmed: sts. slender, rather viscid, dichotomous; lower lvs. spatulate; the others linear: fls. solitary or in 3’s; peduncles long and capillary, white; calyx oblong-cylindrical; petal glabrous-clawed, blade obovate-spatulate, obtusely 4-lobed, or glabrous. S. Eu.

31. alpístris, 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. G. 63, p. 231.—It forms a dense mass of underground sts. and is easily prop. by division or seeds. Var. grandiflora, Hort., is a large-fl.d. form offered in the trade. G. C. I. 55:442. Var. Richentreichii, Hort., is offered in the trade as a smaller form, about 6 in. high.

32. Saxífraga, Linn. (S. petraea, Waldst. & Kit., not Adams). Perennial, somewhat shrubby, densely cespitose, bright green: sts. numerous, 3–10 in. high, ascending, filiform, glabrous or seaboar-puberulent, viscid above: lvs. linear or linear-lanceolate, acute, glabrous or seaboar-puberulent, margin serrulate-ciliate; fls. very long pedicel: calyx 2–3-fl.d. cymes, erect on very long pedicels; calyx tubular-clavate, glabrous, 10-striate, striis green or reddish, puberulent; petals 2-parted, the lobes oblong: caps. ovoid-oblong. Eu. and Asia Minor. L.B.C. 5:454.
33. odongópetala, Fenzl. Perennial, densely pubescent: sts. 4–6 in. long, leafy, subsimple, glandular-villous above: lvs. lanceolate or line-lanceolate, 1-nerved, acute or somewhat obtuse: fls. cymose, 1–7-fl., white; calyx pubescent, rather viscid, whitish, campanulate; petals 2-lobed: caps. ovate. Asia Minor and Syria.

34. Elizabethæ, Jan. Perennial, 4–6 in. high: sts. tufted, erect or ascending, viscid-pubescent: lvs. narrowly lanceolate, acute, the lower or lowermost, long gradually becoming smaller upward: panicle terminal; fls. bright rose to rose-purple, 1½ in. across; calyx tubular, at first cylindrical, at length oval and bladdery, pale dull green, veined and margined purple; petals 2-lobed, white, claw cuneate-flabellate, margin crenate-dentate. Italy. B.M. 5400. G. 8:412.

35. ciliata, Pour. 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-fl. cincinnus, pedicellate, in dense, axillary, white or ivory-white; calyx clavate, short-pubescent, green-red-brown-, or purplish striate; petals 2-lobed.

36. repens, Patrin. Perennial, 8–10 in. high, with a low rootstock: sts. slender, simple or slightly branched, more or less scabrous-pubescent: lvs. narrowly oblong or lanceolate, acute: fls. white, racemose-paniculate on opposite, axillary, 1–5-fl. peduncles; calyx cylindric-clavate, inflated, 10–15-ft., pubescent-violaceous; petals 2-cut, the segms. oblong, obtuse, the claw glabrous. Turkey, Caucasus, Siberia, Siberia, China and Japan, and in N. Alaska.

37. Reichenbachii, Vis.; also spelled Reichenbachiana in the trade. Perennial, miniature, shrub-like, tufted: sts. somewhat woody at base, puberulent below, glabrous, somewhat viscid above: lower lvs. oblanceolate-spatulate, acute, ciliate on the ribs and margin; upper lvs. linear, acute: fls. white, racemose-paniculate, nodding peduncles usually 1-ft.; calyx linear-clavate, 10-nerved, nerves red or green, margin of teeth lanuginous; petals obvate, 2-parted: caps. oval-oblong. Dalmatia.

38. rupéstris, Linn. Perennial, 2–8 in. high, loosely cespitose, glabrous: sts. numerous, erect from a branched base, 1½–7 in. high: lvs. lanceolate, acute, the lower attenuate at base: fls. flesh-color, in repeatedly dichotomous cymes, numerous, long-pedicelled; the petals obvate; calyx ovate-lanceolate, base slightly umbilicated; petals obvate, deeply emarginate: caps. ovoid-oblong. Eu.

39. caucaúsica, Boiss. Perennial, 4–5 in. high, velutinous: caulicles filiform, nude: sts. ascending from below the rosette: lvs. in a rosette, oblong-lanceolate, elongated; calyceous lvs. abbreviated: fls. 1, often 2–3 to a st., subsessile, white; calyx rather softly glandular-hairy, 10-nerved, narrowly cylindrical; petals obvate. Caucasus.—Closeley allied to S. vallesiæ, from which it differs in being velvet instead of glandular, in having shorter cauliine lvs. and almost sessile, instead of long-peduncled fls. and not inflated calyx.

40. vallesiæ, Linn. Perennial, cespitose, about 4 in. high, viscid-pubescent: sts. assurgent, slightly branched: lvs. lanceolate, others lanceolate; calyces lvs. long: fls. long-peduncled, terminal, rarely in pairs; calyx very long, glandular-pubescent, somewhat inflated after anthesis; petals bifid, rose-violet above, greenish beneath, claw ciliate. High Alps.

41. Hôkôkeri, Nutt. Perennial, tomentose-pubescent: sts. many, decumbent, 6–10 in. high, slender: lvs. 2–3 in. long, the lower elliptic-spatulate, narrowed to the petiole; the remainder elliptic-lanceolate, acute, both surfaces pubescent: fls. solitary in the leaf-axils or times in terminal or axillary few-fl. cymes, 2½ in. across, pale pink; calyx soon turged, 10-nerved, veins


42. pusílla, Waldst. & Kit. Perennial, dwarf, villous on the petioles and at the base of the sts., viscos above, cespitose, many-stemmed: sts. low, slender, leafy, dichotomous: lvs. radical, spatulate, the others short-lanceolate: peduncles long, capillary, 1 (rarely 2) -fl.: calyx glabrous or minutely glandulose, turbinate; petals glabrous-clawed, limb white, obtuse, 4-touched: caps. ovate-globose. S. Eu. Considered by some to be only a variety of S. quadrifida.


44. pennsylvánica, Michx. (S. caroliniana, Walt. ?) Wild Pine. Perennial, 6–9 in. high, from a strong taproot, viscid-pubescent: sts. slender, linear-lanceolate or oblanceolate, acute, base tapering to the long, ciliate petals; calyx lvs. 2–3 pairs, shorter, lanceolate or narrowly oblong: fls. rose or white, in small, dense, terminal cymes; calyx pubescent, clawless; petals obovate, claw glabrous, appendaged, 2-lobed. Apr.–May. E. and W. to New England to S. and C. F.S. B.R. 247. L.B.C. 1:41 (as S. palustris) (ed. 2) 1:65.—S. caroliniana is accepted by some authors as the name of this species, but there is considerable doubt as to the identity of Walter's species and it is questionable whether the plant he described is S. pennsylvánica.

S. Célada, Hort., is probably a misspelling of S. Schafta.—S. Correvónia, Hort., is offered as a rare plant growing in "compact tufts, with rosy pink fls. which almost resemble minute roses." —S. graminifólia, Hort., is not recognizable, as being a scarce plant; going under that name.—S. Kidwai, Hort., may be S. multicactum.—S. orientalis, Mill., is according to Miller a plant with st. erect, hisurate; lvs. pubescent; fls. purplish; calyceal conical. It is not treated botanically by William, DeCandolle, Boissier, Nicholson, or Wight, but is offered in the trade as a perennial, 2–2½ ft. high; fls. bright rose, in a head. Var. albta, Hort. and var. compacta, Hort., are also offered.—S. pêris grandifólia, Hort., is offered in the trade as the species, the botanical name in the trade is but better known under the name of S. chafta on a large scale: said to grow about 1 ft. high, to have a loose graceful habit and an abundance of bright pink fls. Offered in the trade.

F. Tracy Hubbard.

SILPHIUM (from the Greek name of an umbelliferous plant of northern Africa). Commonly, some-weed. 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 large species, are yellow.

Leaves opposite, alternate or verticillate, often forming water-holding cups by performation of the st.: heads terminal; involucres small, involucral bracts flat; ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted deciduous ligules: achenes much flattened, falling free or only with the subtending bract.—About 25 species. Silphiums are of easy cult. in any good soil. They require full sunlight and are prop. by division or seed.

a. Foliage much cut.

Inciníatum, Linn. COMPASS PLANT. St. about 6 ft. high, leafy at the base, much less so above, very rough: lvs. 1 ft. long or more, once or twice pinnately parted, with the leaflets finely toothed along the margin: rays 20–30. 3168
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.

terebinthinaceum, 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 1 1/2–3 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.
C. Lvs. connate-perfoliate.

derfoliatum, Linn. (S. erythrocalon, Bernh.). CUP PLANT. INDIAN CUR. St. square, usually dentate, branched above, about 6 ft. high; lvs. thin, ovate or deltoid-ovate, the lower contracted into margined petioles, the upper opposite, connate-perfoliate; fl.-heads 2–3 in. across, with 20–30 rays. July, Aug. Ont. to S. D. and Ga. B.B. (ed. 2) 3: 460. G.W. 11, p. 473.

CC. Lvs. petiolate or simply sessile.

integrifolium, Michx. St. 2–6 ft., obtusely 4-angled to 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.

SILYBUM

(San 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 herbs, roots, and lvs.: lvs. alternate, white-maculate above, sinuate-lobed or pinnatifid, the teeth and lobes spiny; heads large, solitary, or in upper part corymbose, nodding, homoeotic; involucre broadly subglobose, the bracts in many rows; fls. purplish, all perfect; corolla-tube slender, limb 5-cleft to the middle or base: achenes smooth, obovate, oblong.—Two species, Eu., Afr., and Asia.

Mariànum, Gaertn. (Càrthusis Mariànum, Linn. Maria: à: Carta, Groves). St. Mary’s, Blessed, or HOLY THISTLE. Annual or biennial, shining; st. 1–4 ft. high, grooved not winged; lvs. large, with strong spines; heads large, solitary, or in upper part corymbose; involucre slender, sometimes with a spine 1/2–2/3 in. long, the outermost mucronate; receptacle fleshy; fls. rose-purplish; achenes transversely wrinkled or smooth, black or gray. S. Eu., N. Afr., and Asia, also intro. in many places, including N. Amer.; naturalized on the Pacific coast.

F. TRACY HUBBARD.

SIMARUBA (the Caribbean name of S. amara); also spelled Simarouba. Simarubaceae. Evergreen trees sometimes grown in the greenhouse, or hardy outdoors in the far S.: lvs. alternate, abruptly pinnate; the lfts. alternate, entire, leathery; fls. somewhat cymose, in axillary or terminal elongated and branched panicles, dioecious; calyx small, 5-lobed, imbricated; petals 5, spreading at the top, imbricated; stamens 10 in the male fl.; ovary deeply 5-parted in the female fl.: drupes 1–5, sessile, spreading.—About 7 species, Trop. Amer.

amara, Aubl. (S. officinális, DC.). A tall tree: lfts. oblong or oblong-lanceolate, mucronate with a bluntish point, green on both surfaces, glabrous or pubescent beneath: panicle exceeded by the lvs.: fls. yellowish white; petals spreading (when W. not Porto Rico) and Trop. Amer.—This yields the drug known as simaruba-bark.


F. TRACY HUBBARD.

SIMMONDSIA (for the naturalist, F. W. Simmons). Buxaceæ. Evergreen shrubs, sometimes, for ornament or for the oily seed and edible fr.: lvs. opposite, fles. dioecious, in the fl.-axes, apetalous; sepals imbricate; staminodes fls. in clusters; stamens numerous; pistillate fls. single; ovary 3-celled, 1 ovule in each cell. A single species. Related to Buxus.


SINNINGIA (for Wilhelm Sinning, gardener at the University of Bonn). Including Dolichochétra, Léigiera, and Rosanoría. Gesneriaceæ. Tropical herbs with handsome tubular flowers, of glasshouse culture; includes the florists’ gloxinia.

Pubescent or villous, from a tuberous rhizome: lvs. opposite, usually large, petiolate, the floral ones reduced to bracts: fls. usually large, solitary or fasciated in the axis, 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, separate, or the 2 posterior fused, and in some cases 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.

Sinningia speciosa, Linn., is naturalized in gardens and florists’. Related to S. tomentosa, and S. indica. This is used as a house plant in bottomless pots, and is extremely rapid in growth.
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. 8182. Gt. 53, p. 525. G.W. 9, p. 277. A handsome plant, with long flowering period. Var. hybrida, Hort., is a garden hybrid with much larger fls. Var. grandiflora, Hort., is advertised, the fls. "several times larger than the former, and well displayed; have the same dark green and purplish red foliage."

**conspicua**, Nichols. (Rosanowia conspicua, Regel). Root tuborous: st. 1 ft. high: lvs. ovate-oblong, short-acute, 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. (Rosanowia ornata, Van Houtte). A hybrid of the above species with a garden variety of Gloxinia with fls. of a bright red; the result is a plant resembling *S. conspicua*, but differing in having the lvs. tinted on the veins and petioles with purple and in having somewhat more elegantly shaped fl., pure white with purple lines on the inside 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 rounded small sepal of the fls. borne in very long racemes and by the small berry-like frs. The only species is *S. chinensis*, Hemsl. (Holboelia chinensis, Decne. & Planch.) climbing, to 30 ft., glabrous: lvs. long-petioled, 3-foliolate; lfts. stalked, short-acute, broadly cuneate at the base, entire, the terminal broadly obovate, 4–5 in. long, the lateral lfts. obliquely ovate: racemes axillary, 8–12 in. long; fls. unisexual, short-stalked, ½ in. across, white striped brownish; sepal obovate; stamens 6, free, short: carpels 3, developing into 2-celled: ovary purple and sterile: capsule ½ in. across. Cent. China. H.I. 29:2842.—The long racemes of bluish purple berries are strikingly handsome: the plant has proved perfectly hardy in southern England, but is tender at the Arnold Arboretum. Prop. is by seeds and by layers, possibly also by cuttings like akebia.

**SINOMÉNIUM** (Sina, China, and Greek, *men*, moon, meaning Chinese moon-seed). Menispermiaceae. A shrubby vine from E. Asia closely related to Menispernum and Cocculus; from the first it differs in the parts of the fl. being arranged in whorls and in the 9–12 stamens, and from the second chiefly in the structure of the flattened curved seed: lvs. deciduous, alternate, long-petioled: fls. discose, small, in axillary and terminal panicles; sepal 6, pilose outside; petals 6, infixed at the base and inclosing the filaments; the pistillate fls. with 9 staminodes and 3 carpels with recurved styles: fr. a drupe with a compressed crescent-shaped stone ribbed on the back. A handsome vigorous-growing twining vine with large lustrous often lobed lvs. remaining green until late in autumn, with inconspicuous fls. in long pendulous racemes and bluish black frs. It has proved only half-hardy at the Arnold Arboretum. Prop. like coccus and menispernum.


**SINWILSONIA** (for Ernest Henry Wilson, who collected extensively in China during 1909–1910 and intro. numerous new plants into cult.). Hamamelidaceae. A deciduous tree similar in foliage to Hamamelis, but in its fls. more closely related to Corylopsis, from which it is chiefly distinguished by the unisexual, apetalous fls., and the tubular-urceolate calyx-tube: fls. in pendulous racemes, scarcely-petioled; tube urceolate, inclosing the ovary, with obovate-spatulate lobes; petals wanting; the pedillate fls. with 5 staminodes opposite to the sepals; ovary with 2 long and slender styles: fr. a dehiscent 2-seeded woody caps. The only species is *S. Hénryi*, Hemsl. Shrub or tree, to 25 ft., more or less stellate-pubescent: lvs. short-petioled, membranous, broadly ovate to elliptic, or oblong, acuminate, usually 4–6 in. long: calyx-tube yellowish, stellate-tomentose, nearly ½ in. long: caps. sessile, nearly ½ in. long; seeds black. May. Cent. and W. China. H.I. 29:2817.

—Botanically interesting, but without particular ornamental qualities; has proved hardy at the Arnold Arboretum. Prop. is by seeds and probably by layers and by grafting on hamamelis. Alfred Rehder.

**SIPANEA** (native name in Guiana). Rubiaceae. Annual or perennial herbs, hispid-setose, pilose or gla- brate, erect or prostrate, with terete branches: lvs. opposite, petiolate, ovate or lanceolate; stipules linear, often persistent; calyx-lobes as long as corolla, the cymes in corymbs, axillary, terminal or dichotomously disposed, white or rose, the throat frequently golden villous; calyx-tube turbinate or ovoid, the limb with 5 elongate-subulate, persistent lobes; corolla funnelform or salver-shaped, tube elongated with the throat dilated, the limb with 5 equal, broad-ovate spreading lobes; stamens 5; disk annular; ovary 2-celled: caps. ovoid or subglobose, leathery.—About 5 species, Trop. Amer. S. cárnea, Neumann. Perennial herb, about 3 ft. or more high: lvs. oval, lanceolate, acute: fls. pale rose-violet, arranged in a corymb; corolla-tube cylindrical, 5-parted, oval, acute: fr. hemispherical. Cent. Amer. H.U. 4, p. 193. R.H. 1845:445.

**SIPHOCÁMPLUS** (Greek, siphon, tube, and kampylos, curved, referring to corolla); sometimes misspelled *Syphocampylos*. Campanulaceae. Herbs, subshrubs, or shrubs, sometimes climbing, glabrous, his- rute or stellate-tomentose, adapted to the warm- or coolhouse: lvs. alternate, rarely verticillate, entire or dentilicate, rarely incise-dentate or pinnately lobed or divided: peduncles 1-fld., axillary or corymbose grouped at the ends of the branches or laxly racemose: fls. often rather large, red, orange, or purplish, rarely green; calyx 5-lobed; corolla straight or incurved; caps. ovoid or subglobose, 2-valved.—About 100 species, Trop. Amer.


**S. bícolor**, Don.= Lobelia laxiflora, HBK.—S. giganteus, Don (Tupa sallyfolia, Don) grows 14 ft. high: lvs. lanceolate, 6–9 in. long, scarcely petiolate; fls. reddish yellow; corolla falcate, velvety. Ecuador.—S. Lindleyi, Lem., has ovate-oblong, glabrous-serrate
SKIMMIA


F. TRACY HUBBARD.

SYPHYNIA: Hews.

SISYRINCHIUM (an old Greek name first applied to some other plant). Irisidaceae. SATIN FLOWER. BLUE-EYED GRASS. RUSHLILY. 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. 6, nearly alike: caps. gloular, 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.

califómicum, Dry. (Marica californica, Ker-Gawl.) A half-hardy perennial: st. 1½ ft. high, 2 lines through, broadly winged: lvs. many, shorter than the st., about ½ in. broad; spathe 3-6-fld.: segms. of perianth yellow, lined with brown, ½ in. long: caps. oblong. Calif. to Ore. B.M. 983.—Swampy grounds.

BB. St. lf.-bearing.

c. The st. slightly 2-edged.

tenuifólium, Hubn. & Bonpl. A half-hardy perennial: roots fleshy, fibrous: st. ¼-1 ft. high, often branched low: lvs. subterete or narrowly linear: spathes 3-4-fld.; segms. of perianth yellow, ½ in. long. Mountains of Mexico. B.M. 2117; 2313.


cc. The st. broadly winged.

convolútum, Nocc. A tender perennial: root fibrous, slender: st. about 1 ft. high, usually forked: lvs. linear: spathes 3-4-fld.: segms. of perianth yellow, veined with brown, ½ in. long. Trop. Amer.

AA. Fls. purple, blue, or white.

b. St. terec.

grandifórum, Douglas (S. Douglasii, A. Dietr.). A hardy perennial: root-fibers slender, long: st. simple, about 1 ft.: lvs. short, sheathing the lower part of the st.: fls. 2-3, cornuous; perianth-segms. bright purple, rarely white, ½ in. long. May, June. N. W. U. S. B. M. 3509. B. R. 1361. G. 2:100; 5:559.—This is possibly the handsomest species in the trade. Var. álbum, Hort., is also offered and is equally desirable.

BB. St. flat.

c. Spathes equal in length.


cc. Spathes very unequal in length.

angustifólium, Mill. (S. ancpe, Cav. S. berni-dianum, Authors.) A hardy perennial: root-fibers long: st. about 1 ft. high, ½ in. long, through, with 2-3 clusters on long-winged pedunclcs: lvs. linear, shorter than the st., 1-1½ in. wide; spathes 1-4-fld., about 1 in. long; pedicels about 8 in. long. May-Aug. Maine to Va., west to Colo. Var. béllum, Hort. (S. béllum, Wats.) Sts. more narrowly winged, usually without any lf. below the fork: spathes shorter: pedicels longer. Calif., New Mex.

murçonátum, Michx. Hardy perennial similar to the last: sts. narrowly winged: spathes usually purpuretinged, not gibbous, outer lvs. with the margins united a little above the base, ¾-2½ in. long; perianth ½-3½ in. long; perianth violet (rarely white): caps. straw- or greenish yellow. W. Mass. to Va. and Mich. B.B. (ed. 2) 1:544. F. W. BARCLAY.

F. TRACY HUBBARD.

SITOLÓBIUM (name refers to the grain-like fructification). Polyóidiaceae. Here is an old name this fern is still listed, but the group now forms a section of Dicksonia and Dennstedtia characterized by prostrate rhizome and cup-shaped or nearly spherical involucres planted at the base of the depression of the lobes. The fern in question is Dennstedtia cicutaria, Moore (Sitólóbium cicutárium, J. Smith. Dicksonia cicutária, Hook. & Baker), a W. Indian species with bipinnate lvs.: lower pinna 12-18 in. long and 6 in. broad, with deeply cut linear-acuminate pinnules, the segms. oblong-deltoid and deeply cut.

SLUM (from Sion, old Greek name used by Dioscorides). Umbelliférae. 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; umbel united: pedicel, tepal much shorter: involucres and involucral bracts numerous: lvs. white; calyx-teeth acute; petals inflexed: fr. ovate or oblong, laterally compressed or constricted at the junction of carpels.—About 4 species, northern hemisphere, also one species in S. Afr., apt to be subaquatic.


latiólóium, Linn. Water Parsnip. Sls. 3-5 ft. high, angular, furrowed and erect: lvs. pinnate; fls. oblong-lanceolate, evenely serrate, pointed: umbels terminal; involucral lvs. many, lanceolate. Ditches and rivers, England.—Like Ferula and certain other umbelliferous plants, it is valued more for its stately habit and handsome foliage than for its lvs.

F. TRACY HUBBARD.

SKIMMIA (Japanese, Skimmii, meaning a hurtful fruit). Rutáceae. Ornamental woody plants grown chiefly for the bright red berries and the handsome foliage.

Evergreen glabrous shrubs: lvs. alternate, short-petioled, entire, dotted with transudic glandlets: fls. perfect or dicuous, the staminate fragrant and in large panicles; sepals and petals 5-4; stamens 4-5; style with 2-5-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, rarely black, berry-like fruit. They are tender, not being reliably hardy as far north as Washington, D. C. S. Fortunei is somewhat hardier 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
SKIMMIA

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 seed 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 coldframe 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."


**Fortunei**, Mast. (S. japonica, Lindl.). Similar to the preceding but of dwarfer habit: lvs. lanceolate or oblong-lanceolate, acuminate, dark green above, light green beneath, 3½-10 in. long: fls. white, in oblong-ovate panicles, perfect: fr. obovate, dull crimson-red. Spring, China. G.C. II. 25, p. 245 (as *S. oblata*); III. 5, p. 525. The following as *S. japonica*: B.M. 4719; F.S. 7, p. 39; Gn. 7, p. 183, and S., p. 519; G. 1:40; R.H. 1869, p. 259, and 1880, p. 56. This species fruits more freely than the preceding. Var. rubella, Rehd. Peduncles, pedicels, and buds reddish; staminate form. R.H. 1874:311; 1882, p. 180. Var. argentea, Mast., has the lvs. bordered with white. A hybrid between this and the preceding species is probably *S. intermedia*, Carr., with narrow oblong-elliptic lvs. dark green above. To this hybrid belong also *S. Foremani*, Hort., with lanceolate or oblanceolate yellowish green lvs. and subglobose and obovate fr. on the same panicle (G.C. III. 5:553. Gn. 61, p. 160; 67, p. 57) and *S. Rógeresi*, Hort., with similar but deep green lvs. and globose squarish fr.

**SMILACINA**

**SKIRRET** (*Sium Sisarum*, Linn.) is a vegetable of minor importance, the roots of which are used like salsify 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 white blossoms with compound umbels. The roots grow in large clusters, something like those of a sweet potato or dahila, but they are much longer, more cylindrical, and somewhat jointed. The roots have a sweet and slightly floury 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 fleshy 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.

Skirret needs a rich soil. The seeds may be sown in autumn or spring and the plants yield well the first season. For European practice Vilmorin recommends that the seedlings be grown in a seed-bed until they have made four or five leaves and then transplanted into permanent quarters. Sow the seed in drills ¼ inch deep, and thin out the seedlings to 8 inches in the row. The roots may be left outdoors in the ground all winter, but others advise storing them in sand or earth.

**SKUNK CABBAGE** (*Symplocarpus foetidus*).

**SLIPPER FLOWER** (*Calceolaria*). *Lady's*: *Cypreseedium*.

**SLOB** (*Prunus spinosa*).

**SMALL-FRUIT** (*Blackberry*, *Blueberry*, *Currant*, *Dewberry*, *Gooseberry*, *Raspberry*).

**SMÉLOWSKIA** (named for Prof. T. Smelowski, botanist of St. Petersburg, died 1815). *Cruciferae*. *Soráe*. Some what cespitose gray-white-tomentose perennial herbs, rather rare in cult., suitable for the rock-garden: lvs. pinnately or bipinnately divided, fls. racemose, without bracts, white or yellow, frequently small; sepals short, lax, uniform at the base: silique rather short, narrowed at both ends, somewhat 4-sided or laterally compressed; seeds few, arranged in one series.—About 10 species, Asia and N. Amer.

**calycina**, C. A. Mey. Low, tufted perennial, very variable in foliage: lvs. soft, usually deeply pinnatifid, with 2 or several pairs of linear to obvolute, obtuse segms. and a terminal one: rarely a few lvs. entire: racemes at first dense and subcorymbose, but elongating in fr.: fls. white or nearly so; petals about 2 lines long. Arctic regions.—Recommended by some persons for rock-gardens, but it does not seem to be advertised in Amer. F. TRACY HUBBARD.

**SMILACINA** (resembling smilax). *Lilicceae*.

**FALSE SOLOMON'S SEAL**. Perennial herbs, with simple stems from rootstocks (Fig. 3620), used for the hardy border or the wild-garden.

Leaves alternate, nerved, and usually sessile: pinnate or racemose terminal: fls. white or greenish white, sometimes fragrant; perianth 6-parted, spreading, withering-persistent; stamens 6; ovary 3-celled: berry globular, 1-2-seeded.—About 25 species, N. and Cent. Amer. and Temp. Asia. Vagner is an older name for this genus and is used by some American writers; on the principle of fifty years of established usage. Smilacina is retained in the "nomina conservanda" list of the Vienna Congress.

3620. Rootstock of Smilacina racemosa. The figures designate the position of the stalks in the different years. Between each of the figures or scars is a year's growth. (×½)
**SMILAX**

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 plants may be forced slowly for bloom in the late winter and early spring.

*da vùrica*, Turcz.; also spelled *dahurica*. St. many-lvd., rather pilose; lvs. alternate, semiclavate, oblong, glabrous above, rather pilose beneath; racemes terminal; pedicels in pairs or ternate. *Dahuria* and Japan. — Related to *S. stellata*, which is distinguished by the solitary pedicel.

*niculàta*, Mart. & Gal. Glabrous herb: sts. erect: lvs. ovate-lanceolate, long-acuminate, 5-6 in. long, much narrowed at the base, nerves 5-7, panicle terminal, racemously branched, 2½ in. long and as much across, all parts snow-white; fls. about 4 lines across; paniacanth-segments elliptic; ovary ovoid. Mex. B.M. 8339.


*sessilifòlia*, Nutt. (*Vagnèra sessilifòlia*, Greene). Rootstock slender: st. 1-2 ft. high; slender; lvs. 2-6 in. long, lanceolate, acute, flat and spreading; raceme open, sessile, or short-pedunced: berry 3-5 lines through. Early summer. Pacific States.


S. *bicòlia*, Schult. f. = *Maianthemum bifòlium*.

F. W. BARCLAY.

F. TRACY HUBBARD.†

**SMILAX** (ancient Greek name). *Lilìdeæ*. 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 or with large fleshy tubers; in some species with long creeping rhizomes: lower lvs. reduced to scales, the upper simple or slightly lobed, 3-7 (or more) -nerved, deciduous to 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 Floridian smilax 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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**KEY TO THE SPECIES.**

**AA. Shoots woody.**

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This species is undesirable on account of the strong carrion odor of the fls. There are several herbaraceous species in N. Amer. and E. Asia, but only this and the following have been intro. to the trade.

2. lasioneuron, Hook. (S. herbacea var. inodora, Horst. Nemexia herbacea var. melica, A. Nels). Similar to the above but with the lvs. pulverulent-pubescent beneath; peduncles shorter than the lvs.: fls. not carrion-scented. From Colo. to Man, in the Great Plains and E. Rocky Mts. — Distinguished from the other herbaraceous 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: lvs. ovate, larger ones heart-shaped, deciduous: peduncle longer than the pedicle. 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 rootstocks; by proper attention to pruning this species will make an upright hedge-plant of merit.

4. Sieboldii, Miq. Closely related to S. hispida from which it differs in its weaker habit, more pointed narrower lvs, which in the growing plant are distinctly crenulate: peduncles fewer-fl., and little longer than petioles. Japan and Korea.

5. rotundifolia, Linn. HORSE-BRIER. Rootstock scarcely tuberous, long-climbing: 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: lvs. variable, on vegetative branches distinctly hastate or with basal lobes, spiny on margins and midnerv below, smooth and green on both sides; upper lvs. triangular, ovate, thin, fine-nerved, peduncles much longer than pedicels, flat, many-fl.: berries 1-seeded, black, not glaucous. Va. and Fla. west to Kans. and N. Mex. B.B. (ed. 2) 1:529. — Ordinarily a bad weed, but perhaps of use in large landscape plantings.

6. exelis, Linn. Similar to the above in habit: sts. large, angled, with few heavy spines; lvs. heavier and larger: fls. 3–10 in umbel: berries \( \frac{1}{2} \) in. diam., coral-red. Persia, S. Eu. to Azores.

7. Walteri, Pursh. Underground sts. slender, creeping: st. slender, terete, brownish: armed below with stiff short spines, Naked above: lvs. ovate to oblong: umbels few-fl., on short peduncles: berries \( \frac{1}{2} \) in., densely packed in umbels, bright coral-red, white-berried species are known. Swamps in sandy regions, N. J. to Fla. west to Mississippi River Valley. B.B. (ed. 2) 1:530. — The berries of this species are useful for winter decorations in the holiday season.

8. glauca, 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 lvs. and often whole plant glaucous; berries 2-seeded, small, peduncles and pedicels slender, longer than petals. Dry ground, Mass. to Fla. and Texas. B.B. (ed. 2) 1:528. G.F. 5:425 (adapted in Fig. 3622). — Ordinarily a weed, but perhaps of use in large landscape plantings.

9. Bona-nox, 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: lvs. variable, on vegetative branches distinctly hastate or with basal lobes, spiny on margins and midnerv below, smooth and green on both sides; upper lvs. triangular, ovate, thin, fine-nerved, peduncles much longer than pedicels, 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 \( \frac{1}{2} \) in. diam., slightly sebaceous, glaucous when young, spiny below with stout recurved spines, unarmed above,
SMILAX

climbing to the tops of tall trees often 70-80 ft., much branched above: lvs. thin, evergreen, glaucous beneath, ovate to lanceolate, 2-4 in. long; peduncles shorter than petioles, flowering in summer: young berries remaining over winter and ripening the next summer; berries 3-seeded, 3/4 in. or more diam. Vv. to Fla., Ark., and Texas. July, Aug. B.B. (ed. 2) 1:530.—The best American ornamental or evergreen shrubs.

11. laurifolia, Linn. FALSE CHINA BRIER. Similar to the above in habit: lvs. narrow, oblong, thick, green on both sides, turning dark brown on wilting: berries smaller, 1-seeded. N. J. south to Fla. and Texas. July, Aug. B.B. (ed. 2) 1:530.—This plant is always found near water, usually associated with S. Wallichiana.


S. argepis, Lind. & Rod. Tender foliage plant: st. wiry, slender, armed with short, stout thorns: lvs. lanceolate, becoming 8-10 in. long, dark green, blotched with gray, 3-nerved, short-petioled: fls. and fr. unknown. Bolivia. I.H. 39:135. J. H. III. 46:77. According to G.F. 8:305 the above species is as a robust healthy plant doing well in a moderate temperature and quickly forming ornamental specimens. It should be given a rich, fibrous soil and a light and sunny position. It may be prop. by half-ripe cuttings of the side shoots with 5 or 6 lvs. inserted in a moderately warm bed. This may be any one of a number of S. American species. The varied foliage is found in practically all of the woody plants of this genus, being strongly developed in S. gauera, S. bona-noes, and S. lanceata.

J. B. Norton.

SMILAX, FLORISTS’. The smilax of florists is an Asparagus (A. asparagus, 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 sold for sale. Smilax is rarely used in their beds of smilax for three or four years. It is doubtless most profitable to replant every year with young stock, grown from seed. It is a heavy feeder. A strong loam with one-half-fitted cow-manure is the best compost for the bed. A light house is not essential. The middle of an earth-span house running north and south is an ideal place for it, if there is height sufficient to run up the strings 7 or 8 feet. Plant as early as possible in July. Many florists who grow a few hundred strings of smilax make the mistake of putting them in a cool-house. It will grow in a temperature of 50°, but not profitably; 60° at night, and even 65°, is the better temperature. Plants should be 8 inches apart in the row and 10 inches between rows. Red-weather attacks the smilax, but daily spraying is a sure preventive. When cutting the strings, avoid picking out one here and there. Begin to cut at one end of the bed, and as much as possible clear off all the strings, because when decimated so much growth the fleshy roots are liable to rot if over-watered; little water is needed till young growth starts. Care should also be taken in cutting, for many times there will be several young growths a foot or so high that can be saved for a future string, and they may be useless if cut. Good drainage should always be provided.

Young cuttings in July should be raised from seed sown in February. When 2 or 3 inches high, and showing its character-leaves, it should be potted in 2-inch pots. In May, the plants should go into 3-inch pots. It is very important that the first growth, which is always weak, should be made in these 3-inch pots, then, when planted out, the first growth in the beds is strong enough to make salable strings. Never neglect tying up smilax as soon as the preceding crop is cut. For this purpose it is useless silkline or similar green twine. Contrary to what is the case with many plants, the higher the smilax is grown, the more durable the leaves, providing it is not cut prematurely.

William Scott.

SMITHLANTHA (Smith’s flower, named for Miss Matilda Smith, botanical artist, Kew). A name proposed for the species of Nagelia of Regal (which see), a name which had been given four years earlier to a genus of fungi; it is accepted by Fritsch in Engler & Prantl’s “Pflanzenfamilien.” The names under Smithlantha of the cult. kinds are: S. cinnabarina, Kuntze; S. zbrina, Kuntze; S. multiflora, Fritsch (S. amabilis, Kuntze), S. achimenesoides, Fritsch.

SMODINGIUM (Greek, indurated mark; from the callous fr.). Anacardiaceae. Glabrous shrub, allied to Rhus: lvs. alternate, long-petioled, trifoliate; the fls. large, actinomorphic, closely clustered in a corymbose panicle; fleshy green, oblong, several-seeded fruits.

SMOKETREE: Cotinus Coggyria.

SMUT. Diseases of many cultivated cereal grasses and other plants caused by the attacks of fungi of the order Ustilaginales. The mycelium sometimes produces swellings on 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 outer membrane of the tissues bursts or cracks. The chlamydospores produce upon germination a structure known as a promycelium (basidium) which gives rise to lateral or terminal spores known as basidiospores. These spores of the smut on Indian corn may be taken as typic. The disease usually appears first on the leaves, afterward at the junction of leaf-sheath and blade; finally the ear of corn is attacked, and the tassel. On the leaves blisters are found; on the ear, large whitish polished swellings appear. As the spores mature, the swellings become dark in color, and the inclosing membrane finally ruptures, exposing the dark olive-green mass of spores which are 8 to 12 µ (Greek micron) and are 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 similar smut of wheat (Ustilago triticci), etc. The common smut of wheat (Ustilaginoidea tritici), smut of blue-tem grass (Sorosporium anthrasmum), rye smut (Urocystis occulta), onion smut (Urocystis cepula), and colchicum smut (Urocystis colchici). For the loose smut of oats and wheat, the treatment of the seeds with hot water before planting is efficacious. The corn smut is best controlled by destroying the affected plants before the spores mature. The onion smut is due to infected soil which may be treated with sulfur, or formalin. John W. Harshberger.


SOBRALIA (named for G. Sobolewski, Russian botanist). Cruciferae. Erect panically branched glabrous annual or biennial herbs, adapted to outdoor use: lvs. long-petioled, rotundate, coarsely crenate; fls. in corymbose racemes, slender-peduncled, without bracts, white; sepals spreading, uniform at base: silique clavate, pressed or nearly terete, curved, leathery, 1-celled, 1-seeded.—Five species, Asia Minor and the Caucasus region.

clavata, Fenzl. Basal lvs. reniform-cordate, the upper nearly sessile: silique 2½ lines long by 1½ lines wide.
May. Asia Minor.

F. W. BARCLAY.

SOBRÁLIA (for Fr. Mart. Sobral, a Spanish botanist). Orchidaceae. Extremely handsome terrestrial orchids with a very distinct habit, some of them comparing well with cattleyas and helias in bloom.
SÓBRALIA

margin crenate. Guatemala. B.M. 7332. R.H. 1890:
with fls. about as large as S. macrantha, but plants of
more compact habit. Var. supérbis, Hort. Fls. deeply
shaded with deep cream-yellow; throat marked with
orange-brown.

BB. Lip fimbriate on margin; fls. less than 3 in. across.

4. frigens, Lindl. A small species with sts. about
1 ft. high: lvs. 1 or 2, oblong-lanceolate, 4—5 in. long:
fls. 2—3 on a long peduncle, about 2 in. long, pale sulfur-
yellow; sepal oblong, broad, petals similar but
crenate: middle lobe of the labellum fimbriate on the
margin and having many fimbriated cymbia. Colombia.
B.M. 4882.—One of the smallest of the genus.

AAA. Fls. chiefly purple or rose.

5. macrantha, Lindl. Fig. 3624. Sts. tufted, reed-
like, 4—7 ft. high, leafy all the way up: lvs. broadly lan-
ceolate 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; sepal linear-oblong,
4½ in. long, reflexed and twisted; petals broader,
oblong, wavy above; labellum 5 in. long, with the
earliest petals at the base and in the form of a cup,
and 2-lobed at the apex, very wavy; tube long, whitish within,
with a yellow stain in the throat and several thin yellow
1. O. 3:75. Var. Kienastiana, Hort., (var. albà) has
white lvs. Fls. 50:485—189:286. Fls. white, medium;
very large, creamy white. Var. nános, Hort. Fls. smaller
than type; lip dark violet-purple.

6. Brándtse, Krænzl. Sts. 3 ft. high: lvs. lanceolate,
acuminate, 8 in. long; fls. purple-rose, paler outside,
with the labellum darker and having a yellow disk;
sepal linear; petals twice as wide; middle lobe of the
labellum very broad, divided into 2 diverging, rather
acute lobes; anther—bed 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. Fenzlìána, Reichb. f. Sts. slender: sheaths black-
ish, asperulate: lvs. oblong, acuminate: fls. rose-colored;
sepal obtuse, acuminate; petals obovate—cuneate,
three—fourths as long as the sepal: labellum spreading, front
portion ovate, notched, crenulate; horns of the column
curved upward toward the anther. Nicaragua. Var. álba, Hort., has
pure white fls.

8. Hollofdii, Sander. Plants of dwarf habit: fls. rose-
carmine, deeper in the lip, shading to whitish in the
throat. Habitat not stated by Sander.

9. Cántleya, Reichb. f. St. stout: lvs. oblong, acumi-
inate, plaited, bearing several lateral clusters of strong,
thick lvs. of a fleshy 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.

10. Löwii, Rolfe. An imperfectly known species
intro. about 1892 from Colombia. It grows about 1½
ft. high and has fls. of a bright uniform purple.

SOIL

The soil is a superficial covering of the earth's
crust, more or less well adapted to the growth of plants.
It is usually only a few inches thick. Below this is a
subsoil often differing, especially in humid climates,
from the soil proper in color, texture, or chemical
composition. A very striking definition has been
suggested by Sir John B. Law, who considered the soil
to be rotten subsoil, and the subsoil rotting rock. The term
soil is occasionally used in a more comprehensive way
to include both the soil and the subsoil.

The soil adapted to the growth of the higher plants
consists of fragments of rocks or minerals, organic
matter, soil solution, and a soil atmosphere. The
mineral fragments vary in size from the finest clay
particles to gravel and even boulders. The organic
matter is derived from low organisms, from previous
vegetation, or from growing plants; as also from stable
manure, and occasionally fish or animal matter added
to the soil by man. The soil solution consists of water
carrying dissolved substances derived from the soil
and from the organic matter, as well as from
fertilizing materials artificially applied, and constitutes
a nutrient solution from which the plant derives its
mineral constituents. The soil atmosphere differs from
the ordinary atmosphere above the soil in being richer
in carbon dioxide and nitrogen, and containing more
wet vapor and less oxygen.

In origin there are two main classes of soils: sedimen-
tary soils, formed by the disintegration and decomposi-
tion of rocks in place; and transported soils, including
those of alluvial, glacial, and eolian origin. The word
alluvial is here used to include all water—transported
material; the term is, however, frequently used in
a more specific sense to indicate the recent flood deposit
of rivers.

Soils are classified according to their origin and their
mechanical and chemical composition and properties.
Genetically, they are classified according to the rock
from which they are derived, as granite soil, limestone;
or according to the manner of their origin, as alluvial,
lacustrine, or drift. Mechanically, they are classified
broadly into stony, gravelly, sandy, sandy loam, loam,
clay loam, clay, adobe, black—waxy, or according to
some other physical property; chemically, into calcare-
ous, humus, alkali, and according to other striking
classes or features. The soil survey of the United
States Department of Agriculture a local name is
adopted for each type under which the specific
classes are given; examples of this are Hartford sandy
loam, Norfolk sand, San Joaquin adobe.

The physical properties of soils concern the size and
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 other 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 much more soluble, especially when the lime is in the form of the sulfate 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-salt 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 great practical importance. There is a relation of crops to soil under extensive cultivation than upon horticultural crops either in the field or greenhouse, 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 character of crops in 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 carnations, violets, 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 that which allows 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 agency 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.

3625. How the gardener makes his soil, by letting it decay in piles. The larger pile is composed of sods.

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 of crops 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 of the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils in humid countries, 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 is 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, ferment, and the various organisms 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, when in a state soluble and actually dissolved, do not readily diffuse out into the solution between the soil-grains.
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 most soils, though 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 98 per cent of the material with which the plant body is built up in some cases, and only the remaining 2 per cent be strictly derived from the soil. Three important nutrient elements are nitrogen, phosphoric acid, and potash. In the air, these are four-fifths nitrogen, but in the soil 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, and 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 rejects 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 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, and so full that it is almost level with the 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 and used in a light, aerating soil. If the soil is sifted too finely 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 most valuable. Cuttings may be planted in the sand and other substances, which will aid in the young plants 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. Often 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 find the finest possible specimens in the smallest possible pots and space.

Edward J. Cannig.

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 150° 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, 1/4-inch pipe is used with 1/4-inch holes bored in a straight line about 1 foot apart. These pipes are buried in the beds 12 to 16 inches apart."
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 more than 400 pounds."

Remarking on the formaldehyde or formalin drench method, Selby and Humbert say, "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 gallon 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 pedicles solitary and thick; calyx long-tubular, 2-5-cleft at the top; corolla funnelform, the tube cylindrical, the throat oblique and broad-campanulate, lobes broad; stamens 5; ovary 2-celled: berry globose, pulpy.

—About 4 species. Trop. Amer.

Solanadas are attractive plants and their needs are simple. A warm greenhouse—one in which the temperature is never allowed to fall below 60°—will suit them very well in the eastern states. The plants would probably do well outdoors in Florida and the far South. They like 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 the spring, when the wood is ripening, a dry state is preferable for them. The soil that gives the most satisfactory results is good, somewhat sandy loam. It is unwise to disturb the roots of established plants more frequently than is absolutely necessary; the chief point in growing solanadas 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 slanting bottom heat. S. grandiflora is perhaps the best. The flowers do not last more than four or five 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.

longiflóra, Tussac (S. lutes, Hook.). Lvs. oblong-obovate or oblong, acute, petioles purple: fls. fragrant; corolla usually 1 ft. long, 3 times as long as the calyx, contracted at the throat, white or yellowish. B.M. 4345.

AA. Plant becoming 12–20 ft. high.

grandiflóra, 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. 21:273. Gn. 53:214. J.H. III. 34:123.

guttáta, Don. Shrub about 12 ft. high, erect, branched: lvs. alternate, petioled, elliptic-oblong, acute or very short-acuminate, entire, rather glabrous above, more or less pubescent beneath; corolla 6-angled, 3–6 cm. long; corolla 3-lobed, 5-angled, lobes crenate and undulate; 5 purple-brown ridges at the throat. Mex. B.R. 1551.

Hártwéggii, N. E. Br. Branched shrub: lvs. alternate, glabrous, elliptical, acute, short-acuminate or obtuse, base acute; fls. solitary, terminal, yellow, 8–9 in. across; calyx 5-angled, unequally 3–4-lobed; corolla glabrous, tube 5-ribbed, ribs green outside, brownish purple inside, lobes 5, more or less crisped and turned back. Mex. G.C. III. 49:383.

F. TRACY HUBBARD.†

SOLÁNUM (Lati, solamen, solace or quieting). Solanáceae, 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 capucium; also medicinal plants.

Leaves alternate: infl. mostly symподial and therefore superaxillary or opposite the lvs.: corolla gamopetalous and rotate or shallow-campanulate, plaited in the bud, the limb angled or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated and connivent and mostly opening by an apical pore or slit; ovary usually 2-loculed, ripening into a berry which is sometimes incised in the persistent calyx; fls. white, purple or yellow.—Dunal, the latest monographer (DC. Prodr. 13, pt. 1), in 1852, recognized 901 species, and many species have been discovered since that time, the number now being estimated at about 1,200. Many new species have been described by botanists in various volumes of Fedde, Rep. Nov. Sp. Reg. Veget. The genus finds its greatest extension in Trop. Amer. Of the vast number of species, barely 25 are of much account horticulturally, and half that number will comprise all the species that are popularly well known. One of these is the potato. Solanum tuberosum, one of the leading food plants of the human race. The genus seems to abound in plants with toxic properties, although its bad reputation in this respect is probably exaggerated. The species are herbs in temperate climates, but in warm countries many of them are shrubby and some are small trees. Many of them are climbers. It is impractical to list all the species of the genus, as they are distributed into the various botanical groups of a great genus, and the following species are therefore assembled mainly on a
SOLANUM


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S. aculeatissimum, 22.
S. alatum, 27.
S. album, 36.
S. annulare, 12.
S. azoricum, 36.
S. bulbifer, 24.
S. boreale, 3.
S. burbankii, 9.
S. cayennense, 21.
S. caespitosum, 16.
S. ciliatum, 22.
S. citrifolium, 23.
S. cocineum, 25.
S. commersonii, 8.
S. cordatum, 21.
S. crassipes, 15.
S. demissum, 4.
S. depressum, 11.
S. dulcamara, 15.
S. esculentum, 11.
S. etuberosum, 6.
S. fendleri, 2.
S. fondataeanum, 25.
S. glaucophyllum, 13.

*glaucescens*, 22.
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hebrodum, 23.
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*S. insignis*, 11.
*insignis*, 25.
Jamesii, 7.
*jasminifolium*, 17.
*jasminifolium*, 39.
*jasminoides*, 35.
*jamacateum*, 25.
*lobelii*, 28.
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*margaritatum*, 30.
*margaritatum*, 20.
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*urumiae*, 10.

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*nigrum*, 9.
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*pedicellatum*, 40.
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*ramontelli*, 17.
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*Seassothianum*, 36.
sinembres, 24.
Torreyi, 32.
tuberosum, 1, 3.
*unbellefleur*, 21.
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Waracee, 26.
waracoeonoides, 26.
*Weatherillii*, 14.
*Wengeri*, 27.
*Worsleyi*, 41.
*Xanti*, 19.

A. Species bearing underground tubers (except *No. 6*): les. pinnate.

B. Corolla not deeply lobed.

1. *tuberosum*, Linn. POTATO. Figs. 3628, also 3152, 3153, Vol. V. Low, weak-stemmed, much-branched perennial with tender, herbaceous tops, and perpetuating itself asexually by means of thickened or tuberous underground st., glabrous or pubescent-hirsute: lvs. unequally pinnate, the 5-9 obovate-oblate lfts. interspersed with much smaller ones; fls. various in color, white purple, various shades of purple, and yellow, in long-stemmed dichotomous clusters: fr. a globular berry ½-1 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. *Maglia*, Schlecht. D ARWIN POTATO. Rough-hairy branched perennial, with angled more or less winged st., at least near the insertion of the lvs.: lvs. unequally pinnate, the terminal lift. 4 in. long, the lateral ones 2-3 pairs, elliptical, unequal at the base, acute at the apex, the interspersed lift. very small or sometimes wanting entirely: fls. in dichotomous clusters, 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. Infrequent 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 4 in. long, dark purplish, both 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. *Fendleri*, Gray (S. tuberosum var. boreale, Gray). Herbaceous perennial with st. about 18 in. high, angular, and foliage somewhat resembling the common potato: lvs. 4-5½ in. long, with 1-2 pairs of short-stalked lateral lfts., these 1½-1¾ in. long, the terminal lift. somewhat larger, broadly ovate and abruptly rounded or subcordate at the base, acute at the apex, interspersed lfts. very few, all pubescent on both surfaces with scattered hairs: fls. violet, the pedicels ¼-¼ in. long; calyx-lobes about 1 line long, ovate, short-acuminate; corolla about ¾-1 in. diam., the lobes pubescent without. New Mex.

3628. Tuber of potato.—*Solanum tuberosum*. (×¼)

and probably also W. Texas, but apparently very infrequent.—The species has nothing to do with the potato and is much less frequent than the following.

4. *demissum*, Lindl. St., both surfaces of the lvs., pedicels, and calyx pubescent with flattened hairs: lvs. 4-6 in. long with 2-3 pairs of mostly oval lateral lfts., the upper pair sometimes deciduous with the rachis, terminal lfts. much larger than the lateral ones, obovate or oval, interspersed lfts. few: fls. appearing when the plant is quite small and continuing to bloom for some time; calyx-lobes shorter than or only equaling the tube, ovate, slightly acuminate; corolla violet, ½-3/4 in. diam.: fr. ovoid or globose-ovoid: tubers an inch or more in diam. New Mex., Ariz. and N. Mex.—Apparently not infrequent.

5. *edinense*, Berthault. Sts. angled, rather strongly villous: lvs. unequally pinnate, the segms. unequal at the base, pubescent on both surfaces: calyx rather densely hairy with flattened hairs; corolla purple: fr. globose or slightly ovoid.—The tubers are white in the skin and flesh and after 20 years of garden cult. are reported to average 1½ in. diam. For several years this species was confused with *S. etuberosum* which apparently does not produce tubers, and from which it may easily be distinguished by the hairy calyx and larger fl.-segms. Original locality probably Chile.

6. *etuberosum*, Lindl. Sts. 1-2 ft. high, angled: lvs. rather densely short-pubescent: pedicels about ¾ in. long, glabrous but peduncle pubescent: calyx-lobes nearly or quite glabrous, short-ovate, and abruptly contracted to a short acute point; corolla large, deep purple with a yellowish base. Not known to produce tubers, but may be multiplied by dividing its stout underground sts. and also grown from seed. Chile. B.R. 1712.

BB. Corolla deeply lobed.

7. *Jamesii*, Torr. Low and slender, 12-18 in. tall under cult., the small angular branches glabrous or soon becoming so: lvs. oblong in general outline, the rachis narrow-winged, the lfts. 5-9, with no interspersed small ones, small and lanceolate-oblong in shape: lfs. small, white, the corolla deeply cleft and the stamens long and prominent: tubers few, globular, hard, 1 in. or less in diam., withstanding frost. Mountains of Colo., New Mex., Ariz. and Mex. B.M. 6766.—Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

8. *Commeroni*, Dun. Sts. angled, sparingly pubescent or glabrate: lvs. pubescent, strongly so on the lower surface, or sometimes nearly glabrous, mostly 4-5 in. long with 2-4 pairs of lfts., the lfts. oval or slightly
SOLANUM

SOLANUM
pies
widely
freely
plant
corolla
sinuate-toothed,
catum;
the
with
common
so
apex,
3182
3629.
line
French.
5:
In
the
usually
grown
warm
climates,
and
suppl.
sparingly
Dakotas,
weed
or
Ifts.
Solanum
the
or
or
Solanum
muri-
guineense,
S.
GINE.
“huckleberry”
(Fig.
This
form
is
cult.
and
the
fr.
used
for
pots
preserves.
Another
form,
S.
Burbanki,
“garden
huckleberry”
and
S.
villosum
the
Pacific
coast.
In
some
characters
it
appears
to
be
intermediate
between
its
supposed
parents,
and
it
is
used
as
is
the
former.
10.
muri-
catum,
Ait.
(S.
guatemalense,
Hort.)
PEPINO,
MELON
PEAR,
MELON
SHRUB.
Fig.
3629.
An
erect
spineless
bushy
herb
or
subshrub
2–3
ft.
high,
the
branched
often
with
rough
wart-like
excrescences,
and
usually
glabrous
or
narrowed
so:
frs.
entire
with
slightly
undulate
margins,
are
oblong-lanceolate,
or
ovate,
tapering
to
the
more
or
less
margined
petiole
and
also
thereby
the
more
or
less
obtuse
or
sometimes
acute
apex,
the
surface
sparingly
soft-pubescent:
frs.
in
a
long-stalked
cluster,
rather
small,
the
corolla
blue,
deeply
5-lobed,
puberulent
on
the
outer
surface,
inclined
or
nodding:
fr.
ovoideal
or
glazed-shaped,
long-
stalked,
dropping,
yellow
overlaid
with
splashes
of
violet-purple,
4–6
in.
long
when
cult.,
flesh
yellow
and
seedless
under
cult.
Said
to
be
native
of
Peru
and
cult.
in
other
parts
of
Tropical
countries,
and
at
temperate
elevations.
G.F.
5:173.
G.C.
III.
3:309.
This
plant
at-
ttracted
some
attention
in
this
country
around
25
years
ago.
It
appears
to
have
been
intro.
to
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.
This
is
a
little
laborious.

11.
MELONGENA,
Linn.
(S.
insanus,
Linn.),
Erect
and
much-branched
herb
or
subshrub,
2–3
ft.
tall,
waxy
or
scurfy,
spiny:
frs.
large
and
heavy,
and
the
corolla
large,
mostly
in
clusters,
the
calyx
waxy
and
often
spiny,
the
spreading,
deeply
lobed,
purplish
or
greenish
1
in.
or
more
across
fr.
or
larger.
In
Afr.
and
S.
Asia.
Original
habitat
probably
S.
W.
Asia.

VAR.
ESCOLENTUM,
Nees
(S.
esculentum
and
S.
ovigerum,
Dun.)
COMMON
EGGPLANT.
GUINEA
SQUASH.
ASTER-
GINE.
Figs.
1379–1381,
1383,
Vol.
II.
Cult.
for
its
large
frs.,
which
are
usually
oblong,
obovoid,
or
egg-
shape
in
form,
and
purple,
white,
yellowish
or
striped:
differs
from
the
wild
plant
in
having
fewer
spines,
mostly
solitary
frs.,
and
much
larger
and
more
variable
frs.
There
are
2
and
3
seeded
cult.
varieties.

PENTINUM,
Bailey.
SNAKE
EGGPLANT.
Fr.
greatly
eloni-
gated
and
curved
at
the
end.
VAR.
DEPRASSUM,
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:
frs.
small
and
relatively
thin,
less
lobed;
fr.
small
and
longer-stalked:
fr.
purple,
pyriform.
See
EGGPLANT.
SOLANUM

3630. Solanum Pseudo-capsicum. (X½)

DD. Foliage more or less pubescent, at least on the lower surface (except in No. 15).

E. Fls. small, less than ½ in. diam., white.

14. Pseudo-capsicum, Linn. 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 glabrous and somewhat glaucous: lvs. in terminal and lateral branched racemes or corymbs; corolla blue, star-shaped, about 1 in. diam., throat pubescent; frs. small, yellow, ovate-globose, yellow. Province of Buenos Aires in Argentina, and in S. Brazil. B.M. 7945.

15. Héndersonii, 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 Héndersonii, 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, ovate, oblanceolate, or sometimes ovate, narrowed toward the petiole, 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. Brazil and Uruguay. F.S. 12:1242. G.W. 3:329.—Frequent greenhouse and window-plant. Var. Mélvinii, Hort., a compact form 12–15 in. high with ovoid berries. Var. variegánum, Hort., has variegated lvs.

EE. Fls. usually ½ in. or more diam., violet or rarely white in No. 22.

17. Rantonnetii, Cup. (incorrectly spelled S. Rantonnei, Rantonnetia, etc.) (S. maticum, N. E. Br. S. japonicum, Hort.). An erect bushy grayish green half-shrub, growing 3–5 ft. high, the st. marked with raised lines decurrent from the petioles: lvs. entire, lanceolate or ovate-lanceolate, narrowed to the petiole, mostly acute at the apex, glabrous or inconspicuously pubescent on the upper surface, pubescent with short hairs below; the axils, 1 in. or more diam.; calyx-lobes with an abrupt linear point, corolla violet with a light yellow center: the red fr. 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. Gt. 43:1401.—An excellent plant for blooming in the open in summer. Easily prop. by means of cuttings.

18. crispinum, 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. 3–4 in. long, entire, thin, ovate to ovate-lanceolate, subacute at the base, acute at the apex, smooth above, the margins somewhat marked on lower surface: corymb many-flowered, corolla pale violet, about ½ in. broad and twice as long as the calyx, the lobes ovate or ovate-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. 30:429. 161. 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 ones angled, somewhat villos with many-celled usually gland-tipped simple hairs: lvs. membranous, ovate, ovate-oblong to oblong-lanceolate, ½–1¼ in. long, wedge-shaped, rounded or subcordate 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. densely villous with long many-celled tawny viscid hairs: lvs. rather thick, usually less densely hairy than the sts., the lower rather large, ovate to the upper ovate, rounded or subcordate at the base: fls. in rather large forked cymes, corolla 1–1⅔ in. diam., pale violet; ripe fr. dark purple. Islands off the coast of Calif.,

21. *umbelliferum*, Esch. (*S. californicum*, Dun.). A densely villous rarely glabrate shrub: lvs. entire, usually obovate or oblong, rarely oval or ovate, \( \frac{3}{2} - 2 \) in. long; fls. in umbel-like terminal clusters; corolla pale violet or sometimes white, pubescent out the outer surface, \( \frac{1}{2} \) in. diam., showy and fragrant; berry large, purple. Calif.—The plant offered as *S. umbellatum* is very likely this species.

**cc. Plant more or less spiny, the lvs. sinuate or lobed.**

**d. Lvs. pinnately lobed.**

**e. Species perennial.**

22. *aculeatissimum*, Jacq. (*S. clittaturn*, 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 petiole; 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. 1871:321. R.B. 20, p. 249. R.H. 1888, p. 78.

**ee. Species annual.**

23. *citrullifolium*, A. Br. (*S. heterodexam*, Brit., not Dun.). An annual plant armed with straight prickles, glandular pubescent with mostly simple hairs: lvs. 1-2-pinnatifid, the lobes obtuse and repand: infl. racemose, corolla violet, nearly 1 1/2 in. diam., somewhat irregularly 5-cleft, the lobes ovate-acuminate, anthers unequal, 4 of them yellow, the larger one tinged with violet: fr. inclosed in the prickly calyx. W. Texas and New Mex.

24. *sisymbriifolium*, Lam. (*S. Baibisi*, Dun.). An annual plant with many yellow- or orange-colored spines covering the st., both surfaces of the lvs., petioles, and sepals, and the upper part usually somewhat villous with gland-tipped hairs; lvs. oblong or ovate, sinuate or deeply 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. 2933; 3054. C.C. III. 4354.

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 both surfaces, that on the lower stellate: fls. terminal, in clusters of 3 or 4, corolla yellow, about 1 1/4 in. diam., veined on the outside, anthers uneven, the fifth 1/2-3/4 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.**

**e. The lvs. rusty-tomentose at least on the lower surface.**

26. *Warscewiczii*, Hort. (*S. warscewiczoides*, 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 at the base, pubescent at least along the veins above, greenish or rusty below and with dense stellate pubescence or tomentum, oval, 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 sepalae oval and long-acuminate, spiny or unarmed, covered with numerous whitish hairs; corolla acut, upper surface green and tomentose-velvety, woolly with more or less rusty 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. 1865, p. 250; 1896, p. 236.—Bold species, useful for subtropical gardening.

**ee. The lvs. with gray or whitish pubescence.**

**ff. Fls. white.**

28. *integrifolium*, Poir. (*S. cocineum*, Hort. *S. Lobeltii*, Tenore). CHINESE SCARLET EGGPLANT. ORNAMENTAL EGGPLANT. ETHIOPIAN EGGPLANT. Fig. 3632. Solanum integrifolium.—A species grown for its ornamental fruit. (X4)
3632. Coarse, bushy herb, 3 ft. tall, seamy-tomentose, armed with strong hooked spines: lvs. much like those of the eggplant but the lobes shorter, spiny on the midrib and petiole: lvs. small, white, in clusters of 2-6: fr. 1-2 in. across, mostly flattened on the ends but sometimes nearly globular in outline, prominently lobed, bright-scarlet or yellow. Probably African.—An old-time garden plant, but little grown. Annual.

29. marginatum, Linn. f. A shrub 3-4 ft. high: st. terete, covered with white stellate tomentum: spines subulate, those on the upper part 3/4-3 in. long, on older parts 1 in. long: lvs. ovate, pinnately lobed less than half-way to the midrib or the upper ones undulate lobed, subcordate at the base, coriaceous, 3-7 in. long, 2-5 in. wide, covered with fine white stellate pubescence which in age disappears from the upper surface except near the margin, remaining silvery white beneath; spines on the principal veins often 1 in. long; cymes extra-axillary, subumbellate; pedicels covered with white stellate tomentum: calyx spiny, the lobes narrow and acute, corolla broadly campanulate, 1/4 in. diam., white with the center and midrib bluish: fr. globose, 1/4 in. diam., spiny, shining yellow and drooping. Nile Land, Abyssinia. Naturalized to a slight extent at Montecito near Santa Barbara, Calif. B.M. 1928.

FF. Fls. blue or violet.

g. Size of lvs. large, 10-15 in. long.

30. macranthum, Dun. (S. maroniense, Poit.). A shrub 6 ft. or more high, with yellowish brown straight prickles: lvs. 10-15 in. long, narrowed at the base to short winged petioles or sometimes subcordate, ovate, lanceolate or lanceolate-elliptic, sinuate-angled or lobed, pale on the lower surface with stellate pubescence, dense on the younger lvs.: fls. in simple or branched racemes 3-5 in. long and 7-12-ftd.; corolla blue, 1/2-2/3 in. diam., the lobes acute. Brazil. B.M. 4138.

31. macrophyllum, Hort. An erect more or less stellate pubescent plant with curved spines: lvs. large, a foot or more long, unequal at the subcordate base, sinuate-lobed, the lobes oblong-lanceolate, acute, repand-undulate, petioles about 1 in. long, decurrent with the st.: infl. racemose; calyx-lobes with a long attenuate point; corolla large, blue, marked with yellow in the center: berry globose, yellowish, about 3/4 in. diam. Mex. G. 2:283.

gg. Size of lvs. smaller, 5-7 in. long.

32. Törreyi, Gray. Strong perennial herb, with close grayish stellate pubescence, prickles small and few along the st. and midribs of the lvs. or sometimes nearly wanting: lvs. 4-6 in. long, ovate with truncate or slightly cordate base, sinuate 5-7-lobed, the lobes entire or undulate, obtuse, unarm'd: infl. at first terminal, cymose, 2-3-ftd.; lvs. of the calyx short-ovate with an acuminate point; corolla 1/2-2 in. diam., pale blue, the lobes broadly ovate: fr. globose, smooth, 1 in. diam., pale yellow at maturity. Kans. to S. Texas. B. & A. 6461.—It survives the winters at Cambridge, Mass., and spreads by running underground shoots.

33. pyracanthum, Jacq. An erect spiny plant with woody st. 3 ft. tall: lvs. 5-6 in. long, short-petioled, oblong, acute, deeply lobed and the lobes oblong, entire, obtuse, tomentose, spiny along the midvein: lvs. numerous, in lateral racemes sometimes 6 in. long; corolla blue: fr. globose, glabrous, nearly 3/4 in. diam. Probably A. Hooker, Schoenbr., A. 9:36. t. 470.

34. indicum, Linn. A multi-branched prickly undershrub sometimes reaching a height of 8 ft., densely clothed when young with stellate tomentum, the prickles compressed, stout, and sometimes recurved: lvs. ovate, sinuate or lobed, 3-6 in. long and 1-4 in. broad, stellate woolly beneath and prickly along the nerves: racemes lateral, many-ftd.; fls. blue, calyx-lobes in fl. triangular, acute, very woolly, unarm'd, or with slender straight spines, these becoming stronger in fr., corolla 3/4-1 in. diam., lobes broadly triangular, tomentose without, less so within: berry yellow or scarlet, glabrous, about 3/4 in. diam. Very common in Trop. India and China, Malaya, and the Philippines. Doubtfully in the American trade.

BB. Habit of plant climbing, more or less woody, spineless (except No. 33).

c. Foliage entirely glabrous.

35. 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.: racemes short and united into a cluster 3 in. or less long and about 8-12-ftd.; fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. Amer. P. M. 8:5. B.R. 33:33. Gn. 43, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 53, p. 28. —A most useful deciduous climber for the coolhouse, 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. Gnp. 1:259. Var. variagatum, Hort., has variegated foliage.

36. Seaforthiænum, Andr. (S. azureum, Hort., not Fern. S. vendatum, Kunth). Beautiful slender unarm'd herbaceous or slightly woody climber or trailer, with st. 3-4 ft. long, glabrous throughout: lvs. with 3 lfts., these 1 1/2-2 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. 1982; 5823. B.R. 969. R.H. 1893, p. 177; 1897:424.—A very beautiful plant for the coolhouse. Begins to bloom when very young. Var. album, Hort., a variety with white fls. recently intro.

37. Wendlandii, Hook. f. (S. Wendlandii magnificum, Hort.). Fig. 3633. Tall-climbing, glabrous, with a few scattered prickles: lvs. various, sometimes 10 in. long, the uppermost simple and oblong-acuminate, 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 2 1/2 in. across and shallow-lobed: fr. globose. Costa Rica. B.M. 6914. G.C. III. 14:339.
SOLANUM

SOLANDERIA

G.M. 36:610. 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 Brauntvon writes: "S. Wendlandii is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbo 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 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 gross feeder. It should be in full sun, though it does well anywhere."

cc. Foliage usually more or less pubescent, sometimes glabrous or glabrate.

3634. Solanum dulcamara, Linn. Bitter-sweet. Fig. 3634. A more or less pubescent shrub climber with st. 4-6 ft. long: lvs. entire or sometimes 3-5-petated, 1-3 in. long, the entire ones corate, ovate-cordate, or the upper ones hastate: fls. many, in corymb, in panied corymbs opposite the lvs.; corolla white or violet, ½ in. diam., the lobes reflexed, each segm. furnished with 2 green spots near the base: fr. ovoid, ½ in. diam., red or rarely yellowish green. Naturalized from Eu.—Berries poisonous.

39. jasminiföllum, Sendt. St. round, unarmed, sparingly pubescent or glabrate: lvs. ovate to ovate-lanceolate, entire or very slightly undulate, usually subcordate at the base, acute or obtuse at the apex, petiole ½-1 in. long, the blade 1-2 in. long: fls. several in a paniculate cluster; calyx campanulate, the lobes about equaling the tube, oblong and obtuse; corolla about ¾ in. across, deeply lobed, the lobes ovate or oval. Brazil.

40. pensile, Sendt. A woody climber, more tender than the last: lvs. ovate or subcordate above with branched hairs, more densely so and 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. Wörzley, 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 unripe stage the frs. are said to be prepared and used as a vegetable. G.C. III. 27:19.

S. aureolatum, Ait., is allied to S. verbascifolium, and is sometimes mistaken for it. Lvs. 6-7 in. long, ovate-oblong, acuminate, entire, velvety-top above with branched hairs, more densely so and paler below, axis furnished with small lvs.: corymbs subterminal and axillaries: corolla violet, about ½ in. across: berry globose. Afr.—S. betacissum, Cav., is Cyphomandra, for which see Vol. II.—S. cerasoides, Velloz. Shrub or small tree, with cyphomandra-like leaves and the waxy chaffy barked wood, white or yellowish, fr. globose, hairy, included in the calyx. S. Brasil. B.M. 7491.—S. Omsersoni, "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. corymbosum, Jacq. A feathery lobed unarmed, branched half-shrub: lvs. 2-5 in. long, glabrous except for the ciliate margins, ovate or lanceolate, entire or slightly lobed: fls. about ½ in. diam. blue or violet: fr. reddish orange, about 3 in. diam. Native of Peru.—S. ericoidum in Cyphomandra betaceaum.—S. Piafriquin, Pall. & Bois, has fr. the size of a walnut shaped like a tomato, scarlet.—S. solanifolium, Schlecht. & Bouché. Tuber-bearing: lvs. with 3-4 pairs of pinnae, the interposed ones very numerous: fls. 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 white.—S. tuba- gineae and S. Douradiformum said to be graft hybrids of Lyconropicum esculentum and S. nigrum produced by Prof. Winkler of Tangayika. C.C. III. 150. 101.—S. verbascifolium, Linn. Lvs. lanceolate-ovate, or ovate-oblong, entire, tomentose, without smaller lvs. in the axil: fr. rather small, white: fr. the size of a small cherry. Widely distributed in the tropics. W. F. Wight.

SOLDANELLA (Latin, a small coin, referring to the shape of the leaves). Primulaceae. Small glabrous perennial herbs with short rhizomes, hardy and useful in the border or rock-garden.

Leaves long-petioled, thick, cordate-orbicular or reniform, entire: scapes slender, solitary or few, 1-fld. or many-fl., umbellate: fls. blue, violet, or rose, rarely white, nodding, about ½-¾ in. across: calyx 5-parted, segments lanceolate, persistent: corolla hypogynous, funnelform-campanulate, 4-lobed to the middle, the lobes lancinate-lacerate; ovary superior, ovoid: caps. conic-oblong, many-seeded.—Species, 6, mountains of Eu. For account of species and cult., see Gn. 61, pp. 126, 127; for monograph, Paxt. & Knuth in Das Pflanzenreich, hft. 22 (IV. 257).

SOLDANELLES are among the most famous flowers of the Alps, though not the commonest, S. alpina ascends the mountains to the line of perpetual snow. Grant Allen, in "Flashlights on Nature," declares that the flower of solidanella 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.

A. Fls. 2-4 on a scape; corolla split half-way to the base; filaments half as long as anthers.

b. Pedicels pubescent.


B. Pedicels roughish.

Alpina, Linn. (S. Clituei, F.W. Schmidt. S. occiden-
talis, Viehr.). Fig. 3635. Sts. 3-6 in. high: lvs. round-
ish; base more or less kidney-shaped; margin entire or some-

Natural hybrids are known of which this species is one of the par-
ents. Pyrenees, Alps, etc. Hand- some species.

3635. Solidanella alpina. (X¾)
CV. Solidago ulmifolia, one of the common goldenrods.
SOLIDAGO

AA. Fls. solitary; corolla split a third of the way to the base; filaments about as long as anthers.

b. Pedicels roughish.

pusilla, Baumg. Sta. 3-6 in. high; base of lvs. heart-shaped or kidney-shaped; margin somewhat wavy; fls. copper-colored, verging on blue, the fringes straight, not spreading. May. Gn. 61, p. 126. Var. alba, Hort., is a white-fld. form. G.C. III. 55:224. Gn. 78, p. 172.

BB. Pedicels pubescent.

minima, Hoppe. Sta. 3-4 in. high; lvs. roundish; fls. pale lilac, streaked purple inside; the fringes spreading at the tips. June, July. Gn. 61, p. 126. Var. alba, Hort., is a white-fld. form. S. Gündert, Huter, is a hybrid of S. alpina and S. minima. WILHELM MILLER.

F. TRACY HUBBARD.

SÔLEA: Hybanthus.

SOLENANThUS (Greek, tube and flower, referring to the form of the corolla). Boraginaceæ. 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-fld., and numerous in terminal panicles; fls. blue or rose; calyx 5-parted, segms. narrow; corolla tubular or funnelform, 5-lobed, the lobes small, obtuse; ovary 4-lobed, distinct; nutlets 4, depressed.—About 20 species. S. Eu., W. Asia, and Russia.

apenninus, Hohen. (Cymoglossum 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, panied racemes. May, June. S. Eu.—A useful plant among shrubbery or in the back part of borders. Prop. by division or seed.

SOLENIDiUM (Greek, tube, and appearance, in allusion to the shape of the fl.). Orchidaceæ. Epiphytic herbs with abbreviated sts. terminated by 1-2-lvd. pseudobulbs, occasionally grown in the greenhouse; lvs. rather long, thin-leathery: scape simple, axillary from below the pseudobulb: fls. in a lax raceme, medium-sized and long-pedicelled; bracts small; sepals subequal, free, spreading; petals similar to the sepals; labellum spreading at the base of the column, contracted to a long claw, dilated at the tip, undivided; column erect, broadly 2-winged, the wings spreading above into auricles and united with the membranaceous variously toothed or lobed cilia-strandrum; pollinia 2: caps. not known.—One species in the Colombian Andes, S. racemosum, Lindl. About 6 in. high; st. shortened; lvs. rather long, ensiform, thinly coriaceous, narrowed at the base; fls. yellow, spotted with red; sepals and petals free. NOV. J.F. 4:349. Cult. like onicium.

F. TRACY HUBBARD.

SOLENOSTEMON (Greek, tube and thread, referring to the fact that the filaments are grown together, at their base, into a tube). Labiate. Erect herbs allied to Coleus, probably similarly used; lvs. ovate, crenate, long-petioled: whorls of fls. laxly 6- to many-fld., arranged in long racemes or panicles: fls. small; calyx ovoid-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-lipped, 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.

Godefroya, N. E. Br. (Coleus Godefroya, 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-lipped; 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 whithish) heads in spikes, thyrsees, 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
in Eu. and N. Asia, making, altogether, perhaps 130 species. A very few of the important species may be described here; for others, the current botanical manuals should be consulted.

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. They present few difficulties in cultivation. They may be transplanted from the wild with the greatest ease, and the stools may be lifted and divided as soon as they become root-bound and show signs of failing. 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:

with a background of sumac, the autumnal colors of which are beautifully harmonized by the blues and purples of the asters and the yellows and cream-yellows of the goldenrods.

A. Heads in small axillary clusters, not usually in large terminal infr.

Cea, Linn. Wreath Goldenrod. Fig. 3636. A smooth slender perennial, often glaucous, simple or sometimes branched: lvs. stalkless, acuminate, the base narrowed, sharply toothed, 2½-3½ 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.

AA. Heads in a large terminal infr, which is not composed of 1-sided clusters of fls. (secund).

B. Les. serrate.

Spydosa, Nutt. Fig. 3637. Stout, smooth, usually simple-stemmed perennial, smooth below, often rough above: lvs. glabrous, firm, the basal 3–6 in. long and ½–1½ in. wide, diminishing in size above, crenate, pinnately veined: heads in a large showy terminal thrusys, the branches of which are ascending and often leafy; bracts of the involucrum oblong, very blunt. Rich soil, E. N. Amer. A.G. 13:583. G.F. 3:561 (adapted in Fig. 3637).—Excellent for half-shady border.

BB. Les. entire or essentially so.

Virgarea, Linn. European Goldenrod. A rough simple-stemmed but stout perennial 1–3 ft. high; basal lvs. 4–7 in. long, 2½ in. wide, obtuse or acute; upper lvs. sessile or narrowed into margined petioles: fls. in a dense terminal, rather narrow and often interrupted thrusys which is often 8–10 in. long: bracts of the involucrum acute or acutish. E. G. 27:7.—One of the best garden plants of the group. A prostrate form is offered. S. cåmbria, Huds., is a compact and dwarf form, 6 in. or less high, with larger heads. S. Virgarea is represented in the U. S. by S. Cåller, Fern. (S. Virgarea 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.

3638. Solidago canadensis.

3639. Solidago nemoralis.

3640. Solidago rugosa.

AAA. Heads in a terminal infr., usually a panicle, which is composed of 1-sided branches or clusters (secund).

B. Foliage fragrant; lvs. pinnately veined.


BB. Foliage not fragrant; lvs. triple-nerved, with a pair of lateral veins beside the midrib.

C. Lower lvs. lanceolate, sharply serrate.

Canadensis, Linn. Fig. 3638. St. 3–5 ft., stout, hairy and usually much branched: lvs. acute at each end, the lower sharply serrate, lanceolate, 3–7 in. long, ½–1½ in. wide, the upper smaller and often entire: fls. in a very large terminal secund panicle, involucral bracts linear, obtuse or acutish. In dry soil, E. N. Amer.—There are many wild forms but none seems to be in the trade. Aug.–Nov. This is a coarse and somewhat weedy species; very common.
SOLIDAGO

cc. Lower lvs. oblanceolate, merely crenate or entire.

dermorilis, Ait. Fig. 3639. St. slender, hairy, 18-24 in. tall: lvs. thick, roughish, the lower petioled, oblanceolate, crenate; upper lvs. becoming smaller, linear-oblong, acutish and entire: fls. in a 1-sided panicle, not very large or showy; bracts of the involucre linear-oblong, obtuse. In dry open places, E. N. Amer.—Aug.—Oct. Good for the sunny border and the fls. usually very persistent.

BBB. Foliage not fragrant; lvs. pinnate-tined, rough.

rugosa, Mill. Fig. 3640. Stout erect mostly stiff plant, to 7 ft., hairy: lvs. crowded above, lanceolate to ovate-lanceolate, sharply serrate, more or less rugose: heads in a broad pyramidal panicle, closely arranged on one side of the curving branches. Canada and U. S.

Any number of Solidagos may be offered in lists, but they are scarcely trade commodities. S. Balscley, Torr. & Gray, N. C. to which kindergarten is to 2 or 3 ft. high, with ovate-oblong to oblong-lanceolate lvs., and heads in a loose and elongated thyrse; the name is listed abroad, the plant said to be "suitable for rock-gardens, latter summer-flowering, yellow, 1 ft. — S. flexuosa, S. giganetis, S. lasiophylla, are also listed, but the writers do not know what plants pass under these names in cult. — S. sempervirens, Linn. A maritime feathery-lvd. smooth plant, tall and stout, 2-4 ft. and more: lvs. entire, lanceolate to lance-oblong: heads in short racemes white, petals dispensed in a panicle. Atlantic seaside of the U. S. — S. spectabilis, Gray. Plant 1-2½ ft. tall: lvs. lanceolate to linear, the lower oblong or more or less spatulate and sparingly serrate: heads golden yellow, numerous and crowded in a thyrse. Nov. to Calif.

L. H. B.

N. TAYLOR.


Leaves narrow, entire or rarely sinuate: fls. nodding, at the ends of the branches, in lax, few-flld. cymes or rarely 1-flld., blue; sepals small, distinct, petals obovate, spreading from the base; anthers convoluted in a cone around the ovary; ovary subsessile, perfectly 2-celled: berry oblong, indehiscent.—About 3 species, Austral. Prop. by cuttings in sand under glass, or by seeds, which germinate readily.

heterophylla, Lindl. AUSTRALIAN BLUEBELL CREEPER.

Fig. 3641. Small shrub, 2-6 ft. high, with slender, twining stems: lvs. variable, from lanceolate or oblong-linear to ovate-lanceolate, or ovate-oblong, obtuse or slightly acuminate, entire, 1-2 in. long, usually narrowed into short petioles: cymes 4-8-12-flld., terminal or subaxillary: fls. bright blue, ½-3½-in. long. July. B.M. 3253. B.H. 21-22—3. B.R. 1466—3. A species of much cult. in Cent. Calif. and a great favorite on account of the brilliant blue of its lvs. Especially valuable for covering banks, rockwork, and low fences, preferring to scramble over other plants. Also grown as an herbaceous border plant, being kept within bounds by the shears. The roots are very attractive to the California pocket-gopher, who plucks and savages it with if not watched. Sometimes seen in greenhouses.

parviflora, Turez. Much more slender and twining than S. heterophylla, usually loosely soft-hairy: lvs. lanceolate or oblong-linear, the larger about 1 in. long, very short-petioled and thinner than the preceding: fls. small, solitary, 1-2-3 in a cyme; pedicels filiform: berry ½-3½-in. long, tapering at both ends. A. H. 3-2. A. H. 3-4—3.

Drummondii, Morr. St. weak, flexuous-twing to the left, prostrate, pubescent: lvs. alternate, linear-lanceolate, both ends acute, scarcely petiolated, nerves plose: cymes 2-flld. or the fls. solitary, terminal; peduncles rather glabrous: fl. nodding; sepals linear, villous. Austral. B.H. 4-5—3.

F. TRACY HUBBARD.

SONCHUS (the Greek name). Compositae. 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-tipped, or else pinnatifid and laciniate, more or less pricky-margined: heads homogamous and ligulate, yellow-flld., with more or less imbricated involucral bracts, becoming thickened or tumid at base, corolline 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. arbores c. laciniatus described as a "magnificent foliage plant with laciniated lvs.," is probably a form of S. pinifolius, Ait., 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. Calif. as S. Jaequina, is probably S. conglesi, Wild., described as a beautiful foliage plant with long and broad crowded recurved oblong lvs. more or less pinnatifid lvs. (1 ft. or less long and 2-3-in. wide, and showy pinnules of yellow heads 2-3 in. across; Canary Isls., where it is known as pastor's lettuce (lachua de pastor), perhaps in reference to its showiness and velvety appearance of the lvs. for salad. The lvs. of other species of Sonchus are said sometimes to be similarly used. The names S. elegantissimus and S. laciniatus sometimes appear in horticultural literature, representing ornamental plants with much-dviolied lvs., the segms., very narrow; they are probably forms of Canary or Madeira species.

L. H. B.

SOLERILA (adapted from a native name). Syn., Cenecistea, Melastomaceae. Herbs or small shrubs of various habit, with ornamental foliage, suitable for the greenhouse.

Leaves similar or dimorphous, often membranaceous, entire or serrulate, 3-5-nerved: fls. in scorpoid 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, beaked. —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 3's. The fls. are usually rose-colored, 1½ in. across or less, and generally dispersed in scorpoid racemes or spikes. The species described here are all caulescent plants with lvs. distinctly petiolated, those of each pair being of equal size (except in S. maculata): fls. 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 flower. At this time the plants should be hardened off by gradually withholding water, and they should also be kept a little cooler. When they have ripened the proper checking in order to furnish material for cuttings. Keep the old stools a little warmer and they will gradually 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. Siebrecht.)

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**KEY TO THE SPECIES.**

A. **Foliage not variegated**.................................. 1. **speciosa**
B. **Foliage variegated**.............................. 2. **maculata**
   C. **Marina of ves. ciliate**................ 2. **maculata**
   D. **Marina of ves. not ciliate**........ 3. **picta**
   E. **Calyx glabrous or rarely dotted**............. 3. **picta**
   F. **Number of nerves 7: margin of ves. minutely serrate** 4. **picta**
   G. **Number of nerves 9 or 7: margin of ves. sharply and prominently serrate** 5. **orientalis**
   H. **Color of nerves dark purple: ves. covered with short, dark purple hairs** 5. **orientalis**
   I. **Color of nerves green: ves. glandular-puberulent**................. 6. **margaritacea**
   J. **Lvs. with a dark green ground, and pearl-like spots of regular size and arrangement** 7. **Hendersonii**
   K. **Lvs. silvery, only the nerves dark green**............. 8. **argentea**

1. **speciosa**, Zenker. This is practically the only species cult. for its fls.: height 1 ft.; lvs. 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); 5026. F.S. 22:2442.

2. **maculata**, Roxb. This differs from the other species described in having lvs. of unequal size. The larger half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticate, 9-11-nerved: fls. violet.

**Sonerila**

India. R.H. 1883, p. 91, is too poor to determine.—Probably not in cult.

3. **lata**, 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 terminal, contracted, 7-flcd.; calyx oblong-cylindric, purple; petals oblong, subacuminate. China.—Closely related to S. maculata.

4. **picta**, Korth. Erect or ascending, with seury or pubescent branches; lvs. short-petioled, broadly lanceolate, wedge-shaped at the base, minutely serrate, 7-nerved, lined with white along the primary nerves: fls. rosy. Sumatra.—S. picta of the trade is probably S. orientalis var. picta.

5. **orientalis**, Lindl. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1881, and remarkable for two novel features: some of the varieties have dark purple or bronzy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. G.W. 6, p. 337. In I.H. 37:113 the lvs. are shown as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color not described. Habitat not stated. The typical form is said to have bronze 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 purplish lvs. of the type, with an irregular lanceolate strip of silvery-gray down the middle. Var. Robert Sullier, R.B. 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, pubescent below, 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. II. 4:72. Long.—Supposed to be native of Java. In Vol. III, ed. 1, page 654, Gravescia guttata var. **margaritacea** is erroneously referred to Sonerila instead of Salpinga. **Salpinga margaritacea** is readily told from **Sonerila margaritacea** by its 5-nerved lvs. and floral parts in 5’s.

7. **Hendersonii**, Hort. (S. **margaritacea** var. **Hendersonii**, Hort.). This is referred by 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.M. 1875: 150. I.H. 23:200. G.W. 2, p. 285. G.Z. 18:161.—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**, Fournier). For horticultural purposes this may be treated as a distinct species, characterized by its silvery foliage, resembling that of certain begonias, with no dark purple nerves except on the petioles. 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.
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A very handsome hybrid between the orientals and margaritaecea groups is called Mme. Paul du Toit. It has the serrate lees and some of the silveriness of S. argentata, with the colorless minute dots of the S. orientalis group. It is much like Robert Sallier, but the central coloring is bronze-yellow as well as silverly and more broken up by the green.

S. marmorata and S. picturata 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 Echtesdrasia. Leguminosae. Ornamental woody or rarely herbaceous plants grown chiefly for their attractive flowers and handsome foliage.

Deciduous or evergreen useful ornamental plants: lvs. alternate, odd-pinnate with opposite usually small entire lfts.; fls. pea-like, in racemes or terminal leafy panicles; calyx with 5 short teeth; standard 6-lobed 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, indehiscent 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. tetrapetala 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. viciifolia 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 very 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 ample 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. Fls. white, violet, or pink.

B. Lfts. 5-9 in. long, or less; spinescent shrub.

C. Fls. in large terminal panicles.

1. viciifolia, Hance (S. DAvidi, Komarov. S. Moorecroftiana var. DAvidi, Franch.). Fig. 3642. Spinescent shrub, to 6 ft., with slender spreading pubescent branchlets; lvs. 1-1½ in. long, short-petioled; lfts. 11-15, sessile, elliptic, obtuse, and mucronulate, pubescent beneath, ½-3 in. long; fls. bluish violet or nearly white, about ½ in. long, in short, 6-12-fld. racemes terminal on short branchlets; 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. C.C. III. 36:3. Gn. 68, p. 87, 78, p. 469. Ggn. 16-3. C.W. 11, p. 139.—Graceful shrub; has proved quite hardy at the Arnold Arboretum.

bb. Lfts. larger: unarmored 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; lvs. 7-9 in. long; lfts. 7-17, distinctly stalked, ovate to ovate-lanceolate, acute, rounded at base, dark green and glossy above, more or less pubescent beneath, 1-2 in. long; fls. yellowish white, ½ in. long, in loose panicles 15 in. long; pod distinctly stalked, glabrous, terete, 2-3 in. long, ½ in. broad. July-Sept. China; cult. in Japan. Gn. 24, pp. 210, 211, 214; 29, pp. 222, 73; p. 43. G.M. 38:665. Ggn. 6, p. 247. M.D.G. 1808:183. 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. 2:106. G.C. III. 28:479. F.E. 14:130, pl. 43. Var. columnaris, Schwerin. Of narrow pyramidal habit. Var. violacea, Carr. (S. violacea, Dipp., not Thwaites). Lfts. 15-17, sparingly 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, is hardy in all climates, is large and broader, elliptic lfts. densely pubescent beneath, less so above; the second has pale pink lfts. and 11-17
SOPHORA

ovate to ovate-oblong lfts. soft-pubescent beneath; the third has larger oblong-lanceolate lfts. broadly cuneate at the base and slightly pubescent beneath. There is also a form with variegated lvs.

c. Fls. in racemes.

3. affinis, Torr. & Gray. Small round-headed tree, with slender branches, to 20 ft.: lfts. 13-19, elliptic,

3644. Pod of Sophora japonica. (x1)

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 3-5 in. long; pod terete, moniliform, more or less pubescent, 3/4-5 in. long, black. Spring. Ark., Texas. S.S. 3:122.

dd. Foliage evergreen: racemes terminal.

4. secundiflora, Lag. Small tree, 35 ft. high, with short, slender trunk and upright branches forming a narrow head or shrubby: lvs. 4-6 in. long; lfts. 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 near the base with a few dark spots, very fragrant about 1 in. long, in 1-sided racemes 2-3 in. long; pod white-tomentose, terete, 1-7 in. long, 1/4-3/4 in. thick; seed bright scarlet. Spring. Texas to New Mex. S.S. 3:121. R.H. 1854:201.—On account of its handsome fragrant fls., to be recommended for planting South.

AA. Fls. yellow, in axillary racemes: lvs. evergreen. (Edwardsia)

b. Pod 4-winged: fls. about 1 1/2 in. long.

5. tetrapetala, Ait. (Edwardsia tetrapetala, Poir.). Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches: lfts. very numerous, almost sessile,

3645. Sophora japonica var. pendula, in winter.

SOPHROCATTELYA


6. chrysophylla, Seem. (Edwardsia chrysophylla, Salish.). Tree, to 30 ft. lfts. 12-21, obovate-oblong or oblong, obtuse, tawny or grayish pubescent beneath, less so above, rarely glabrescent, 3/4-1 in. long; fls. pale yellow, about 1 in. long; standard slightly shorter than wings; pod 4-winged, 4-6 in. long. Hawaiian Isls. B.R. 738.

3646. Sophora japonica var. pendula, in summer.

BB. Pod not winged: fls. 3/4-1 in. long.

7. 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, 3/4-1 in. long; fls. 3/4-1 in. long, in short racemes; standard as long as wings; pod terete, not winged, 1-4-seeded. Chile. L.B.C. 12:1125. B.R. 2738.

S. alopecuroides, Linn. Grayish-pubescent undershrub, with upright virgate branches: lvs. 6 in. long, with 15-20 oblong lfts.; fls. yellow: racemes dense, terminal, about 6 in. long; pod terete, 6-12-seeded, W. Asia to Himalayas. Half-hardy.—S. australis, Linn.—Baptisia australis.—S. platycarpa, Maxim.—Cladrastis platyarpa.—S. tomentosa, Linn. Pubescent shrub: lvs. 6-10 in. long; lfts. 13-19, oval to oblong, obtuse, 1-1 1/2 in. long; fls. yellow, in terminal 6-12-in. long racemes; pod 4-6 in. long. Southern states, W. India. B.M. 3390. Not hardy North.

ALFRED REHDER.

SOPHROCATTLEYA (compound from Sophronitis, Cattleya, and Leilia). Orchidaceae. A name to designate the hybrids between the genera Sophronitis, Cattleya, and Leilia.

SOPHROCATTLEYA (compound from Sophronitis and Cattleya). Orchidaceae. A group established to contain hybrids between Sophronitis and Cattleya.

saura.—S. Nigida=S. grandiflora $\times$ C. columnata.—
S. Sazsa=S. grandiflora $\times$ C. Trianae.—S. schoenbrun-
nessis=S. cerna $\times$ C. Bowringiana.—S. Thuvei=
S. grandiflora $\times$ C. Mendelii. J.H. III. 58:295.—S.
varnumelensis=S. grandiflora $\times$ C. amethystoglossa.
G.M. 49:165. —S. Wilczewskiana=S. grandiflora $\times$
labiata. G.M. 57:207.—S. weevilodensis=S. eximia $\times$
C. labiata.

GEORGE V. NASH.

SOPHROLÆLIA (compound from Sophronitis and Lælia). Orbitidææ. A group-name to comprise hybrids between Sophronitis and Lælia. S. Gratixie—L. tenbroesa $\times$ S. grandiflora. G.M. 50:685.—S.
heatonensis=L. purpurata $\times$ S. grandiflora. G.M. 45:698.
—S. Marriottiana=following.—S. Mariottii=L. flava $\times$
S. grandiflora. G.C. III. 27:66.—S. Orpeli=L. punica $\times$
S. Ortodonana=L. Diana $\times$ S. grandiflora.

GEORGE V. NASH.

SOPHRONITIS (Greek, modest). Orbitidææ. 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 enigmatic side
lobes, the base leading into a cavity in the wall of the 
ovary; column short, the stigmatic surface covering 2 wing-like
projections at its summit; pollinia 8.—About 6 species, 
closely related to Lælia, Cattleya, and the like; Brazil.

These plants, and also Sophrocattleyas and sophro-
laeias, thrive in the temperature of the cattleya house.
In the winter season, give a moderate supply of water and
plenty of fresh air. Rest them at 50° to 55°, and water
sufficiently to keep them from shriveling. Grow them
in shallow pots with plenty of drainage, and a thin
layer of fine turfy fern-root, using no sphagnum. (Wm. Mathews.)

grandiflora, Lindl. (S. cocinea, Reichb. f.).

Pseudobulbs clustered: lvs. about 2 in. long, 
elliptic; fls. solitary, on short peduncles, 3½–4 in.
across, brilliant scarlet, often with a shade of 
orange, with an orange labellum; sepals
oblong-lanceolate; petals broadly elliptic;
labellum narrow, with folded sides. Flowers
during the whole winter. Organ Mts. B.M. 3701.
F.E. 1:22; 17:1716. P.M. 9:193. G.M. 25:474 (var. roseo);
II. 22:561; III. 9:669; 17:492; 21:266; 43: 
A.F. 6:609.

cerna, Lindl. Very small plants with a creeping 
rhizome bearing 1-ldv. pseudobulbs; lvs. ovate, thick
and leathery, a little over an inch long; fls. 4–8, on a
st. from the axis of the lvs., bright scarlet or reddish
orange, with an orange lip; sepals and petals ovate;
labellum ovate-acuminate, shorter, concave. Winter.

violacea, Lindl. One of the smallest of cult. orchids; 
pseudobulbs ovoid, 1 in. long: lvs. linear, 2–3 in. long: 
fls. bright rose, about 1 in. diam.; sepals and petals
oblanceolate, acuminate, labellum rhomboid-obovate, 

HEINRICH HASSELBRING.

SORBÁRIA (derived from Sorbus: the leaves resemble
deather those of the mountain-ash). Syn., Basitoma.
Rosaceæ. Ornamental woody plants chiefly grown for 
their large panicles of white flowers and the handsome
pinnate foliage.

Lonicera shrubs: lvs. alternate, odd-pinnate, with 
serrate lfts., stipulate: fls. in terminal panicles; sepals
and petals 5; stamens 20–50: carpels 5, opposite to 
the calyx-lobes, partly connate, dehiscent at the
ventral suture, with several seeds.—Eight species in E.

Asia. Formerly usually united with Spirea but easily
distinguished by the stipulate, pinnate lvs. and the 5
carpels being opposite to the sepals.

The sorbarias 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.
sorbifolia is hardy North and S. stellitica, S. assurgen,
and S. arborea have proved hardly at least as far north
as Massachusetts, while S. atehisonii is somewhat
hardier and S. Lindleyana still more so. They are well
adapted for borders of shrubbery 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 overgrow 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. sorbifolia, followed in order by S.
stellitica, S. assurgen, S. arborea, S. Lindleyana, and 
S. atehisonii which usually continues flowering until 
September. They grow best in a somewhat moist 
and rich soil and thrive also in partly shaded situations.
Propagation is by hardwood cuttings; also from root-cuttings,
suckers, and seeds, like spirea.

A. Lfts. doubly and sharply serrate, 3½ in. or more wide.
B. Panicles with upright ramifications, dense.
C. Stamens 40–50: lfts. with usually 20 pairs of veins.

sorbidolia, A. Braun (Spirea sorbifolia, Linn.
Basitoma sorbi-
dolia, Raf.). Fig. 3647. Up-
right shrub 5–9 ft. high, much
spread by suckers: lfts. 13–
23, lanceolate or ovate-lan-
ceolate, long-acumini-
te, doubly serratate, stellate-pubescent beneath when
young or glabrous, 3–4 in. long: panicles 5–10 in. long;
217. F.E. 30:777.—Sometimes escaped from cult.

stellitica, Schneid. (S. sorbifolia var. stellitica, 
Maxim.) Shrub to 5 ft.: branchlets pubescent; lfts. 11–
19, oblong-lanceolate to lanceolate, long-acuminate,
stellate-pubescent beneath, 2½–3½ in. long: infl. puberu-
lous, 8–10 in. long: calyx pubescent: carpels and frs.

cc. Stamens about 20: lfts. with 25 or more pairs of veins.

assurgen, Rehd. Shrub, to 8 ft., with upright or ascending 

tendrils: lfts. 13–17, oblong-lanceolate to narrow-

lanceolate, long-accuminate, cunate at the base, often
falcate, pubescent on the veins beneath, 2½–3½ in. long:
panicle 6–12 in. long, puberulous; stamens longer than

bb. Panicles with spreading ramifications, open.

Lindleyana, Maxim. (Spirea Lindleyana, Wall.
Basitoma Lindleyana, Kunze). Four to 8 ft. high: lfts.

3047. Sorbária sorbifolia.—Often as

Spirea sorbifolia. (x3)


S. grandiflora, Maxim. (Spiræa grandiflora, Sweet. Spiræa sorbifolia alpina, Falls). Allied to S. sorbifolia. One to 3 ft. high; lvs. glabrous; panicles 3–5 in. long; fls. ½ in. across. S. Siberia. Gn. 9: 295. Kirißiin, Maxim. (Spiræa strobiliflora, Regel). Allied to S. sorbifolia. Shrub, 5–10 ft. lfts. 12–19, glabrous; panicle broadly pyramidal; stamens as long as corolla; fr. with the style much below the bracts. N. China.—S. Mildeii, Focke=Chamaesmaria Millefolium. ALFRED RENNER.
c. Habit tree-like
cc. Habit shrub-like
AA. Poliage simple.
B. Fr. with persistent calyx.
c. Under side of lvs. glabrous at length; green; lvs. lobed; ovary inferior; fr. brown, with gris-cells
cc. Under side of lvs. grayish or whitish tomentose; ovary half-superior.
D. Lvs. lobed or sharply serrate.
E. Shape of lvs. ovate to oblong, usually acute.
F. Margin of lvs. lobed.
G. Base of the usually broadly ovate lvs. mostly rounded.
H. Base of the ovate to oblong-ovate lvs. broadly cuneate.
I. intermedia
FF. Margin of lvs. sharply and doubly serrate.
EE. Shape of lvs. suborbicular to broadly obovate.
DD. Lvs. serrulate, grayish-tomentose or sometimes glabrous beneath.
Bb. Fr. with deciduous calyx leaving a circular scar; ovary quite inferior.
c. Under side of lvs. glabrous or slightly pubescent.
D. Styles usually 2: lvs. ovate to elliptic-ovate.
DD. Styles usually 5: lvs. elliptic-oblong to obovate-oblong.
CC. Under side of lvs. white-tomentose.

Group 1. Aucuparia.

1. americana, Marsh. (Pyrus americana, DC. S. micrantha, Dum.-Cours.). AMERICAN MOUNTAIN-ASH. DOGBERRY. Fig. 3648. Small tree, attaining 30 ft., with spreading branches, or sometimes shrubby: lfts. 11-17, lanceolate, long-acuminate, sharply serrate, glabrous or slightly pubescent when young, light green above, paler beneath, 1 1/2-4 in. long; fls. 1/2-1 1/2 in. across, in dense, 3-6-in.-broad, usually glabrous corymbs: fr. globose, bright red, 1/2-1 1/2 in. across, with the calyx-lobes very small and connivent. May, June. Newfoundland to Man., south to Mich. and N. C. S.S. 4:171, 172. F.E. 23:209; 32:721. Var. microcarpa, Torr. & Gray (S. microcarpa, Pursh), has narrower foliage and very small fls. about 1/2 in. across.

2. decora, Schneid. (S. americana var. decora, Sarg. Pyrus amsuchofolia, Gray, not Cham. & Schlecht. Pyrus silchenensis, Rob. & Fern., not Piper. S. scopulina, Brit., not Greene). Small tree or shrub, closely allied to the preceding: lfts. 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, 1 1/2-3 in. long; fls. 1/2-1 1/2 in. across, in 2-4-in.-broad and rather loose corymbs, sometimes few-fld.: fr. globose, ovoid when young, red, about 1 1/2 in. across, with more or less upright calyx-lobes. May. Labrador to Minn., south to N. Y. and Vt. S.S. 4:173, 174.—Often confounded 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. decor a is often planted for its showy fr.

3. 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; lfts. 9-15, oblong to oblong-lanceolate, serrate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, 3/4-2 in. long; fls. white, 1/2 in. across, in flat, 4-6-in.-broad, tomentose or sometimes almost glabrous corymbs; stamens about as long as petals: fr. globose, about 1/2 in. across, bright red. May, June. Eu. to W. Asia and Siberia. H.W. 3:54, pp. 78, 79. Var. dulcis, Kraetel (var. moravica, Zengerling). Almost glabrous: petioles purplish; fls. oblong-lanceolate, 2-3 in. long, glaucous beneath, usually serrate only above the middle. The fls. 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.M. 52:887. Var. rössica, Sprecht, is similar and also bears edible fr., but the lfts. are larger and broader and more serrate. Var. Beissneri, Rehd. (var. dulcis lactinatala, Beissn., not var. lactinatala, Hartm.), is a handsome and graceful form of var. dulcis with the lfts. pinately lobed and the fl.-stalks and young branchlets bright red. G.W. 3:267. Var. fastigata, Loud., forms a narrow pyramidal tree, with upright branches. Var. péndula, Hort., has long and slender pendulous branches. M.D. 1911, p. 246. Var. integrifolium, Lange. Lfts. entire or nearly so. Var. Fifsana, Dipp. (var. fructu-oluteo, 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. tianschénica, Rupr. (Pyrus thianschénica, Regel). Small tree or shrub, similar to the preceding; young branchlets glabrous, red-brown and glossy when older; petioles 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: corymbic; stamens half as long as petals; styles 2-5: fr. globose, bright red. May, June. Cent. Asia. H.W. 1196.—This species is often confused with the European mountain-ash, from which it is almost indistinguishable without frs. or lvs. except by the glaucous winter buds.

Group 2. CORUS.


—This species is often confused with the European mountain-ash, from which it is almost indistinguishable without frs. or lvs. except by the glaucous winter buds.

Hybrids of Group 1 with Group 4 or with Aronia.

7. hybrida, Linn. (Pyrus pinnatifida, Ehrh. P. fénica, Babington. S. intermédia × S. Aucupária). Tree, attaining 40 ft., of regular, pyramidal habit, with upright branches: young branchlets and petioles whitish tomentose: lvs. ovate to oblong-ovate, with 1-4 pairs of deciduous lfts. at the base, but pinnately lobed, upper part lobed with the lobes becoming gradually shorter and more indistinct toward the apex, dark green above, whitish or grayish tomentose beneath, 2-1⁄2 in. long; petioles about 1 in. long: frs. 1⁄2-11⁄2 in. across, in broad, rather loose tomentose corymbs: fr. oval, 1⁄4-3⁄8 in. high, brown, dotted. May, June. H.W. 3, p. 86. S.I.F. 3: 485.—A form of narrow pyramidal habit is var. fastigiata, Hort. G.C. III. 42: 185.—Natural hybrid, occasionally found with the parents in Eu. Two different hybrids are usually included under S. hybrida: the typical one is S. Aucupária × S. intermédia, which has the lvs. oblong-ovate to oblong, 3-5 in. long, with 10-12 pairs of veins, the lfts., and lobes narrower and pointed and the veins often slightly recurved. It is mostly cult. under the name of S. quercifólia, or S. quercóides. Hort. The second hybrid is var. thuringiaca, Rehd. (Pyrus thuringiaca, Ilse. S. thuringiaca, Schned.). It is a hybrid of S. Aucupária × S. Aria; it has ovate to ovate-oblong lvs., somewhat less deeply lobed, 21⁄2-4 in. long, with 5-10 pairs of veins, lfts. and lobes broader and more entire, with the veins usually curving upward. This is known in gardens as S. quercifólia hybrida nana. Var. decírennes, Kochen (S. decírennes, Hedl. S. lanuginosa, Hort., not Kit,), is a transition to S. Aucupária; only the 3 or 5 upper lfts. are connate into a terminal lft., which, like the upper separate lfts., is deciduous at the base, but side less densely tomentose. In some nurseries under the name of S. sambucifólia.

8. spária, Pers. (Pyrus heterophylla, Dur. S. Aucupária × Arônia arbutifólia). 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, 11⁄4-21⁄2 in. long, pubescent beneath: frs. white or pinkish white, in pubescent or glabrous corymbs 1-11⁄2 in. broad: frs. subglobose or pear-shaped, dark purple. May, June. Of garden origin. B.R. 1196.—Sometimes cult. under the name S. quercifólia floribunda nana. Hybrids of different origin are usually united under S. spária; the more pubescent forms with dark purple fr. are probably the offspring of S. Aucupária and Aronia arbutifólia and represent typical S. spária, while the more glabrous forms with usually blackish fr. have S. Aucupária and Aronia melanoarpa as their parents and may be called S. fâllax, Schned. (S. heterophylla, Dipp.). A similar form with quite glabrous and more pointed lvs., is probably a hybrid of S. americana and Aronia melanoarpa, and is named S. sorbilóxia, Hedl. (S. Sörgendii, Dipp.).

Group 3. TORMINARIA.

9. tominális, Crantz (Pyrus tominális, Ehrh. Tominaría tominális, Dipp. T. Clusi, Roem.). WILD SERVICE TREE. Round-headed tree, with spreading branches, 40-80 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; petioles 1-11⁄4 in. long: frs. white, 1⁄2 in. across, in broad, rather loose tomentose corymbs: fr. oval, 1⁄4-3⁄8 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.

ally rounded at the base, pinnately lobed with short, broadly triangular, sharply serrate lobes, and with 6-9 pairs of veins, grayish or whitish tomentose beneath, 2½-4 in. long; petioles ½-1 in. long: fls. about ⅜ in. across, in dense corymbs: fr. globose-ovoid, about ⅜ in. high, orange to brownish red. May, June. Occasionally occurring in Cent. Eu. H. W. 3, p. 55.

11. intermédia, Pers. (Pyrus intermédia, Ehrh. Sörbus scánica, Fries. Aria suècica, Koehne. Håmbia suècica, Dipp.). Tree, 20-40 ft. high, with oval head: lvs. ovate to oblong-ovate, broadly cuneate at the base, pinnately lobed with broad and short, irregularly serrate lobes and 5-8 pairs of veins, whitish tomentose beneath, 2½-4 in. long; petioles ½-¾ in. long: fls. about ⅜ in. across, in broad, tomentose corymbs: fr. orange-red, globose or subglobose, about ⅜ in. high. May. N. and Cent. Eu. S.I.F. 3:485.—This is sometimes confounded with S. hybridus and considered to be a hybrid of similar origin, but it is certainly a good species. It never bears distinct lfts. at the base and the sinuses do not reach farther than one-third toward the middle.

12. Aria, Crantz (Pyrus Aria, Ehrh. Aria nícea, Host. Håmbia Aria, Medikus). White Beam-Tree. Fig. 3651. Tree, with broadly pyramidal or oval head, 25-60 ft. high: lvs. elliptic to oblong-ovate, usually cuneate at the base, acute or obtuse at the apex, sharply and doubly serrate, of firm texture, bright or dark green and glabrous above, white-tomentose beneath, 2½-5 in. long; petioles ½-¾ in. long: fls. ½-⅜ in. across, in tomentose, 2-3-in.-broad corymbs: fr. subglobose, orange-red, about ⅜ in. high. May, Cent. and S. Eu. to Himalayas and Siberia. G.M. 44:291. H.W. 16:2.—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. Decaisnéana, Rehd. (Aria Decaisnéana, Lav. Pyrus Decaisnéana, Nichols. Pyrus Aria var. majestica, Prain. S. Aria var. majestica, Zabel). Lvs. elliptic or ovate, irregularly doubly serrate, 3-7 in. long: infl. 3-4 in. across: fls. ⅜ in. across: stamens longer than styles: fr. oval. ⅜ in. across. B.M. 1814. Origin unknown, probably from the Himalayas. Var. edulis, Wenzig (Pyrus edulis, Willd. S. longifolia, Hedl.). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2½-5 in. long: fr. oval, ½-⅜ in. high. There are several garden forms, e. g. var. testacea, and some others, and luteascens, Hort., with or more yellow foliage.


14. alpina, Heynh. (Arônia densiflôra, Spach. A. Wildenowii, Zabel. S. Aria × Arônia arbutifólia). 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, ⅜ in. across. If the hybrid is S. Aria × Arônia arbutifólia 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 similar hybrid is S. Dippelii, Zabel (S. Aria × Arônia melanocépita) with the lvs. often finally glabrescent and black fls. over ⅜ in. across.

Group 5. Micromeles.

15. alnifólia, Koch (Micromeles alnifólia, Koehne. Pyrus Misyabel, Sarg.). Fig. 3652. Tree, to 60 ft., with upright branches: branchlets glabrous or slightly pubescent: lvs. ovate to elliptic-ovate, rounded at the base, short-acuminate, unequally serrate, glabrous above, pubescent or slightly pubescent beneath, on vigorous shoots sometimes densely pubescent, 2-4 in. long, with 6-10 pairs of veins: infl. loose, nearly glabrous, 6-12-fl.: fls. ½-⅜ in. across: ovary usually 2-celled: fr. subglobose, ⅜ in. across, red with yellow. May; fr. in Sept., Oct. Cent. China, Manchuria, Korea, Japan. B.M. 7773. G.F. 7:84 (adapted in Fig. 3653). Gt. 41, pp. 283, 284; 52, p. 3. S.I.F. 1:49.


17. Fölgneri, Rehd. (Micromeles Fölgneri, Schneid. Pyrus Fölgneri, Bean). Tree with spreading and arching branches: young branchlets tomentose: lvs. ovate to elliptic-ovate, acute or short-acuminate, rounded or broadly cuneate at the base, finely serrate or on shoots doubly serrate and often slightly lobed, dark green and glabrous above, white-tomentose beneath, 2-3 in. long, with 8-9 pairs of veins: infl. about 4 in. across, tomentose, many-fl.; fls. ⅜-½ in. across; styles 3: fr. ovoid, red, about ⅜ in. long. May; fr. in Oct. Cent. China. M.D.G. 1912:136. Var. pendula, Rehd. (Pyrus Fölgneri var. pendula, Veitch). Branches pendulous.—This is a very handsome and graceful species.
SORGHÁSTRUM (named for its resemblance to sorghum, a name which has been applied to Holcus). Grasses having the inflo, as in Holcus but the pedicellate spikelet wanting, the pedicel only present.—Species about 12, mostly American.

nátns, Nash (Chrysopogón nántns, Bentham. Andro- pgon axéndaceus, Michx.). INDIAN GRASS. In large clumps, perennial, 3-5 ft. tall, bearing beautiful narrow panicles, 6-12 in. long, the copious golden hairs and brilliant yellow anthers producing a charming effect when in bloom, turning to a brownish bronze; culms simple, lvs. pale. A native species occurring on dry soils from the Atlantic to the Rocky Mts. Dept. Agric. Div. Agrost. 7:21. f. 15. 1897.—Useful for the wild border. One of the handsomest natives; very hardy and worthy of greater use.

A. S. HITCHCOCK.
SOWBUGS. There are two common species, Armadilloidium vulgarie and Porcellio laevis, known respectively as the greenhouse pillbug and the door-yard 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, saxifrage, 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. These 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 corn-meal add enough brown sugar to sweeten it, then add two tablespoonsfuls of paris green and stir until it is 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 (Mancassellus brachyurus).—In the western 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 1/4 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 soon accumulate in great numbers. They may be destroyed by the addition of a liberal quantity of copper sulfate solution. Less injury will result to the plants if the water is drained off soon after the cress has been gathered.

C. R. CROSBY.
M. D. LEONARD.

SOW THISTLE: A name for the prickly weedy species of Sonchus.
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 few, remote or sometimes solitary, broad-striate or frequently marked with short brown lines; fls. 1 to 2 in a spathe, sessile, rather large, yellow; perianth-tube short and slender, 6-lobed; ovary 3-celled; caps. membranaceous, ovoid or oblong, included in the spathe.—About 3 species, Cape Colony, S. Afr. Sparaxis is a group of spring-blooming Cape bulbs of the *Ixia* tribe, with spikes of 6-petaled, more or less funnel-shaped fls. 1-2 in. across and exhibiting an extraordinary range of color and throat-markings. These plants are less popular than *ixias*, which they much resemble. The plants are dwarfer and more compact than *ixias*, usually 6-12 in. high, the spikes are shorter and fewer-flowered, and the blossoms are sometimes larger. Sparaxis is essentially distinguished from *Ixia* and other allied genera by the subregular perianth, unilateral and arcuate stamens, and scarious lacerated spathe-valves.

Although a few plants of *sparaxis* are occasionally cultivated in America by bulb-fanciers, one may search through many American catalogues without finding them listed. The Dutch bulb-growers offer twenty-five distinct kinds, which is perhaps a quarter of the number of varieties of *ixias* in cultivation. According to J. G. Baker, there is "only one species in a broad sense, varying indefinitely in the size and coloring of the flowers." For practical purposes Baker recognizes the three species given below; of these the most important and variable is *S. tricolor*.

*Sparaxis pulcherrima* of the Dutch trade is properly *Dierama pulcherrima*, Baker. This grows as much as 6 feet high and has pendulous bright blood-purple flowers but apparently with pale rose and perhaps other varieties (also a white variety). It is distinguished by its pendulous flowers with regular perianth, simple style-branched, equilateral stamens, and large bracts which are not laciniate. B.M. 5555. F.S. 17:1810. Gn. 20:598; 44: p. 281. G. 16:396; 29:197. G.L. 27:152. This plant is said by F. W. Burbidge to be "perhaps the most graceful of all the Cape irids." See Vol. II, page 1007.

A. Throat of fls. same color as segms.

b. Fls. small; segms. ½-3 in. long.

*Sparaxis bulbyfera*, Ker. Corn globose, ½-3 in. thick: basal lvs. about 4, linear or lanceolate, ½-1 ft. long: sts. ½-2 ft. long, simple or branched, bearing low down 2-3 small lvs., often with bulbils in the axils: fls. solitary or few in a spike, yellow; perianth-tube ½ in. long, B.M. 545 (as *Ixia bulbyfera*).—To this species Baker refers *S. albitória*, Eckl., with fls. whitish inside, and *S. violacea*, Eckl., with dark purple fls.

bb. Fls. larger; segms. 1 in. or more long.

*Sparaxis grandiflora*, Ker. Habit, corn, lvs., and spathe just as in *S. bulbyfera* but the fls. larger, the limb 1 in. or more long, usually yellow or purple, and larger anthers. B.R. 258 (fls. white inside, midvein on the back purple). B.M. 541 (as *Ixia grandiflora*; fls. rich purple, margined lighter); 779 (fls. primrose inside, flamed purple outside).—The principal named forms are: var. *atropurpurea*, Hort., dark purple; var. *anemoneflora*, Hort., pale yellow; var. *Liliago*, Baker, white, flushed with claret-purple outside; and var. *stellaris*, Baker, dark purple, the segms. narrower than the type, obovate and acute rather than oblong.

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 fls., 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. 1543:213 (as *S. picta*, B. purpurea, *S. pulchella*).—According to Baker, this is the favorite species among the *sparaxis*. 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, excluding blue and yellow, which latter color usually appears in the throat.

Wilhelm Miller.

SPARMANNIA (Greek, fillet, referring to the ribbon-like leaves). *Sparrmannia*: Broom-Canes. Hardy or aquatic herbs which may be used in the bog-garden or along the pond-edge. *Pflanzenreich*, IV, 8, 1900.

Leaves alternate, sessile, linear-elongate, erect or floating, entire: fls. monocious, in globular, sessile, or pedunculate heads, the upper bearing 3- androeci, naked fls. and minute scales, the lower consisting of numerous sessile or shortly pedicellate pistillate fls.; ovary 1-2-celled; fr. obovoid 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 fls. 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.

A. Infl. unbranched.

*b. Fls. large*

*b. Height 3-8 ft.*

*eurycajum*, Engl. Sm. sts. stout, 3-8 ft. high, branching: lvs. linear, flat, slightly keeled beneath; staminate heads numerous, pistillate 2-4 on a st. or branch, 10-16 lines in diam.: fr. sessile, angled, depressed at the summit. May-Aug. N. Amer.

BB. Height 2-4 ft.

*ramose*, 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). *Tiliæceae*. Shrubs or trees, with soft stellate pubescence, grown in the greenhouse and also out-of-doors in the southern United States. Lvs. cordate, oblong, fls. white, in terminal, umbelliferous little cymes; sepals 4, petals 4, naked at the base; stamens numerous, free; ovary nearly 4-celled: caps. globose, spiny.—About 5 species, Afr.
SPARMAXXIA

Sparmannia 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. Lvs. deeply 6-7-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, incised 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.

AA. Lvs. not lobed.

africana, Linn. A large shrub or tree, 10-20 ft. high: lvs. cordate-acuminate, 5-7-angled, unequally toothed, 5-6 in. long, 7-9-ribbed below: fls. white, on many-fl. peduncles: caps. 5-celled. S. Afr. B.M. 516. G.M. 37: 233. B.H. 1858, p. 105. Gn. 45: 528; 76, p. 192. G. 22: 689; 27: 1915. Gn. W. 22: suppl. March 25. G. W. 5, p. 596.—A useful greenhouse plant. Var. flore-pleno, Hort., is also grown. G.C. II. 19: 477.—S. africana is not common in S. Calif., but is highly esteemed. One specimen, 40 years old, is 12 ft. high and 16 ft. through, and consists of a clump of 8-9 ft. in diam. It is literally covered with snowballs of 4 in. diam., the blooms being so heavy that the ends of the branches touch the ground, necessitating severe pruning as soon as blooms were past beauty. No viburnum, hydrangea, or other shrub can compare with it at its blooming season. During the remainder of the year it has the appearance of a clump of osier suckers, the lvs. being nearly identical in appearance with those of the osierwood. It is therefore a dense mass of broad lvs. and looks well anywhere and at any time. This is one of the finest white-fl. shrubs or trees in cult. The double variety is not so desirable as the single. (Ernest Braunton.)

F. W. BARCLAY.

SPARTINA (Greek, spartine, a cord, referring to the tough leaves). Gramineæ. Herb. 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-fl., strongly flattened, sessile, closely imbricated in 2 rows on one side of a narrow rachis; spikes 2 to several in a raceme.—Species about 10, most of them found in fine marshes of the seacoast.

Michauxiana, Hitchc. (S. monosporaoides, Amer. Auth., no. Roth). Fresh-water Cord-Grass. Fig. 3655. Culms 3-6 ft.: blades narrow, 2-4 ft., tapering to a long slender point, flat but soon involute in drying, the margins very searose: 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. monosporaoides, Roth (S. polystachya, Willd.), on the Atlantic and S. foliosa, Trin., on the Pacific coast act as mud-binders and are important factors in the natural reclamation of salt-marshes. In England, S. stricta, Roth, and S. Tempsendii, Groves, perform the same service. G.C. III. 43: 33. S. alterniflora, Linn., is common to the British Isles and to the St. Lawrence and New England coasts.—A yellow-margined form (S. monosporaoides var. aureo-marginalis) is shown in G. 31: 171.

A. S. HITCHCOCK.

SPÄRTUM (Greek, spartos, the ancient name of the plant). Syn., Spärtantius. Leguminosæ. Ornamental hardy shrub grown chiefly for its bright yellow flowers. Leaves alternate, simple, small: fls. in terminal, loose racemes; calyx split above, hence 1-lipped, with 5 minute teeth; keel incurved, acuminate; pod linear, compressed, many-seeded; seeds with callose appendage at the base, like in Genista.—One species in the

Medit. region and the Canary Isls. Allied to Genista and Cytisus, but chiefly distinguished by the 1-lipped calyx. The slender branches yield fiber, which is used in S. France and Spain for making ropes, cords, and cloths. This is a handsome shrub with long and slender rush-like green branches, small and sparse foliage and showy papilionaceous flowers in terminal racemes. It is especially adapted for warmer and drier regions; in the East it is probably hardy as far north as Philadelphia. It becomes naturalized easily, as happened in several localities in South America, whence it was afterward described as S. americanum, Meyen. It grows in almost any kind of well-drained soil and is well suited for planting on exposed sandy and rocky situations. Propagation is by seeds and by Greenwood cuttings under glass.


For other species sometimes referred to Spärtium see Genista and Cytisus. For S. aestuens, Biv., S. jexa, Poir., S. monospermum, Linn., S. radiatum, Linn., and S. stratum, Alt., see Genista; for S. purpurea, Linn., S. scoparium, Linn., and S. multiflorum, Alt., see Cytisus.

ALFRED REHDER.

SPARTECYTUS FILIPÉS, Webb.: Cytisus filipes.

SPATHÈLIA (from the Greek for a staff). Rubbe-ceæ. Odd evergreen trees without branches, grown in the warmhouse and the American tropics.

Trunk simple, the lvs. aggregated at its extremity, so that the plant has the aspect of a tree-fern or palm: lvs. alternate, odd-pinnate; lfts. many-paired, alternate, linear-oblong or sickle-shaped, subdentate or serrate, the margin glandular: fls. polygamous, rather large, short-pedicelled, in large panicles, which are terminal, elongated and branched, the ultimate branches somewhat cymose; calyx 5-parted, the segms. spreading, valvate or subvalvate; petals 5, imbricate; disk none; stamens 5; ovary 3-angled, 3-celled: drupe without juice, elliptic-oblong, 3-edged, 3-winged, the shell stony.—About 5 species, W. Indies,

Juncceum, Linn. St. slender, usually leaning, resembling a palm, 20-50 ft. high: the lvs. and panicles are frequently several feet long: lfts. 20-40 pairs, very variable, opposite or alternate, sessile or petiolulate, cordate or obliquely rounded at base, oblong- or linear-lanceolate, crenate or entire: panicle powdery. Sometimes planted in the W. Indies. B. R. 670.

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 f- to lanceolate, oblong or lanceolate; spadix shorter than the spathe, sessile or stipitate, cylindrical, densely fl.d.: 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-conical, 3-celled, cells 1-2-seeded.—About 27 species, mostly from Trop. Amer., one or two Malayan. Monographed by Engler and Krause in Engler’s Phanzenreich, l.f. 57 (IV. 23B), 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 5; ovary 3-4-celled, oblong, style pyramidal, more or less exerted, corona.

Section CUSPATHIPHYLLUM.

B. Ovary-cells 8-, 6-, or 4-ovuled. 

cochlearispathum, Engler (S. heliconifolium, Schott). Caudex short: lvs. thin membranaceous, broadly oblong, margin usually slightly undulate, base rotundate or subcordate, 20-30 x 8-10 in.: spathole oblong, 6-12 in. long, base more or less acute, apex gradually narrowed to a cusp, somewhat decurrent on the peduncle. Mex. I.H. 21:189.

blándum, Schott. Lvs. elliptic-oblong or oblong, acute, base rather suddenly narrowed and concave, 10 x 4 or more in.: spathe pale on both surfaces, elliptic-oblong, about 3 in. long, base suddenly narrowed, apex cuspidate-acuminate, narrowly decurrent on the peduncle. Dutch Guiana.

AA. Petals free; ovary shortly obpyramidal, hexagonal, top truncate, style not at all distinct.

Section AMOPHYLLUM.

B. Petiole 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: spathe white, oblong-lanceolate, about 3 in. long, long-cuspidate; spadix yellow-green or whitish. Colombia. I.H. 21:159 (as Anthurium floribundum). F. 1850, p. 76.

BB. Petiole almost twice as long as blade.


AAA. Petals connate in a 6-angled cup which is truncate or 6-lobed; stamens 6; ovary obvoid or ovoid and 3-celled, top rather flat; cells 2-, 4-, 6-, or 8-ovuled.

Section Massowia.

cannéfolium, Schott; also spelled *cannifolium* (*Póthos cannéfolis*, Dyr. *S. cándícom*, Popp.). Lvs. membranaceous, ovate-oblong or elliptic-oblong, with 3-8 veins, 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, 4-½-8 in. long, base suddenly narrowed, scarcey decurrent, apex short-cuspidate; spadix greenish or yellowish. W. Indies. Colombia. B.M. 603.

hybridum, N. E. Br. A hybrid between *S. cannéfolium* and *S. -pictum* with 6-8 long. Petiole oblong-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. Chiechbrighthi, Hort., is offered in the trade, but is unknown botanically.—*S. pictum*, Hort. Lindl. *Monstera plant.* F. TRACY HUBBARD.

SPATHODEA (Greek, spatha-like, referring to the shape of the calyx). *Bignoniacée*. Two or 3 evergreen trees native of Trop. Afr. with large odd-pinnate opposite or sometimes ternate lvs., the lfts. entire, and with large fls. 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 ovolves in several rows: caps. oblong-lanceolate, acuminate at the ends, loculicidal with woody valves; seeds elliptic, broadly winged. The *Spathodeas* are handsome evergreen trees with large pinnate flowers, and large, whitish, red, or orange-red or scarlet fls. 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., glabrescent: lvs. 1-1½ ft. long; lfts. 9-19, 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; fls. scarlet, in many-fl. racemes or panicles; calyx coriaceous, boat-shaped, recurved, 2-4 in. long; corolla about 4 in. long, with ovate, plicate, and somewhat undulate lobes; ovary papillos: caps. 8 in. long, glabrous. Trop. Afr. B.M. 6091. F.S. 8:830. J.F. 4:388. G.C. III. 50:438.

niótica, Seem. Shrubby tree, to 20 ft.: branchlets pubescent: lvs. ½-1½ ft. long; rachis pubescent; lfts. 9-15, ovate-oblong, short-acuminate, entire, glabrous above, densely pubescent or tomentose beneath, 1½-4 in. long; fls. almost like those of the preceding species, but usually much larger, with ovate-oblong, 2-4 in. long; calyx persistent; ovary acute; fruit large, woody, pitted; seeds 1-2, with fleshy, scarlet fls. in large panicles. In. Cent. Trop. Afr. H. Johnston, Uganda protectorate, 1:68.—In its smaller size this tree has an advantage over the preceding species the fls. of which are usually borne so high on the tree as to be almost out of sight.

E. làvis, Beauv., is now referred to *Newbouldia* which differs from *Spathodea* chiefly in the shape of the calyx which includes the base of the corolla and is split on one side and 2-lobed at the apex, and in its funnelform-campanulate corolla, the inclosed stamens with parallel anther-cells: caps. elongated-linear with beathy valves; seeds with the wing emarginate in one side. *N. làvis*. Seem. (Spathodea *làvis*, Brongn.). Shrub or tree, to 40 ft., nearly glabrous; lvs. opposite or ternate, 1-2 ft. long; lfts. 7-13, ovate-oblong, obtusely acuminate, serrate, glabrous or nearly so, 3-5 in. long; fls. white with purple spots, in dense terminal panicles; calyx oblong, 2-lobed at the apex, ½-1 in. long; corolla 2-½-3 in. long, limb lobes 6-toothed: ovary sub-globose; fruit large. *Newbouldia làvis*. Trop. Afr. W. Afr. B.M. 4537. F.S. 1:51. F.S. 6:634. H.U. 5:357. The bark has medicinal properties.—*S. pendándra*, B. & R. (F.M. 3691), is apparently a form of *N. làvis* with staines. pale purple corolla and 5 stamens.—*S. speciosa*, Brongn.—*Newbouldia làvis*.

ALFRED REHDER.

SPATHOGLOTTIS (Greek, spatha and tongue; said to refer to the shape of the lip). *Orchidácée*. 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-lvd.: lvs. elongate, long-attenuate, narrow, plicate, articulated: scape lateral, bearing large fls. in a terminal raceme: sepals free, subequal; petals similar or broader and longer;
labellum not spurred, lateral lobes somewhat convolute, middle lobe clawed; column slender; pollinia S.— About 40 species in Asia, Austral., and the Malay Isls. 

Spathoglottis grow best at the warm end of the cat-
tleya or Brazilian house in a moist shady location. Pot

SPERGULA

S. aurea—Vieillardii, Hort., is a hybrid between this and S. aurea. Fls. pale chrome-yellow, with the sepals slightly and the petals profusely dotted with crimson, the tips of the lobes of the lip rich crimson. G.C.I. III. 23:309. G.M. 41:308—S. Colmanii=S. aurea var. × S. aureo-Vieillardi.—S. ovatipes=S. Fortunei × S. paltha. —S. Hardingiana, Parl. & Reichh. f. Scapes basal, up to 15 in. tall: fls. numerous, rose-purple or pale lilac, about 1 in. diam.; sepals lanceolate; petals linear-lanceolate; lip linear, twisted at base, with 2 yellow brown-spotted tubercles. G.N. Burma. B.M. 7904.—S. kromovii=S. plicata var. Michoilti × S. Vieillardi.—S. Kim-

baltiana, Hook., is often regarded as a variety of S. aurea, from which it differs in having the backs of the sepals mottled with red-brown, the crest glabrous, and narrower lvs. B.M. 7443.—S. plicata var. Michoilti is advertised by Sander. Fls. amethyst-color, with the segms., broader than in the type. Habit more dwarf.—S. Sou-

diana, F. M. Bailey. Fls. in upright spikes, more than 1 in. across; sepals and petals light rose-color. Queensland.—S. sebrina=S. Fortunei × S. plicata.

HEINRICH HASSELBRING.

SPATHYEMA: Symplcogopus. 203

SPEAR DOCK: Nuphar avena. 

SPERMINT: Mentha. Spear wood: Eucalyptus doratozylon. 

SPEAR WORT: Species of Ranunculus. 

SPECKLARIA (from Speculum Veneris, meaning Venus' looking-glass). Campanulaceae. VENUS' LOOK-

ing-glass. Erect or decumbent, hispid 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 sub-

SPRATTYEMA: (with 3-fld. 

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 some of the 5-angled fl-

buds. F. TRACY HUBBARD.

SPEAR WELL: Veronica. 

SPLENT: Tritcum. 

S PÉR GULA (Latin, spargere, to scatter; the seeds are said to be ex-

peled). Caryophyllaceae. Annual herbs including Spernum (which see), a for-

age plant adapted to poor dry sandy soils: lvs. subu-

late, appearing whorled from the cluster of second-

ary lvs. at the axil; stip-

ules small and scanty: fls. pedicelled, in cymose racemes; sepals 5; petals 5, entire; stamens 10, rarely 8; styles 5, alternate with the sepals; ovary 3-valved, many seeded: caps. 5-

valved, the valves oppo-

site the sepals.—About 5, possibly more species, temperate regions of the world. Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

3656. Venus' looking-glass. 

Specularia Speculum. (X ½)
arrénsis, Linn. Annual, 6-18 in. high, branched at or near the base, bright green, little if at all viscid: lvs. linear, clustered at the nodes in 2 opposite sets of 6-8 together, appearing as if verticillate: lvs. numerous, small, white, about 1½ in. across and borne in terminal panicles: seeds papillate. Eu. S. sativa, Boerm., the cult. Sperula is a dull green viscid plant, with margined not papillate seeds. Eu. F. Tracy Hubbard.†

SPHÁCELE (old Greek name). Labiáce. A score or more of shrubs or subshrub.s, in Calif., Hawaii, and S. Amer., one or more of which has been listed for ornament, but apparently little known in cult. Fls. whitish to red or blue, 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. chamadryoides, Briquet (S. campanulata, Benth.), from Chile, is mentioned abroad: 2-3 ft., shrubby: lvs. oblong-lanceolate, short-stalked, wrinkled: fls. pale blue, ½-¾ in. long about 2 in a whorl. B.R. 1382. Coolhouse plant.

SPHÁRÁLCEA (Greek for globe, and Alcea, the generic name of the marshmallow). Malvaceae. Grote Mallow. Shrubs, subshrubs, or herbs, adapted to the warmhouse or outdoors in the far South. 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 top into many filaments; ovary many-celled: fr. subglobose, of many compressed, 2-valved, dehiscing, 2-3-seeded carpels, united in a ring around a central torus, from which they slowly separate.—About 65 species, 4 or 5 of which are S. African, the remainder from 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 Abutilon but with 3 bractlets instead of none.

A. Lvs. 5-7-lobed.
B. Fls. in spikes.

acerifolia, Torr. & Gray. Fig. 3658. Perennial herb, 2-6 ft. high: lvs. 3-4 in. long, cordate, palmately 5-lobed (sometimes with 2 or more basal lobes), coarsely serrate: fls. rose-color, varying to white, 2 in. across, 15 or more in spicate clusters terminating the branches. Rocky Mts. B.M. 5404.

BB. Fls. in umbels.

umbellata, Don (S. vitifolia, Benth. & Hook. Malva umbellata, Cav. Malva umbellata, Benth.). Shrubs, 3 ft. or more high, flaccid-tomentose: lvs.long-petiolate, cordate, somewhat 7-lobed, peltate, nerves, flat, glabrate and green above, hoary and ribbed beneath; the lobes short, acute, margin crenate: peduncles axillary, usually 3-fld., rarely 2-5 fld.: calyx broad-campanulate, leathery, 5-lobed, the lobes semi-ovate; petals scarlet, white at base, subcordate; filaments forming a white column. Mex. B.R. 1605. L.B.C. 3:222. Var. tricolor, Hort., is said to have reddish purple fls. striped with white and rose.

AA. Lvs. 3-lobed.
B. Fls. scarlet or rose.


BB. Fls. brick-red.

cisplátina, St. Hill. (S. minütà, Spach. Malva minütà, Cav. M. minütà, Jacq.†). Tender branching subshrub, 2-4 ft. high, formerly considered desirable for conservatory decoration in Oct. and Nov., when it produces its brick-red fls.: lvs. 1-2 in. long, 3-lobed, coarsely and unequally crenate, midlobe longest: fls. 1½ in. across, in axillary, few-fld. cymose racemes. La Plata. The above description is from B.M. 5595.—Minuta means cinnabar-red, the color of red lead. There seems to be no reason why S. cisplatinà and S. Munroana should be confused. The lvs. of S. Munroana are obscurely 3-lobed, the lobes broad, blunt and short; the lvs. of S. cisplatinà are deeply and sharply cut, acuminate and narrowed toward the base, the lobes narrow and acute, the midlobe over twice as long as the side lobes. The color of the fls. is very distinct and the clusters are branched in S. Munroana but not in S. cisplatinà. F. Tracy Hubbard.†

SPHÁROCÓDON (Greek, globe and bell, probably referring to the shape of the corolla). Asclepiadaceae. Perennial herbs with a woody or tuberous rootstock, suitable only for the warmhouse: sts. erect, not twining: lvs. opposite, short-petioled, elliptic or oblong; fls. moderate-sized, in pedunculate sublateral umbel-like cymes; calyx 5-parted; corolla campanulate or somewhat so, 5-lobed, the lobes overlapping and slightly twisted to the left in bud; crown of 5 small fleshy compressed, tubercules or teeth; column arising from the base of the corolla; anthers without appendages: fr. unknown.—Five species from Trop. and S. Afr. S. obtusifólium, Benth. Rootstock woody: sts. several to a root, erect, 1-3 ft. high, branching only at the base; lvs. elliptic, usually very obtuse and apiculate, sometimes subacute: fls. in sublateral, 2-3-fld., umbel-like cymes, dark purple; sepal linear-lanceolate, acute; corolla broadly campanulate, 5-lobed to one-third of the way down or more. Trop. and S. Afr. B.M. 7925.

SPHÁRÓTÚNE: Tooea.

SPHÁROSTÉMA: Schizandra.

SPHÁNAGÜM. Sphagnum moss, bog-moss, or peat-moss is found in swamps or bogs and is one of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the North Temperate zone. According to Warnstorf, 1911 (Engler’s “Das Pflanzenreich”), there are 342 recognized species of Sphagnum, of which many occur in North America. Sphagnum moecicarum differ from the true Sphagnum, but they are usually classified in a distinct family, Sphagnaceae. Besides differences in structure of the reproductive organs, the marked differences lie in the
CVI. Spinach.—Above, a plant of Long Season variety. Below, spinach field near Norfolk, Virginia.
SPILANTHES erect
Div.
spikelets yellow; num ovate-oblong, petiole decayed for in (Acridococcus pose for such chopped the other one-third cenia inclosed and more lume).

obtusata, SPHENOPHOLIS Unless unless packing the other one-third cenia inclosed and more lume).

SPHAGNUM

Spikelets rather large, 3-4-fl. united, collected in terminal panicles; calyx 5-parted, not glandular; 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. prunieri, Szyzlowicz (Acridococcus prunieri, Juss.). A tall climbing shrub, silky-hairy, with white flowers. The inflorescence consists of 3-5-comp. ovate-oblong, 1-4 in. long: fls. subcorymosely clustered at the ends of the branches, 1-1½ in. diam., golden yellow; petals short-clawed, orbicular, margins crisped: samaras silty-pubescent. S. Afr. B.M. 7894.

SPHENOPHOLIS (Greek, sphen, a wedge, and pholos, a sheath, referring to the broadly obvolute second glume). Syn., Ectonia, Endl., not Raf. Graminea. Slender perennial with rather delicate panicles: spikelets 2-3-fl., articulated below the glumes; glumes dissimilar in shape, the first narrow, the second obovate.—Species about 5, N. Amer. These three kinds have been catalogued among native plants offered for sale.


AA. Panicule more loose and slender. pállens, Scribn. (Ectonia pennsylvanica, Gray). Lvs. 3-6 in., with panicule-branches lax, nodding, glumes unequal, the first shorter. Moist woods and meadows. Maine to Texas. Ibid. 257.

SPILANTHES 3205


A. S. HITCHCOCK.

SPICE BUSH: Benzoin.


SPIGELIA (named for Adrian von der Spigel, physician, 1558–1625). Loganiaceae. Annual or perennial herbs, some hardy, the others either warmhouse or greenhouse plants, rarely somewhat woody, with opposite membranaceous to feather-vanous leaves. Lvs. usually 3-nerved, and long or small, red, yellow, or purplish fls. usually borne in terminal one-sided somewhat curved spikes; calyx 5-lobed; segms. narrow; corolla tubular; lobes 5, valvate; stamens 5, attached to the corolla-tube; ovary 2-loculed; style articulated, simple, obtuse or somewhat capitate and stigmatate at the summit: capsule, flattened, circumscissile above the persistent base.—About 50 species, Amer.


F. W. BARCLAY.

SPILÁNTHES (Greek, meaning spot-flower, in reference to the markings on the disk in some of the species). Compositae. Herbs, mainly weedy, some of them desirable for outdoor planting, with opposite lvs.: rays yellow or whitish, or none: achenes nearly always flattened, biaristate or without bristles, glabrous or strongly ciliate, in the latter case quite distinct in appearance. There are about 40 species of Sphántheles, 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. (Tropaeolaceae), for the pungent flavor of its lvs., used in salads; 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, Pará 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. callithorpha belonging in the radiate section, Acetocarpus, DC.

S. americana, Hieron., var. ripens, 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. In fixation the erect-stemmed species predominate. A hybrid combining with this the handsome lvs. and red st. of S. phaneractis would be most pleasing; were it productive. Sect. Mo. A., Arund., Co., and Texas.—A. H. Moore. Decumbent or prostrate; lvs. long-acuminate; internodes long: rayless species, but of pleasing appearance. Yunnan Prov., China.—S. charitopis, A. H. Moore. One of the dainty species; a fair companion-piece to S. isolaecus, but with pale disks. Branh, 1½ ft. high: flores, Green yellow; flower with long, small attractive heads. Yucatan, Mex.—S. grisea, A. H. Moore. Lvs. densely hispidulous: rays large, very bright yellow. Panama.—S. isolaeccus, A. H. Moore. A dainty little plant, with white and spKndens, A. H. Moore. Lvs. densely green foliage; disk violet, the tiny rays creamy. Porto Rico. Though not quite so charming, S. charitopis would be a pretty good companion.—S. paneractis, A. H. Moore. Decumbent or
prostrate; sta. red; lvs. linear to linear-lanceolate; rays large, bright yellow. Known from states of Jalisco and Michoacan, Mex. One of the few very conspicuous-fl. species.—S. polypelectra, A. H. Moore. Erect: rays golden yellow and slender.

ALBERT HANFORD MOORE.

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.

The spring crop is grown from seeds sown in autumn, or from those sown in winter in hotbeds or coldframes, or from those sown directly in the open ground as soon as it is fit in the spring. If the plants for spring use are to be started in the fall, the seeds should be sown about six to eight weeks before hard freezing weather is expected. Then the plants will have attained sufficient size and roothold to enable them to pass the winter. It is advisable to cover the plants, just before winter sets in, with straw or loose litter or dry manure. Even though the plants will withstand the winter, they nevertheless thrive better if given this protection, particularly in soils that are likely to heave. It is customary to grow this fall-sown spinach on wide ridges or beds that are made by plowing several furrows together, leaving a dead-furrow between them. This allows of surface drainage. These beds may be from 5 to 10 feet wide. On these beds, the seeds are sown in rows running lengthwise, the distance between the rows being from 10 to 20 inches, depending on the methods that are employed for tillage. If hand tillage alone is to be given, the plants may be placed closer. In the spring the cover is removed from the plants at the earliest opportunity, for spinach is most desired very early in the season. Unless the land is in extra good “heart,” it is well to make a surface application of a soluble fertilizer early in the spring in order to start the plants into growth. A fertilizer that is very rich in nitrogen gives best results; in fact, it is customary in some places to use a solution of nitrate of soda or sulfate of ammonia, applying the material with a sprinkling-cart. From fifty to seventy-five pounds of the fertilizer may be used to the acre with very good results at each of two or more applications.

For home use, spinach is sometimes carried over the winter in frames, the plants having been transplanted to the frames or raised in them during the late fall. These frames are protected from severe freezing weather by mats or shutters. Whenever it is desired to bring the plants into growth, sash is placed over the frame, and extra protection is given in very cold weather. The plants will soon become green and begin to make new leaves. Different frames may be covered at different times as the season advances, there being a need to providing a supply for home use. Sometimes the seed is sown in hotbeds that are made late in winter or very early in spring, and the plants are secured in advance of the early season. The growing of spinach in frames is less frequent than formerly, owing to the fact that the market is now supplied with the product grown in the middle South.

Spring spinach may be grown from seeds that are sown as soon as the land can be worked in spring. If the land has been plowed and manured in the fall, quicker results may be secured. 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 seed when 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 the first successions 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 markets, such as the Virolay and the Round-leaved. The prickly spinach is considered to be the most hardy and is chiefly recommended for fall sowing.

SPINACIA (from spinus; alluding to the spiny fruit). Chenopodiaceae. SPINACH. SPINAGE. According to Volkens (in Engler & Prantl’s “Pflanzenfamilien”), there are only two species of Spinacia, S. oleracea, Linn., the common spinach of our country, and S. tetrandra, an annual of the Middle American region. 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. S. oleracea, 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 types are the true species S. oleracea is not known, but as a matter of nomenclature, Linnaeus’ S. spinosa, 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 bracteate, whereas those of Atriplex are included in a pair of calyx-leaflets. Spinacia is diocious, bearing the flowers in small axillary clusters; stamens 4 or 5, in a 4- to 5-lobed 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 larger heads and heads, and are used for greens, often showing little of the halberd or sagitate shape. See Spinach.

L. H. B.
SPIRAEA (ancient Greek name of a plant used for garlands, derived from spire, band, wreath; probably first used for the present genus by Clusius). Rosaceae, subfamily Spireoideae. SPIRAEA. Ornamental woody shrubs, grown for their profuse handsome white, pink, or carmine flowers.

Deciduous shrubs: Ivs. simple, short-petioled, dentate or serrate, sometimes lobed, rarely entire, without stipules: fls. in umbel-like racemes, corymbs or panicles, 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 dehiscent along the inner suture, with several minute oblong seeds. — About 70 species in the temperate regions of the northern hemisphere, in Amer. south to Mex., in Asia south to the Himalayas. Many species formerly included under Spirea are now referred to other genera; see Physocarpus, Holodiscus, Sorbaria, also Chamoxambiataria, Luetkea, Petrophytum, and Sibiria for shrubby species, and Aruncus, Filipendula, and also Astilbe for the herbaceous ones. There is a monograph of Spirea and the allied genera in Maximowicz in Acta Hort. Polon topics, vol. 6, pp. 105-261 (1879) and a monograph of the cult. species, with their numerous hybrids fully described by H. Zabel, Die strauchigen Spireas der deutschen Gärten (1893). There is much horticultural literature on spires, for the plants are popular and about two-thirds of the known species and numerous hybrid forms are widely grown in gardens and in cult. settings.

The spires 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 these are S. arguta, S. Thunbergii, S. Vanhouttei, S. pubescens, S. trilobata, S. nipponica, S. media, S. ulmifolia, S. alba, S. Douglasii, S. Menziesii, S. tomentosa. The recently introduced S. Henryi, S. Veitchii, S. Wilsonii, S. Rosthornii and S. Sargentiana have proved hardy at the Arnold Arboretum, while S. bella, S. japonica, and S. albiflora 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. Blumei, S. chinensis, S. canescens, and S. bella are more tender and not to be recommended for the North, but are hardy or nearly hardy in the milder states. S. prunifolia is hardy as far north as Boston.

In regard to the flowering season, the spires can be divided into two groups. The first one contains the species of the section Chamaedryon, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calospora and Spiraia, with white or pink flowers in corymbs or panicles appearing from June to autumn. Some of the most important species, arranged according to their relative flowering-time, are the following: Early-flowering spires—S. Thunbergii, S. arguta, S. hypericifolia, S. prunifolia, S. media, S. pilosula, S. pubescens, S. chinensis, S. Komarovii, S. trilobata, S. Vanhouttei, S. cantoniensis, S. nipponica. Late-flowering spires—S. bella, S. Rosthornii, S. Wilsonii, S. Henryi, S. Sargentiana, S. Veitchii, S. corymbosa, S. densiflora, S. canescens, S. japonica, S. albiflora, S. salicifolia, S. alba, S. Menziesii, S. Douglasii, S. tomentosa. Many species of the second group do not produce their flowers at all once like those of the first group, but continue blooming for a longer time.

The spires 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. chamaedryfyla and S. media, which are some what stiffer and less handsome and produce suckers. S. canescens, S. Henryi, and its allies have the graceful habit of the first group. S. japonica and its numerous hybrids form mostly low, round bushes and are pretty as single specimens or in the border. S. alba, S. Douglasii, 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 — of those of the sections Spiraia and Alpinia spirea can be pruned more severely if necessary, since they produce their flowers at the ends of the young shoots.

3660. Spirea Thunbergii.

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KEY TO THE SECTIONS.

A. Infl. a simple umbel-like raceme: fls. white.

Section I. CHAMEDYTEN. Species Nos. 1-20.

Aa. Infl. compound: fls. white or pink.

B. Fls. in corymbs.

Section II. CALOSPIRA. Species Nos. 21-42.

BB. Fls. in panicles.

Section III. SPIRÆA. Species Nos. 43-55.

Section I. CHAMEDYTEN. 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 crenately dentate only near the apex, often 3-nerfed, bright green.

C. Shape of lvs. linear-lanceolate: 1. hypericifolia

CC. Shape of lvs. ovate to oblong-lanceolate: finely pubescent when young

D. Umbels on the lower part of the branches stalked.

E. Lvs. oblong.

ER. Lvs. obovata.

ED. Umbels all sessile, 3-6-fl.d.

AA. Fls. in umbel-like racemes on leafy stalks.

B. Margin of lvs. entire or crenate or dentate only toward the apex.

C. Foliage grayish pubescent on both sides.

CC. Foliage almost glabrous

D. Shape of lvs. elliptic to oblong-lanceolate.

E. Lvs. pennerised: shoots angular.

EE. Lvs. all or partly 3-nerfed.

F. Shoots striped: lvs. all 3-nerfed.

FF. Shoots tertere: lvs. partly pennerised, partly 3-nerfed.

DD. Shape of lvs. almost orbicular, 3½ to 5½ in. broad.

BB. Margin of lvs. incisely serrate and often slightly lobed (only in No. 18 sometimes entire).

C. Stems shorter than or as long as petals; sepals erect or spreading in fr.

D. Foliage glabrous.

E. Form of lvs. orbicular to ovate.

F. Apex of lvs. obtuse.

G. Lvs. pennerised, ovate...11. Blumei

GG. Lvs. patently 3-5-nerfed.

FF. Apex of lvs. acute.

EE. Form of lvs. rhombic-lanceolate.

DD. Foliage pubescent, at least beneath.

E. Umbels and foliage pubescent.

F. Tomentum grayish...15. blanda

FF. Tomentum yellowish...16. chinensis

EE. Umbels and foliage glabrous.17. pubescens

CC. Stems longer than petals; sepals reflexed.

C. Shoots tertere, often pubescent...18. media

DD. Shoots angular, glabrous.

D. Lvs. doubly and irregularly serrate from below the middle...

EE. Lvs. simply serrate, usually only above the middle...

1. hypericifolia, Linn. Vigorous shrub, 5 ft. high, with slender arching or upright branches: lvs. almost sessile, cuneate-ovobate to oblong-lanceolate, 3-nerfed or with few lateral veins, almost glabrous, 3½-1½ in. long: fls. 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, oblong-lanceolate: fls. smaller, yellowish white; pedicels glabrous; petals obvate, shorter than stamens: fls. somewhat earlier, but less showy. G.O.H. 9. Var. flabellata, Zabel (S. flabellata, Bertol. S. hypericifolia var. crenata, Boiss. & Buhse). Lvs. obvate to oblong-lanceolate, acute, incisely serrate at the apex or entire on the flowering branches. Var. obovata, Maxim. (S. obovata, Waldst. & Kt.). Lvs. obvate, rounded at the apex, crenate above the middle. S. E. Eu. G.O.H. 11. Var. truncata, Zabel (S. thalicroides, Hort., not Pall.). Lvs. broadly obvate to oblong-ovobate, truncate and crenately dentate at the apex. Siberia.

2. Thunbergii, Sieb. Fig. 3660. Shrub, 5 ft. high, with spreading or arching branches: lvs. linear-lanceolate, sharply serrulate, 1-1½ in. long: fls. pure white, about ½ in. across, in 3-5-fl.d. naked umbels; petals obvate, much longer than stamens: follicles with the spreading styles below the apex. April, May. Chinas, Japan. S.Z. 1:69. G.F. 2:84, 85. J.H. 3:437. —A very graceful early-flowering shrub, the slender arching branches clothed with feathery bright green foliage, turning late in fall to orange or scarlet. Almost hardy, but tips of branches sometimes killed by severe frost; valuable for seaside planting.

11. _Blumei_, Don (S. _rupetris_, Sieb.). Shrub, 4 ft. high, with spreading and arching branches: lvs. ovate to rhombic-ovate, incisely crenate-serrate, pale bluish green beneath and rather prominently veined, ½–3/4 in. long: fls. polygamous, white, in many-fl.d. umbels; petals roundish-ovate, about as long as stamens: follicles with spreading or reflexed styles. Japan. June. 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. _trilobus_, 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, ½–1 in. long: fls. pure white, in many-fl.d. umbels; petals in fr.: follicles with ascending styles. May, June. N. China to Siberia and Turkestan. L.B.C. 13:1271. G.F. 1:432. F.E. 30:45 (as _S. crataegifolia_).—Handsome bushy shrub, quite hardy; cult. under many different names as _S. aquilegifolia_, _S. diantifolia_, _S. crataegifolia_, _S. Blumei_.

13. _Vanhouvëti_, Zabel (S. _cantiëniësis_ × _S. triloba_. _S. aquilegifolia_ var. _Vanhouvëti_, Briot.). Fig. 3664. Shrub, 6 ft. high, with arching branches: lvs. rhombic-ovate or rhombic-ovate, rounded or somewhat narrowed at the base, acute, incised-serrate, dark green above, pale bluish green beneath, ¾–1 ¾ in. long: fls. white, ½ in. across, in many-fl.d. umbels; petals twice as long as stamens; follicles upright or spreading in fr. May, June. Of garden origin. G. 53, p. 251; 71, p. 334. G. M. 1:116; 3:131. G. 27:94. F. 10:133. F. E. 14:389; 17:673; 31:600. C. L. A. 4:610. F. 2:317. G. 5:210. A. G. 7:173. M. D. G. 1900:17.—This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming spires and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

14. _cantiëniësis_, Lour. (S. _Reesewëna_, Lindl. _S. lanceoldia_, Poir. _S. corymbosa_, Roxbg.). Shrub, 4 ft. high, with slender, arching branches: lvs. rhombic-ovate, incisely doubly serrate, dark green above,
pale bluish green beneath, 1-2 1/2 in. long: fls. over 1/4 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. lanzecta, Zabel (S. reevesiana 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.

15. blanda, Zabel (S. chinensis x S. cantoniensis. S. reevesiana robusta or nöba, Hort.). Upright shrub, 6 ft. high, with arching branches: lvs. oblong-to-ovate, acute at both ends, incised-serrate, dark green and almost glabrous above, grayish-tomentose beneath, 1-1 1/2 in. long: fls. rather large, pure white, in pubescent umbels; sepals ovate-lanceolate, upright in fr.: follicles pubescent, with spreading styles. May, June. Of garden origin. — Only half-hardy North.


17. pubescens, Turcz. 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. 1/4-1/2 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-fld. form as handsome as the foregoing species.

18. média, Schmidt (S. confusa, Regel & Koern.). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young: lvs. ovate to oblong, cuneate at the base, incised-serrate above the middle, almost glabrous or pubescent, 1-2 1/2 in. long: fls. in many-fld. 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. glabrescens, 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. sericea, 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-fld., 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. 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. trânsiens, Zabel. Lvs. narrower, oblong-ovate. — This and the preceding species spread by suckers.

20. flexuosa, Fisch. (S. chamaedryfolia 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-fld., short-stalked. May, June. N. E. Asia. Var. stenophylla, Schneid. (S. chamaedryfolia var. stenophylla, Zabel). Lvs. smaller and narrower, usually less than 1 in. long.

Section II. Calospiria. Species Nos. 21-42.

A. Corymba on usually short lateral branchlets along the mostly arching branches of the previous year.

B. Lvs. 1/2-1 in. long, crenate-serrate, or serrate only at the apex: corymba on very short branchlets.

C. Branchlets angular: Lvs. generally oval, obtuse: winter buds with 2 outer scales.

D. Branchlets terete: Lvs. generally oblanceolat; winter buds with several bracts.

E. Upper surface of lvs. glabrous; margin entire; flowering branchlets 2-3 in. long. 23. Veitchii

F. Upper surface of lvs. more or less pubescent, margin usually dentate toward the apex.

G. Inflo glabrous. 24. Wilsonii

H. Inflo pilose. 25. Henriyi

I. Winter buds elongated, pointed, with 2 outer scales: lvs. doubly or inciscely serrate.

J. Foliage pubescent on the veins below, incisely serrate. 26. Rothornii

K. Foliage glabrous, lvs. deeply serrate. 27. Longigemmis

L. Foliage glabrous, lvs. sharply serrate: winter buds ovate, with several scales.

M. Shoot angular: Lvs. usually ovate-oblanceolat, fls. pink. 28. bella

N. Shoot terete: Lvs. usually ovate to elliptic: fls. white. 29. expansa

AA. Corymba terminal on upright shoots of the year.
SPIRÆA

B. Inf. pubescent, rarely glabrous, very compound, besides the terminal corymb, sometimes blooming alone or what later appear beneath it, only weak branches with a single corymb.

C. Shrub 1 ft. or less, with bullata, less than 1 in. long...

D. Branches terete.

E. Ripe follicles diverging...31. japonica

F. Fls. pink...32. margaretae

G. Fls. whitish or blushed...33. Fozii

DD. Branches more or less angular, rather stiff, almost glabrous.

E. Color of fls. pink, rarely whitish...34. Bumalda

EE. Color of fls. white...35. abiflora

BB. Inf. consisting of only one terminal corymb, usually glabrous: follicles not diverging.

C. Corymbs usually pubescent.

D. Sepals reflexed in fr.: Ivs. generally oblong, acute, or acuminate; fls. pink or whitish...36. superba

DD. Sepals upright in fr.: Ivs. generally ovoid or oval; fls. white...37. corimbosa

CC. Corymb glabrous (often puberulous in No. 41).

D. Stamens longer than the petals.

E. Fls. pink; annular disk wanting...38. densiflora

EE. Fls. white; disk present.

F. Lvs. oblong, entire, or with few teeth above the middle; flowers...39. virginiana

FF. Lvs. oval or elliptic, toothed.

a. Margin of Ivs. sharply, often doubly serrate, acute acuminate...40. lucida

bb. Margin of Ivs. crenate-dentate, rounded...41. betulifolia

DD. Stamens as long as petals; decompound shrub: Ivs. 5/2-1 in. long, sharply serrate...42. decumbens

21. canescens, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches; branchlets angled: lvs. broadly oval to obovate, very short-petioled, crenately dentate above the middle, grayish green, pubescent; the youngest glabrous at length, 7/4-3/4 in. long: fls. white, rather small, in dense, semi-globose corymbs to 2 in. across, appearing very profusely along the branches; stamens about as long as petals; sepals upright or spreading in fr.: follicles villous, with the ascending styles a little below the apex; July. Himalayas. Gn. 45, p. 49; 49, p. 421; 55, p. 148; 61, p. 406; 62, p. 414; G.C. III. 43:90.—Very graceful and handsome shrub, but not hardy N. It occurs under very many different names in the gardens, as S. cuneifolia, S. cuneola, S. flagellata, S. flagelliformis, S. rotundifolia, S. vaccinifolia, and others. Var. myrtifolia, Zabel (S. argéntia, Hort.). Lvs. dark green above, glaucescent and less pubescent below, narrower. M.D.G. 1906:385.

22. Sargentiana, Rehd. Shrub, to 6 ft., with slender spreading branches; branchlets terete, puberulous at first, soon glabrous: lvs. elliptic-oblong to obovate-oblong, narrowed into the petiole, with a few acute teeth at the apex, rarely entire, puberulous above, villous beneath, chiefly on the corymbs; flowers...3665. Spiræa Henryi. (×10)

3665. Spiræa Henryi. (×10)

23. Veitchii, Hemsl. Shrub, to 12 ft., with spreading and arching branches; branchlets puberulous while young, reddish, striped: Ivs. oval to oblong, rarely obovate, obtuse, cuneate at the base, entire, finely puberulous beneath and glaucous, glabrous above, 7/4-1/4 in. long: corymbs 1/2-2/3 in. across, pubescent: fls. 3/4 in. across, white; calyx puberulous; stamens longer than petals: carpels glabrous, upright. June, July. B.M. 3883. J.H.S. 35, p. 152, fig. 98. G.M. 52:698.—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: lvs. very short-petioled, oval to oblong or obovate, 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, 7/4-2/3 in. long: corymbs dense, 1/2-2 in. across, glabrous or nearly so: fls. 3/4 in. across, pure white; calyx glabrous; follicles sparingly pilose, slightly spreading. June. Cent. and W. China. B.M. 3890. G. 35:851.

25. Henryi, Hemsl. Fig. 3665. Shrub, to 8 ft., with spreading branches; branchlets sparingly pilose or nearly glabrous: lvs. obovate or oblong to oblanceolate, 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, 7/4-3 in. long; petiole 7/4-3/4 in. long: corymbs 2 in. across, rather loose, pilose: fls. 3/4 in. across: stamens shorter than petals: follicles hairy, slightly spreading. June. Cent. and W. China. B.M. 8270. Gn. 65, p. 44. J.H.S. 28:62, fig. 20. G. 37:35. Var. notabilis, Farquhar. Corymbs larger.

26. Rosthornii, Pritz. (S. pratiti, 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, pubescent; ovate to ovate-oblong, acuminate, cuneate at the base, rarely nearly rounded, incisely serrate, bright green, hairy on the veins beneath, 1 1/4-3 in. long; petals 1 1/4-1 1/2 in. long; corymbs rather loose, 2-3 in. across, pilose, on elongated branchlets: fls. 3/4 in. across, white, stamens longer than petals. June. W. China.—A graceful shrub with handsome bright green foliage.

27. longigeminus, Maxim. Fig. 3666. Shrub, 4 ft. high, with slender terete branches, glabrous: axillary buds ovate-lanceolate, elongating before the petals: lvs. ovate-lanceolate to oblong-lanceolate, incisely and doubly serrate, with glandular-tipped teeth, bright green, glabrous, 1 1/4-2 1/2 in. long: fls. white in rather loose 2-3 in. broad pubescent corymbs; sepals spreading in fr.: follicles almost glabrous, with terminal spreading styles. June, N. W. China. G.F. 7:345 (adapted in Fig. 3666).

I.T. 5:92. G. 34:43.—Hardy.

28. béla, Sims (S. exspina, Wall. S. ovata, and S. coccinea, Hort.). Shrub, 3 ft. high, with slender, spreading branches, angular and sparingly pubescent: lvs. ovate-elliptic to ovate-lanceolate, acute at both ends, sharply serrate from below the middle, almost glabrous, whitish or bluish green beneath, 1-2 in. long: fls. dioecious, 3/4 in. across, pink in small corymbs, 1 1/2 in. long.

29. *expansa*, Koch (*S. bella 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, 1 1/2-3 in. long: fls. white, 1/4 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. *japonica*, Linn. (*S. callus*, 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. callus* is var. *Fortunei*, Rehd. (*S. Fortunei*, Planch. *S. callus*, Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2-4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurred, callous-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 deciduous petioles and the infl. is less compound. Other varieties of Chinese origin are the two following recently intro. varieties. Var. *acuminata*, Franch. Lvs. ovate-oblong to lanceolate, acuminate, green and pubescent beneath, at least on the veins, 2-3 1/2 in. long: fls. pink, in terminal corymbs 4-6 in. across. Cent. and W. China. Var. *ovalifolia*, Franch. Lvs. oval to elliptic, acute, glabrous and glaucous beneath, 1 1/2-3 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 corymb 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. *atrosanguinea*, Zabel. Fls. deep pink, in tomentose corymbs. Var. *ruberrima*, 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. *Fózii*, 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. albiloba, Miq. (S. japonica alba, Regel. S. leucanth, Lange). Fig. 3067. Low shrub, 1½ ft. high, with stiff, upright branches: lvs. lanceolate, coarsely or sometimes doubly serrate, glabrous, 1–2 in. long: fls. white, in dense corymbs, one large terminal and many smaller ones below along the branch; disk prominent; sepals reflexed in fr.: follicles upright, not or little diverging. July, Aug. Japan.

36. supérba, Zabel (S. albiloba × S. corymbosa). Low shrub, with striped dark brown branches: lvs. elliptic-oblong to oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1–3 in. long: fls. rather large, pink or almost white; disk prominent; petals orbicular or broadly obovate. June, July. Of garden origin.


39. virginiána, Brit. Much-branched shrub, to 4 ft., glabrous: lvs. lance-oblong, acute, cuneate or rounded at the 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 2 in. across. June. Va. to N. C. and Tenn. B.B. (ed. 2) 2:246.

40. lácida, Douglas (S. corymbosa var. lácida, Zabel). Closely allied to S. corymbosa: branches yellowish brown or brown; lvs. more incisely serrate, oval or obovate: corymb glabrous, usually looser and more flat, broader. June, July. Brit. Col. to Sask., Wyo, and Ore.

41. betulífolia, Pall. Low, much-branched shrub: lvs. oval to obovate-oblong, usually cuneate at base and very short-petioled, serrate or crenately serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ½–1½ in. long: corymb 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. betulífolia.


Section III. Spiræa. Species Nos. 43–55.

A. Infr., a broad panicle, about as broad as high. (Hybrids 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, up-right branches.

Cc. Lvs. glabrous or nearly so.

D. Apex of lvs. acute. 44. conspicua

DD. Apex of lvs. obtuse or acutish.

E. Shape of lvs. broadly ovate or oblong. 45. notha

EE. Shape of lvs. oblong or oval-oblong. 46. pyramidata

Gg. Lvs. pubescent or tomentose beneath.

B. Base of lvs. acute. 47. sanssouciana

DD. Base of lvs. rounded. 48. Watsoniana

AA. Infr., an elongated panicle, longer than as broad. (Spiræa proper.)

B. Foliage glabrous or nearly so.

Bb. Lvs. sharply serrate, except at the very base.

Bbc. Lvs. coarsely serrate above the middle: fls. pink. 49. salicifolia

EE. Fls. white. 50. alba

D. Panicles glabrous. 51. laifolia

Gc. Lvs. coarsely serrate above the middle.

C. Follicles glabrous: lvs. grayish or whitish tomentose beneath.
43. Fontenayssis, Billiard (S. fontenaysensis, Dipp. S. canescens × S. salicifolia). Shrub, 6 ft. high, with slender, upright branches: lvs. oval or oblong-ovate, rounded at both ends, crenately serrate above the middle, pale bluish green beneath, almost glabrous, 1½-2½ in. long: fls. white or pink, in 1½-3 in. long panicles; petals orbicular, about as long as stems; sepals spreading in fr. June, July. Of garden origin.—Not quite hardy N. Var. álba, Zabel, is the white-fl., var. rósea, Zabel, the pink-fl. form. S. pruinósa, Zabel (S. brachylóbria, Länge. S. lucúrótós, Hort. S. canescens × S. Douglassi), is a similar form, but the lvs. are tomentose beneath and the fls. pink.

44. conspícus, Zabel (S. albiýlóra × S. álba). Upright shrub, 3 ft. high, with dark brown puberulous branches: lvs. elliptic-oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1½-2½ in. long: fls. pinkish white, in broad finely pubescent panicles; petals shorter than stems. July–Sept.—Handsome form. A similar hybrid is S. syringáeflóra, Lem. (L. albiýlóra × S. salícifólia), with oblong-lanceolate or lanceolate lvs., serrate above the middle, and pink fls. Closely allied is also S. semperfíórensc, Zabel (S. japoníca × S. salícifólia, S. japoníca or S. fortííéíeí var. panicuílátí, Hort.). Higher than the former; lvs. oblong-lanceolate; usually less serrate: fls. pink. R.H. 1860, pp. 496, 497. Gn. 45, p. 48. G. 3:191.

45. nótha, Zabel (S. corymbósa × S. latífólia). Shrub, 3 ft. high, with brown, glabrous branches: lvs. broadly ovate to ovobate, short-petioled, coarsely and doubly serrate, almost glabrous, 1-2 in. long: fls. white to pinkish white, in broad, glabrous panicles; stems almost twice as long as the orbicular petals. July, Aug.—Of garden origin.

46. pyramídáta, Greene. Possibly hybrid between S. lucída and S. Menziéís. Upright shrub, 3 ft. high: lvs. oval-oblong to oblong, acutish or obtuse, usually doubly serrate above the middle, glabrous or nearly so, 1½-3 in. long: panicles 1½-3½ in. long, rather dense, puberulous: fls. pinkish or almost white. July. Found wild in Ore. and Wash.


49. salícifólía, Linn. (S. sübríca, Raf. S. salícifólía var. cărnea, Ait.). Upright shrub, 5 ft. high, with terete yellowish brown branches puberulous when young: lvs. oblong-lanceolate to lanceolate, sharply and sometimes doubly serrate with often incurved teeth, 1½-3 in. long; fls. light pink or whitish, in oblong, dense, tomentose panicles leafy below, the lvs. exceeding the ascending ramifications; stamens twice as long as petals; sepals upright in fr.; follicles ciliate at the inner suture. June, July. S. E. Eu. to Japan and probably Alaska. R.F.G. 24:152. G.W.H. 82. Var. grandíflóra, Dipp. (S. grandíflóra, Lindl.). Lower, with larger, lighter pink fls. L.B.C. 20:1958.

50. álba, Dur. (S. salícifólía var. paniculátá, Ait. S. lanceolátá, Borkh.). QUEEN OF THE MEADOW. MEADOW-SWEET. Attractive upright shrub, attaining 6 ft., with reddish brown branches puberulous when young: lvs. narrow, oblong to oblanceolate, acute, usually regularly simply serrate, 1½-2½ in. long: fls. white, in leafy pyramidal tomentulose panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens white, usually 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. salícifólía.

51. latífólia, Borkh. (S. salícifólía var. latífólia, Ait. S. carpiníflóra, Willd. S. canádíénisc, Hort. S. bethléhemíénisc, Hort.). QUEEN OF THE MEADOW. MEADOW-SWEET. Fig. 3668. Branching shrub, 2-5 ft. high, with bright or dark red-brown glabrous twigs: lvs. broadly oval to obovate 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 stems 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. E.M. 2:485. G.C. III. 43:417.—This and the preceding species have been referred to most American botanists to S. salícifólía. S. alba is chiefly found west, S. latífólia east of and on the Alleghanies, while the true S. salícifólía is an Old-World species.

52. Menziéíséí, Hook. (S. Douglassii var. Menziéíséí, Presl). 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 rather 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.
SPIRANEA


55. tomentosa, Linn. HARDHACK. STEEPLEBUSH. Shrub, 4 ft. high, with upright, brown, tomentose branches: lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely yellowish or grayish-tomentose beneath, 1-2 1/2 in. long: fls. deep pink or purple-red, in dense, rather narrow or sometimes broad panicles, 3-8 in. long; stamens somewhat longer than the obvolute petals; sepals reflexed: follicles pubescent, usually diverging. July-Sept. Nova Scotia to Ga., west to Man. and Kans. B.B. (ed. 2) 2:245. Em. 2:485. Gn. 5:344. Var. albta, Rehd. (l. albiflora, Macbride). With white fls., often pubescent, and by suckers like most of the species of 

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Spiranthes

S. cernua, Rich. NODDING LADIES’ TRESSES. Lvs. mostly basal, linear or linear-oblongate: st. 6–25 in. high, usually pubescent above, with 2–6 acuminate bracts: fls. white, yellowish, fragrant, nodding or spreading, in a spike 4–5 in. long; lateral sepals free, the upper one connivent with the petal; labellum oblong, contracted above and dilated toward the apex. July, Aug. N. Y. to Fla. and La.

S. hoodii, Schlecht. (Neottia cernua, Jacq.)=Stenorrhynchos. HEINRICH HASSELBRING.

Spiranthes (S. cernua) is a genus of perennial herbs with showy flowers, often found in moist habitats in North America and Europe.

Spondias

S. præcox, Wats. (S. graminifolia var. Walteri, Gray). Lvs. linear, 4–12 in. long, grass-like: st. 10–30 in. high, glabrous, pubescent above, leafy: spike 2–8 in. long: fls. white or yellowish, spreading; lateral sepals free, the upper one connivent with the petal; labellum oblong, contracted above and dilated toward the apex. July, Aug. N. Y. to Fla. and La.


S. cytherea, N. E. Br. (Neottia species, Jacq.)=Stenorrhynchos. HEINRICH HASSELBRING.

Spondias (S. præcox) is a species of flowering plant in the family Anacardiaceae, native to tropical regions of the Americas, with ornamental flowers and fruits used in horticulture.

Romanzoffiana, Cham. & Schlecht. Lvs. linear to linear-oblongate, to 3–8 in. long: st. 6–15 in. high, leafy below: spike 2–4 in. long: fls. white or greenish, ringent; sepals and petals broad at base, connivent into a hood; labellum oblong, broad at the base, contracted below and dilated at the apex, crisp. July, Aug. N. Amer. G.C. II. 16:465; 26:400.

Ilícida, Ames. St. 4–10 in. high, glabrous or pubescent, bearing 4–5 lanceolate or oblongate lvs. near the base: fls. small; sepals and petals white, lateral sepals free, narrowly lanceolate, the upper one somewhat united with the petals; labellum oblong, yellowish above, not contracted in the middle, wavy, crisp, obtuse or truncate. June–Aug. Maine to Minn. and Va.

Spondias

S. cytherea, Sonn. (S. dólchis, Forst.). OTAHEITE-APPLE. POMME CYTHÈRE. CAJA MANGA. VI or Evi in Tahiti.

S. cytherea is native to the Pacific Islands, particularly Tahiti and Samoa, and is known for its ornamental flowers and fruits.
SPRAGUE

SPONDIAS

void, golden yellow, up to 3 in. long, the seed about 1½ in. long, oval, echinate. Society Isla, but widely spread in the tropics.

Mombin, Linn. (S. purpurea, Linn.). Spanish Plum. Prunier d'Espagne. Ciruela. Small tree, sometimes spreading, stiff, up to about 25 ft. in height: lvs. 5–8 in. long; lfts. 16–21, oblong-elliptic, 1–1½ in. long, ±3 in. broad, usually somewhat asymmetrical, acute or bluntish, subrulate, racemose in the axil, about 1½ in. long, few-fl.; the fls. purplish maroon: fr. oblong-obovoid, commonly purplish, about 1 in. long, the seed oblong-elliptical, ±3/4 in. long, roughened on the surface. Trop. Amer.

lútea, Linn. (S. Mombin, Jacq., not Linn.). Hog-Plum. Mombin. Jabo. Cájé. Tall, slender tree, up to about 60 ft. in height: lvs. 8–12 in. long; lfts. 7–17, ovate-lanceolate or lanceolate, 2–3/4 in. or 2 in. long, 1–1½ in. broad, subventire or serrulate; panicle ½–1 ft. long, the flower yellowish-white: fr. ovoid, yellow, 1–1½ in. long, the seed oblong, ±1 in. long, smoothish. Cosmopolitan in the tropics.

pinnata, Kurz (S. mangifera, Willd.). Hog-Plum. Mombin. Amra. Small tree: lvs. 12–16 in. long; lfts. 5–11, ovate-oblong or elliptic-oblong, 4–6 in. long, 1½–2 in. broad, acuminate or entire; panicle 10–14 in. long, the flower whitish: fr. ovoid, yellow-green, 1½–2½ in. long, the seed oblong-elliptical, 1½–2 in. long. smoothish. Trop. Asia; according to Hooker, ascending to 5,000 ft. in the Himalayas.

tuberossa, Arruda. Ímú. Ímú. Low, spreading tree, up to 25 ft. in height, with swollen roots: lvs. 4–6 in. long; lfts. 5–9, oblong-ovate, 1–1½ in. long, ±3/4 in. broad, sharply acute to acuminate, coriaceous at base, entire; panicle 4–6 in. long; fls. whitish: fr. ovoid, light yellow, 1½ in. long, the seed oblong-ovate, slightly flattened, ±½–¾ in. long, smooth. Brazil.

Cultivation and uses. The Otahiite-apple, S. cytherea, is said to have been introduced to Jamaica in 1782, and again in 1792 by the famous Captain Bligh, who brought the bread-fruit to Tahiti to the West Indies. It has not become popular in Cuba, nor is it very extensively grown on the mainland of tropical America. In south Florida it succeeds well, and fine specimens can be seen at Miami and other points. S. cytherea is very firm, but 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 worthy of culture 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 rough 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 sparsely, superficially 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, others rather inferior. In Cuba, where this fruit is called ciruela, the different varieties are distinguished by the addition of such words as roja (red), amarilla (yellow), and the like. In Brazil the species seems to be 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 ripened in California, though it may be possible to grow it success-fully in favored locations. The tree, which is much smaller than the Otahiite-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 Otahiite-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. Firms of it in a drink makes an excellent refreshing drink. The tree is large and handsome, and is a conspicuous feature of many Cuban landscapes. S. pinata, 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 preserves, and for curds. Firminger advises using it as a stock for S. cytherea.

The imbu 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 plum or date, and is very agreeable. Pickles are 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 inarched, 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. POPENEOE.

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 Mildeye, Rust, and Smut, in Vols. III, V, VI. For propagation by spores, see the discussion under Ferns, page 1211, Vol. III.

SPOROBOLUS (Greek, spora, seed, and ballein, to cast forth, referring to the grain readily falling from the spikelet). Gramineae. DROOSPeed. Spikelets 1-ld.; most of them usually shorter than the ovary or ovoid in form. 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. Wrighti-anus, Munro, Sacaton, of the alkali lands of the S. W. and of Mexico, and S. airoides, Torr., an allied species, furnish pasture in alkali flats. S. virgatus, Loisel., a small annual with minute spikelets in a delicate panicle, is offered as an ornamental by some seedsmen under the name of Agrostis minitiflora. The species are little known horticulturally. A. S. HITCHCOCK.

SPRÁGUEA (named for Isaac Sprague of Cambridge, Mass., botanical artist, collaborator of Asa Gray). Portulacceae. Dwarf half-hardy perennial herbs, well adapted to the rocker: lvs. radical, spatulate, somewhat fleshy; the caudine minute, alternate:
SPRAGUE

stipules small and scarious: fls. ephemeral, in dense, scorpioid 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 8-10, black and shiny.—One, possibly 2 species, W. C. America.

umbellata, Torr. Sts. several, simple, erect, 2—12 in. high: radical lvs. spatulate or ob lanceolate; the cauline similar but smaller: fls. white, tinged rose, in a dense capitate umbel of nearly sessile spikes; sepals con spicuous; petals oblong-ovate. Late summer. Sierra Nevada, at 3,000—10,000 ft. altitude, from the Yosemite valley to the British boundary, usually in sandy dry soils. B.M. 5143. May be treated as an annual. Var. caudicifera, Gray, is a subsalpin form in which the caudex-like branches extend for a year or more (the 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.

SPRAYING: Diseases and Insects, page 1057, Vol. II.

SPREKELIA (J. H. von Speckelsen, of Hamburg, who sent the plants to Linnaeus). Amaryllidaceae. Japanese Lily. Half-hardy bulbous plants, generally grown in the greenhouse, often known as amaryllis lvs. appearing late, strap-shaped-linear: scape hollow, cylindrical, 1-fld.: fl. large, showy; perianth gaping, tube none, upper segm. broadest, 2 lateral lanceolate, 3 lowest deflexed, rolled together inclosing the stamens and style; ovary turbinate, 6-angled, 3-celled: caps. globose-trigonic, 3-valved. — One species, Mex. For cult., see Amaryllis; also consult Hippeastrum, with which these plants are sometimes confused.

formosissima, Herb. (Amaryllis formosissima, Linn.). Bulb globose, 2 in. diam.; tunics brown: lvs. 3—6, con temporary with the fls., linear, green, finally 1—1% ft. long; pedunde reddish, 6—12 in. long; spathe red-brown, 2 in. long, bifid at the tip; pedicel erect: perianth bright crimson, 3%-4 in. long. April. B.M. 47. G.L. 27:140. G.W. 15, p. 358. Var. glauca, Baker (S. glauca, Lindl.), has glaucous lvs.: fls. smaller and paler than the type. B.R. 27:16. F. TRACY HUBBARD.

SPRING BEAUTY: Claytonia.

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 that is not already written in other articles in this work, but names of a few plants for spring effects may be suggested.

The spring-gardener will think first of bulbs—cro cuses, hyacinths, tulips, squills, snowdrops, fritillaries, and others. These are described under their regular alphabetic generic entries, and also under the article Bulbs in Vol. I.

If one does not have a greenhouse, many of the annual flowers may be used for early spring bloom if the seeds are started in the window, or, as with pansies, if plants are established in autumn and carried over winter under a protection of leaves or other mulch. Some of the early-blooming hardy annuals are al y sum, candytuft, collinsia, daisy (Bellis perennis, perennial but may be treated as an annual after the manner of pansies), pansy, schizopetalon, stocks, violet, Virginian stock, wallflower (annual), pinks as annuals.

The spring-garden will derive its chief satisfaction, however, from the early-blooming perennial herbs, of which there are several numbers of very attractive species. A few of the best kinds are here named: Adonis vernalis, anemonis, arabis, arbutiu, aquilina, clintonia, cowslip (Primula), dicienra, forget-me-not, heliollorus or Christmas rose (earliest, except perhaps some of the bulbs), iris, oxalis, Papaver nudicaule, pinks, polyanthus and other kinds of primula, pyrethrum, wallflower (perennial), and very many native perennials as epigae, trillium, erythronium, hepatica, isopyrum, anemone, claytonia, phlox, sanguinaria, caltha.

The wealth of early-blooming trees and shrubs must not be overlooked, nor the beauty of sturdy herba cious growths pushing from the ground.

A good part of one’s success in spring-gardening results from careful preparation the previous autumn, particularly in providing good winter protection for young or partially tender plants that are to be carried over. All should be made ready before winter closes in, so that the first advantage may be taken of the opening of spring.

L. H. B.


SPURRY (Spergula salteae, which see) has long been grown in Germany, France, Holland, and Belgium, where its value 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 sown 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.

L. A. CLINTON.

SQUASH: See the article Pumpkin and Squash, page 2859, Vol. V.

SQUAW-BERRY: Mitchella repens.

SQUILL: For the garden squill, see Scilla; for the medicinal squill, see Urginea.

SQUIRREL-CORN: Dicentra canadensis.

STACHYS (from an old Greek name applied by Dios corides to another group of plants, coming from the word for spike). Labiate. 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. 3a:200. 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. spectabilis) has come into notice as a kitchen-garden plant.
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KEY TO SECTIONS.

A. Outer bracts developed, reaching at least half-way up the calyx, often equaling or even exceeding it.
B. Annulus or ring at base of corolla absent; corolla-tube mostly exerted; anther-cells parallel.
C. Corolla more than 1 in. long
D. Corolla scarcely less than 1 in.
E. Lowest floral-lvs. lanceolate.
F. Lvs. white beneath.
G. Lvs. green or pale beneath.
H. Calyx ½ in. or more long
I. Calycerta scarcely ½ in. long

1. densiflora, Benth. (Betonica inaeqa, Ait.). Perennial, 1½ ft. high; sts. erect, hispate; lvs. 2–3 in. long, petiolate, ovate-oblong, obtuse, crenate, base cordate, soft-pilose or more or less villous; floral lvs., lowest corolla-ovate, short-petiolate: floral whors approximate in a dense spike, lower whors remote: calyx campanulate; corolla villous outside, flesh-colored. S. Eu. B.M. 2125.—There are older names referred to this species, but it is not certain that they are truly synonyms; even Betonica inaequa may not belong here.

2. officinalis, Franch. (S. Bétonica, Benth. Bétonica officinalis, Linn.). BETONY. Fig. 3671. A hardy perennial herb 1–3 ft. high: lower lvs. long-petiolate, ovate-oblong, crenate, obtuse, coriaceous at the base, 3–6 in. long; upper lvs. sessile, obovate-lanceolate, acute: fls. purple, in dense, terminal spike. July. Eu., Asla Minor. —Rarely found as an escape in this country, and once cultivated for use in domestic medicine. Useful for ornament, and now advertised for that purpose. There are white-fl. forms of the species offered in the trade, under the names of S. Bétonica alba and S. Bétonica albiflora and there is also a large-fl. form with soft rose-colored lvs. known as S. Bétonica grandiflora.

3. grandiflora, Benth. (Bétonica rösea, Hort. B. spicata, Hort. B. grandiflora, Willd.). A hardy perennial about 1 ft. high: lower lvs. broadly ovate, obtuse-crenate, long-petiolate, base broadly heart-shaped; the upper gradually smaller, nearly similar and sessile, the uppermost bract-like: fls. violet, large and showy, the perianth tube about 1 in. long and 3 or 4 times surpassing the calyx; in 2–3 distinct whorls of 10–20 lvs. each. Asla Minor, etc. B.M. 700. G.M. 53:628. Var. robusta, Hort. (Betonica grandiflora robusta, Hort. B. spicata robusta, Hort.), is said to have tufts of corrugated lvs., to grow 18 in. high and spikes 3 in. long of rosy pink fls. Gn.W. 25:

290. Var. superba, Hort. (Bétonica 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 Beetroica superba alba.

4. longifolia, Benth. (Betonica orientalis, Linn.). A hardy perennial herb about 1 ft. high, densely villous: lower lvs. petiolate, oblong-lanceolate, obtuse, crenate, deeply coriaceous 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 1½ ft. long. July. Caucasian.—Briet in Engler & Prantl’s Pflanzenfamilien has adopted macrostachys as the specific name, basing his name on Bétonica macrostachys, Wender, but authorities differ as to the identity of Wender’s material, hence the Bentham name has been retained.


Section II. ERIOSTOMUM. Species 6–10.

AA. Outer bracts minute, very much shorter than the calyx.

Section III. EUSTACHYS. Species 11–17.

A. Corolla yellow
B. Corolla purple or pink.
C. Base of lfs. cordate.
D. Base of lfs. narrowed or sometimes rounded-cordate.
E. Lvs. green above or on both surfaces.
F. Lvs. green on both surfaces.
G. Lvs. green above, canescent to lanate beneath. 10. sericea

6. tmolea, Boiss. Perennial, about 1 ft. high: sts. ascending, densely sericeous-pamose: lvs. lanceolate or oblong-lanceolate, obtuse, obscurely dentate, petiolate, the radical about 3 in. long: floral lvs. oblong, acuminate: floral whors densely many-fl., far remote: calyx pedicellate, hispate, long-campanulate; corolla yellow, tube included. Mt. Tmolus region, Asia Minor.

7. germanica, Linn. Perennial, 1–4 ft. high: sts. subterranean, tall, loosely white-lanate: radical lvs. 2–5 in. long, rather long-petiolate; caudine lvs. short-petiolate, ovate or ovate-lanceolate, obtuse, base usually cordate, crenate; lower floral lvs. subessissile, somewhat clasping, crenate-white-lanate; floral whors many-fl., distinct, racemose, upper approximate: calyx lanate inside; corolla pale pink, variegated with white, lanate outside, tube included. Eu., Cent. Asia and N. Afr. B.R. 1280. Var. Boissiéri, Briq. (S. crética, Sibth. & Smith, not Linn.), has oblong or linear-lanceolate or oblong-triangular or short-lanceolate floral lvs. and a rose-colored corolla, the upper lip of which is lanate. S. E. Eu., Asia Minor, and Syria.
8. *lanata*, Jacq. WOOLLY WOUNDWORT. A hardy perennial 1-1 1/2 ft. high, white-woolly throughout: lvs. oblong-elliptical, the upper smaller, the uppermost much shorter and whorled: fls. small, purple, in dense 30- or more-fld. whorls in interrupted spikes. Caucasus to Persia. Gn. 78, p. 543.—Often grown as a bedding plant. Valuable for its very white herbage.

3672. Tuber of *Stachys Sieboldii* (X3/4)

9. *alpina*, Linn. Herbaceous, tall: sts. erect, pilose 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, 15-20-fld.: calyx rather pilose, teeth lanceolate-ovate, strongly spinous; corolla obscurely purplish or red-brownish, about twice as long as the calyx. Eu.

10. *sericea*, Wall. Herbaceous, tall: st. erect, very pilose: lvs. petioled, ovate or ovate-oblong, rather obtuse, crenate, base cordate, both surfaces villous, 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, spinous; 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. Eustachys.**

**A. Species annual**

17. *corsica*, Linn. *Species perennial*. **B. Corolla-tube long-exserted**


13. *aspera*, Michx. Erect, usually strict, 3-4 ft. high. The st. retrorsely hairy on the angles: lvs. oblong-ovate to oblong-lanceolate, mostly acuminate, serrate, petiolo, corolla small, glabrous, pale red or purple, in an interrupted spike. Wet places, Ont. and Minn. to the Gulf. L.B.C. 15:412.—Has been offered by dealers in native plants.

14. *floridana*, Schult. & Schultes, erect, 1-2 ft. branching, glabrous: lvs. cordate-oblong-lanceolate, blunt-toothed, stalked: fls. small, light red, in an open interrupted spike: tubes 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 *S. Sieboldii*.

**Subsection Recete.**

15. *recta*, Linn. (S. *sylvestris*, Forsk.). Perennial: st. erect or ascending, about 2 ft. high, pilose: lvs. short-petioled, ovate-ovate or lanceolate, obtuse, crenate, 1-1 1/2 in. long, base rounded or narrowed, rugose, hairy; floral lvs. sessile: floral whorls about 10-fld., distant: calyx ovate-campanulate, hairy, teeth ovate, subspinose; corolla yellowish white, throat purplish glabrous, twice as long as the calyx. S. Eu., Caucasus. Var. *leucoglossa*, Boiss. (S. *leucoglossa*, Griseb.). Lvs. narrowly lanceolate, lower serrate, upper entire and linear: calyx somewhat scabrous, teeth as long as the tube. Caucasus.

**Subsection Infraeulures.**

16. *citrina*, Boiss. & Heldr. Subshrub, gray-canescen-t panose: lvs. 1-1 1/2 in. long, all basal, long-petioled, elliptical, obtuse, base attenuate, entire or minute, crenulate; floral lvs. narrower: fls. in small terminal heads which are short-ovate, dense; the lower floral whors often subdistant and interrupted; calyx hissute, campanulate; corolla sulfur-yellow, hissute outside, included in the calyx. Greece, E.

17. *corisca*, Pers. Fig. 3673. Slender procumbent pilose herb: lvs. about 3/8 in. long, petiolo, ovate, very obtuse, broadly crenate, base rounded or subcordate; floral lvs. smaller: floral whors 2-4-fld., remote: calyx campanulate, hispid, teeth lanceolate, acute, subspiny; corolla pinkish white, twice as long as the calyx, the tube short-exserted. Medit. region.

3673. *Stachys corsica*. (X3/4)

**Subsection Genuinae.**

12. *Sieboldii*, Miq. (S. *affinis*, Bunge, not Fresenius. S. *tuberosa*, Naudin). *Chorogla*. CHINESE or JAPANESE ARTICHOKE. KNOTROOT. CROSNES DU JAPAN. Fig. 3672. Erect hairy mint-like plant, growing 10-18 in. tall: lvs. ovate to deltoid-ovate to ovate-lanceolate, cordate at base, obtuse-dentate, stalked: fls. small, whitish or light red, in a small spike: tubers (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 is cult. 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. 57.
STACHYS

_Batonia cárnea_, Hort., is offered in the trade, probably a flesh-colored form of _S. grandiflora._ _Batonia ríbária_, Hort., is also in the trade, probably a red-did. form of _S. grandiflora._

F. TRACY HUBBARD.

STACHYTARPÉTÁ (Greek, dense spike). _Verbenáceae._ Simple pilose, villous or glabrous herbs or shrubs, suitable for the warmhouse but hardly outside in the extreme southern United States.

Leaves opposite or alternate, dentate, often rugose: spikes terminal, sometimes long and dense, sometimes short or lax: fls. white, blue, purple, or scarlet, solitary in the axils of the bracts, sessile or half sunk in the rachis of the spike; calyx narrow-tubular, 4-5-ribbed, 4-5-toothed; corolla-tube cylindrical, limb spreading, 5-cleft, lobes broad, obtuse or retuse; perfect stamens 2; ovary 2-celled: fr. included in the calyx, oblong-linear.

—About 50 species, mostly natives of Trop. and Subtrop. Amer. and one ( _S. indicá_ ) is dispersed very broadly in the tropics of Afr. and Asia.

_mutabilís_, Vahl. A low shrub, scabrous-pubescent: lvs. ovate, dentate, scabrous above, whitish-pubescent beneath: spike long, erect: bracts lanceolate, subulate: calyx 4-dentate, hispid, 4-6 lines long; corolla crimson, fading to rose, ±5½ in. across. W. Indies, Mex. to Guiana. B.M. 976. GT. 8, p. 178.—Cult. in S. Calif. _S. indica_, Vahl. ( _S. jamaicénís_ ), Dalz. & Gibs.). Herb, 1-2 ft. high: branches quadrangular: lvs. 1-4 in. long, elliptic, serrate: spikes 3-12 in. long; fls. finally sunk in the thickened rachis, deep blue; calyx 4-toothed, 4-nerved. Trop. Amer.; Asia, probably naturalized. B.M. 1860.

F. TRACY HUBBARD.

STACHYRÚS (Greek, spike and tail; in allusion to the form of the inflorescence). _Stachyrúrseae_, formerly usually included in _Ternstræniáceae._ Ornamental woody plants grown for their very early flowers and the handsome foliage.

Deciduous or evergreen shrubs or trees: lvs. alternate, slender, petioled, serrate, with small deciduous stipules: fls. perfect or polygamous, nearly sessile, in pendulous axillary racemes; sepals 4, glabrous; imbricate; petals 4, imbricate; stamens 8 with slender filaments; ovary superior, incompletely 4-celled; style simple, with 4-lobed stigma: fr. a 4-celled, 4-seeded 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 flowers 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.


chinénsis, Franch. Shrub, to 15 ft., very similar to the preceding species: young branchlets greenish or dull brown: lvs. ovate to oblong-ovate, long- acuminate, rounded or subcordate at the base, crenately serrate, glabrous, 2½-5 in. long: fls. spreading, about ½ in. long; style as long as petals or slightly exerted: fr. globose, ½ in. across. March. Cent. China. Gn. 79, p. 182. ALFRED REHDER.

STACKHOUSÍA (named for John Stackhouse, an English botanist). _Stackhousiáceae._ Small herbs from a perennial herbaceous or woody rhizome, used for ornamental planting in warm climates: lvs. alternate, linear or spatulate, entire, leathery or somewhat fleshy; stipules none or very minute: fls. spicate at the ends of the branches or fascicled along the rachis, rarely racemose, white or yellow, hermaphrodite; calyx small, tube hemispherical, 5-lobed or rarely 5-parted; petals 5, linear or spatulate, claw elongated; stamens 5, inserted on the disk-margin, erect; ovary sessile, free, subglobose, 2-5-lobed or -parted, 2-5-celled: fr. splitting up into 2-5 globose, pungent or winged indehiscent berries.—About 20 species, Austral.

monogýna, Labill. ( _S. linariifólía_ , A. Cunn.). A half-hardy perennial herb, usually simple, about 1½ ft. high, with linear or lanceolate lvs. about 1 in. long; spikes at first dense, then lengthening to 4-6 in.: buds pinkish when young; fls. white. B.R. 1917.—The plant in the Californian trade is apparently not the above species, but a tall described shrub which has robust branches 1-2 in. across, surrounded by imbricated bracts and bright yellow fls. with a purple-streaked keel.

F. W. BARCLAY.

F. TRACY HUBBARD.

STADMÁNÑIA (named for Stadmann, a German botanist); also erroneously spelled _Stadmánñia_. _Sapináceae._ Branched pustulate trees, apparently very rarely cult.: lvs. alternate, without stipules, abruptly pubescent: fls. 3-6 pairs, opposite and alternating: lvs. ovate-oblong, obtuse: panicles axillary, branched: fls. small, pedicelled, polygamo-dioecious; calyx subshperical, 5-toothed; petals none; disk thick, raised and lobed; stamens 8: ovary oblong, 3-celled: berry dry, oblong-spherical, indehiscent.—The only species of this genus that is well known is a tropical tree from the Bismarck Isls., there known as bois de fer or ironwood. This is a large tree with hard, heavy reddish wood, once frequent in the primeval forests of Mauritius but now scarce. It is not known to be in cult. in Amer. Nine other names appear in Index Kewensis, apparently all Brazilian species, but one of them is a bare name and the others were first described in the early 1860’s in Linden’s catalogue.


S. amdítís, Hort., is offered in the trade, but is not known botanically: it is said to be an imposing decorative plant for warmhouse cult. and to require the same treatment as gardenias.

F. TRACY HUBBARD.

STAG-HORN FERN. _Platycérrum._ S. Sumach: _Rhus._

STANDARDS OF COLOR MEASUREMENT.

There is no universally acknowledged standard of color measurement, nor any international agreement between physicists and artists as to the constituents of such a
A standard of color exclusively useful in horticulture would be an absurdity, inasmuch as a standard would fail to be as far-reaching as the word implies if it did not meet the requirements of all classes of art, science, and industry. There is nothing logical in one normal red named one way for the horticulturist and another named differently for someone else. In the musical profession tone has been standardized by what is known as International Pitch at middle C of the piano-forte. All musical instruments throughout the world are commonly tuned to that pitch; it is an absolute standard. But as yet, the exact pitch of what is called normal red color is not standardized, and as a consequence the whole chromatic scale which by deduction and mathematical measurement should fall into line by the establishment of this one normal hue remains unfixed and is somewhat of a bone of contention between color experts.

A circle divided into the scientifically significant 360°, each one of which represents a distinct hue of the chromatic scale in tangible pigment, is by no means impossible though it is difficult of accomplishment. The writer successfully completed such a scale and finds it remarkably true to the scientific theory of color balance. At the present time, however, there is no mechanical process capable of reproducing such an exact scale with the fidelity it demands.

A diagrammatic representation of the color circle will be found on page 832, Vol. II, of this Cyclopedia, and the following table (Fig. 3675) indicates exactly the positions occupied in that circle of certain hues contained in the standards of authors mentioned below. A diligent comparison of the figures will demonstrate the lack of agreement among authorities.


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 l.f. contracted to a petiole at the base: f.s. produced on 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 hypochiloid-shaped or saccate, often with two horns on the upper margin, passing gradually into the mesochil, which consists of a fleshy central part and two lateral horns; the terminal lobe or epichil firmly or movably joined to the mesochil, usually biseriate, but not saccate, basally of the labellum continuous with the long-winged column.—About 50 species inhabiting Trop. Amer. from Mex. to Brazil. The f.s. expand with a perceptible sound early in the morning. Stanhopeas enjoy a shady, moist location. A temperature of 60 to 65° F. at night and 70 to 75° during the daytime should be maintained in winter, with a gradual advance of 10° toward midsummer. They should be grown suspended from the roof in orchid cabins or terracotta baskets with large openings at the bottom, and if 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 to use. 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.)

A TABLE OF COMPARATIVE COLORS BASED UPON MATHEMATICAL INTERVALS OF 360° OF THE CHROMATIC CIRCLE.

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<tr>
<th>NORMAL LEVELS</th>
<th>MILET BRADLEY</th>
<th>ROBERT RIDGWAY</th>
<th>LOUIS PRANG</th>
<th>SCHUYLER MATHEWS</th>
<th>EMILY N. VANDERPOEL</th>
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<td>YELLOW 1</td>
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<td>SCARLET 90</td>
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<td>PURPLE 210</td>
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<td>VIOLET 240</td>
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3675. Standards of color.
INDEX.

a. Labellum with an excavated or saccate base and a plane terminal lobe.

b. Mesochil and pleuridria wanting 1. eburnea

c. Mesochil and pleuridria present.

d. Hypochil boot-shaped, short and sessile.

e. Fls. pale yellow.

f. The hypochil white, crimson-spotted, with 2 large brown basal spots.

EE. The hypochil purple or crimson inside.

dd. Fls. orange.

eee. Hypochil Hausknecht or globular.

ff. Not purple; middle lobe triangular.

FF. Not purple; middle lobe concave.

dd. Epichil evidently 3-toothed at the apex.

e. The hypochil not spotted, purple; middle lobe ovalate.

EE. Epichil purple or crimson.

ff. FIs. yellow.

ff. FIs. white.

ee. Sepals and petals spreading, the former broadly ovate.

ff. Sepals and petals reflexed, the former oblong-ovate or oblong-lanceolate.

AA. Labellum reduced to a saccate pouch.

1. eburnea, Lindl. (S. grandiflora, Lindl. S. calceolata, Hort.). Pseudobulbs conical, 1½ in. long; lvs. leathery, 8–12 in. long; sepal pendulous, with small bracts, 2–5-fld.; fls. 5 in. across, ivory-white; sepalas broad; petals narrow; labellum 3 in. long, solid, fleshy, excavated at the base and bearing 2 hooked horns over the mouth, spotted on the back with purple; column orange, with broad wings toward the apex. Guiana. B.M. 3359. B.R. 1529. 1.H. 14:531 (as var. spec- 

tabilis). L.B.C. 15:1414 (as Ceratochilus grandiflorus). 2. WARDII, Lodd. Pseudobulbs 2 in. long; lvs. large, broad, and leathery; f-st. 9 in. long; bearing 3–9 fls., which are bright yellow to golden orange, spotted with crimson; lateral sepal round-oblong, concave, acute; petals lanceolate, revolute, the cavity in the base of the labellum deep velvety purple. Aug. Mex. and S. B.M. 5299. Gn. p. 28. C.O. 2. Var. aerea, Hort. (S. aerea, Lodd.). FIs. golden yellow, with 2 dark spots on the hypochil. Fragnant. 3. ocultula, Lindl. (S. guttulata, C. Koch). Fig. 3676. Lvs. ovate, with a blade 1 ft. long; scape 1 ft. long, clothed with scarious pale brown sheaths, 3–6-fld.; fls. 5 in. across, very fragrant, pale yellow, thickly spotted with purple; sepalas 3 in. long, reflexed; petalas 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. 15:1764 (as Ceratochilus oculatus). S.H. 2 p. 435. G.C. III. 19:264; 43: 19; 44:115; 52:121. J.F. 3:309–10. 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 lvs. as in S. Bucephalus but stouter: scape 2-fld., 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; sepalas 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 sepalas. Colombia. Gn. 33:334.

5. Bucephalus, Lindl. (S. grandiflora, Reichb. f.). Pseudobulbs crowded, rugose; lvs. petioled, 9 in. long, pointed: the pendulous raceme bearing 4–6 large, tawny orange fls. marked with large crimson spots; sepalas 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.


7. Shuttleworthii, Reichb. f. Pseudobulbs large, conic- 

cal, sulate: lvs. broadly oblong, acut; raceme pendu- 

lus, loose: sepalas, petals, and base of the labellum apricot-color with dark purplish blotches, front part of the labellum yellowish white; hypochil semi-globose; horns flattened, suberect, terminal lobe triangular; column whitish, green along the middle and spotted with purple in the inside. Colombia.

8. devoniensis, Lindl. (S. maculata, Knowles & Weste.). Lvs. about 9 in. long; scape pendulous, 2–3-
STANHOPEA

fls.: fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepal oblong to ovate-oblong, obtuse; petals narrow; hypochil broad, saccate, purple, horns incurved, middle lobe ovate, channelled, obscurely 3-toothed. Peru. F.S. 10:974. F.C. 3:121.

9. tigrina, Batem. Lvs. and pseudobulbs as in the genus: scape short, pendulous, clothed with large, thin brown scales; fls. 6 in. across, waxy and very fragrant; sepal broadly ovate, concave; petals oblong-lanceolate, both dingy yellow mottled toward the base with large blotches of dull purple; hypochil broad, cup-shaped; horns 1 in. long, fleshy, bent forward at right angles; middle lobe rhomboid, with 3 fleshy teeth at the apex; column large, spatulate. Mex. B.M. 4197. B.R. 25:1. G. M. 32:398; 38:149. F. 1845:59. G.C. III: 4:451. C.O. 7.—One of the most striking forms among the orchids. Var. lutescens, Hort. Brilliant yellow to orange marked with chocolate.


11. saccata, Batem. Fls. smaller than those of the other species, greenish yellow, changing to deeper yellow at the bases of the sepals, regularly speckled with brown; lateral sepal oblong-lanceolate; petals narrower, oblong, all reflexed; hypochil deeply saccate; horns flat, a little twisted, epichil quadrate. Guatemala. I.H. 8:270 (as S. radiosa).

12. cornuta, Lem. Pseudobulbs and lvs. large; scape reduce, clothed with green bracts, 2-fld.: sepal erect, 2 in. long, ovate, concave, white, petals smaller; labellum reduced to a fleshy sac-like hypochil, 1 1/2 in. long, yellow, mottling to orange at the base; column as long as the labellum and of the same color. Cent. Amer. B.M. 4855. F.S. 2:181. G.C. 1850:295.

S. Ameánae, Hort.=S. Lowl. =S. belliformis=S. insignis x S. poculata. R.H. 1896:322. =S. consolida, Rolfe. Sepals and petals ivory-white, the latter spotted with purple; the sepals elliptic-oblong, spreading, 2 1/2-3 in. long, 1 1/2-2 in. wide, the petals conning, inclining column, about 2 in. long, 1 1/4 in. wide; lip buff-yellow, with the interior of hypochil orange, over 1 1/2 in. long, 3-lobed; hypochil subglobose; epichil oblong, truncate. Colombia. B.M. 8417. C.O. 4.—S. consolidae, Rolfe. Fls. 6 in. across, petals dull gray, narrowly, maroon, waxy, sepal upper blotched, lower, with numerous small purple blotches, the petals 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. peruviana, Rolfe. Fls. golden yellow, petals oblong, the dorsal oblong, the lateral obliquely and broadly oval; petals linear-oblong, revolute; lip with the hypochil suffused dark purple on sides; epichil orbicular-oblong, purple-spotted. Peru. B.M. 8417.—S. Rödlin, Rolfe. Fls. ivory-white, faintly yellowed on lip; petals elliptic-oblong, acute; petals lanceolate-oblong, acute, lip with the hypochil papillose inside, the epichil triangular, acute. Brazil.—S. Rodolphiana, Chaes. Fls. about 6 in. across; sepals spreading, oblong-ovate, purple-marbled below, maroon-blotched above; petals triangular-lanceolate, attenuate above, pale green; lip very fleshy, the hypochil suffused maroon-purple below, the remainder blotched; epichil reticulated, triangular, obtuse, spotted with dull purple. Colombia. B.M. 7702. G.M. 41:492. G.C. III: 24:31.—S. Rödlini, Lindl. Resembles S. Wardi in color, but paler; hypochil obovate; epichil stained pink. Mex. A.F. 6:631.—S. stenochila, F. C. Lehm. & Kranzl. Sepals pure white; petals apricot-colored, wide, petiole yellow; lip yellowish, the hypochil maroon, the epichil yellow, the petals white, violet-black; sepals purple, linear-oblong, with the hypochil suffused dark purple on sides; epichil orbicular, purple-spotted. Colombia.—S. Welleriana, Kranzl. =S. Martiana x S. tigrina. Fls. dull straw-color or pale orange; sepals obtusely rounded at base with wine-red, the spots on the petals: G.C. III: 38:102.

HEINRICH HASSELBRING.

GEORGE V. NASH.

STANLEY (named for Edward Stanley, Earl of Derby, 1779-1849). Cruciferae. Glabrous glabrous perennial herbs, similar to arabis in habit, suitable for the flower-garden; lvs. undivided or pinnatifid; racemes elongated, strig, many-fl.; fls. yellow; buds elongated, sepals short, spreading, petals narrowly, elongated, long-cleft: silique long-stipitate, slender, 4-cornered to rather terete, compressed, valves carinately 1-nerved.--About 10 species, Calif.

pinnata, Brit. (S. pinnatifida, Nutt.). Sts. flexuous: lvs. very variable, commonly pinnatifid; segms. lance- oblong or oblanco-elliptic, rarely linear, almost entire; terminal segm. larger; lvs. deep golden yellow, according to D. M. Avery, W. K. Rahn, and to Neb. to Texas and S. Calif., in dry clay or alkaline soils.

STAPELIA

G.C. III: 29:381.—A hardy perennial herb about 3 ft. high with the general appearance of a cleome and fls. about 1 in. across borne in terminal spikes a foot or more long.

F. TRACY HUBBARD.

STAPELIA (J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). Aecelepiadace. Carbon Flower. Odd fleshy cactus-like plants usually grown with greenhouse succulents, both for the great oddity of their forms and for the singular and often large showy flowers.
STAPELIA

Stems low, leafless, coarsely 4-angled, the angle coarsely dentate, usually more or less covered with tubercles and exuccescences: fls. often large, generally fleshy and commonly arise from the angles and notches of the sts., apparently in no regularity and are usually grotesquely barred and mottled with dark or dull colors; calyx and corolla 5-parted, spreading, usually narrow and fleshy, mostly purple or marbled, in some species pale; crown in 2 rows, the outer horizontally spreading, deeply 5-lobed, the lobes entire or shortly 2-3-cleft, the inner of 5 scales adnate to the base of the stamens: fr. of 2 follicles, containing comose seeds.—About 60 species according to N. E. Brown in Dyer, Flora Capensis, vol. 4 (1909); Schumann, in Engler & Prantl’s Pflanzenfamilien, considers that the genus contains 70–80 species; Decaisne, in DeCandolle’s Prodromus, 8 (1844), describes 59 species, and makes references to several more. S. Afr. chiefly, 3 or 4 in Trop. Afr. Some of the species have fls. several inches across, although the plants themselves are relatively small; in fact, the fls. of S. gigantea are a foot across.

Most of the stapelias demand the treatment given to Cape euphorbias and to cacti,—a light, airy, rather dry position during the growing and blooming seasons and a soil made porous with rubble. They are mostly summer and fall bloomers. They should remain dormant in winter. Propagated easily by cuttings. They do best, however, when not grown so dry as cacti are grown. (See under Succulents, p. 2674.) The stapelias are known in cultivation mostly in botanic gardens and in the collections of amateurs. Only a few names occur in the American trade, and one of these (S. cylindrica) is an Echidnopsis. Several other species are likely to be found in fanciers’ collections.

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KEY TO THE SPECIES.

A. Corolla without a distinct raised ring on the disk.
B. Inner surface of the disk and lobes glabrous and rugose or smooth.
C. The corolla-lobes extended not more and usually less than 3 in diam. (except perhaps in No. 9).
D. Lobes of the corolla nearly smooth, ciliate with long flattened tapering hairs. 
DD. Lobes of the corolla very distinctly ciliate with simple hairs.
E. Corolla-lobes extended 2½–7 in diam.
F. Lobes of the corolla ciliate with mixed hirsute hairs.
G. Lobes of the corolla not ciliate.
H. Inner surface of the disk and lobes hairy, besides the border of the disk, usually transversely rugose. 
I. Center of corolla shallowly de- pressed.
J. Center of corolla cup-shaped, about 1½ in deep.
L. Transverse yellow lines on corolla absent.
M. Transverse yellow or whitish lines on corolla present.

1. hipecta, Linn. Sts. erect, 5–8, occasionally 12 in high, softly puberulous, green: fls. 1–3 together, near the base of young sts.; corolla 4–5 in diam., basal half of lobes cream-color, more or less tinted with purplish on the disk, upper half very dark purple-brown, marked with transverse cream-colored or yellowish and purple-brown lines, white-hairy. S. Afr. Var. unguipetala, N. E. Br. (S. unguipetala, N. E. Br.). Corolla 3½–4½ in diam., disk with the inner corolla with 5 bands radiating to the sinuses, pale greenish ochre, margins of the upper half of the lobes much revolute, tips ap- curved. S. Afr. G.C. II. 7:353; III. 44:169.
3. hirsuta, N. E. Br. Sts. erect, branching from a short decumbent base, 4–8 in high, pubescent, light

"The requirements of S. gigantea," Watson states, "are somewhat exceptional. It thrives only when grown in a hot, moist stover from April till September, when the growth matures 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. nóbílis, 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 1½ in. deep, lobes 2½–4 in. long, light reddish purple on the back, inner face transversely rugulose, light ochre-yellow everywhere marked with irregular transverse crimson lines. S. Afr. B. M. 83: 177.

5. tsomóbínia, 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 2½–3 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.


7. glabřifóra, N. E. Br. (S. glabřifólia, Bailey, error. S. grandiála 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 3–4½ 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, whole surface transversely marked with very narrow linear, irregular yellowish white lines. S. Afr. G. C. II. 5: 183.

8. símulá, N. E. Br. Sts. erect, 3–6 in. high, 4–angled, minutely puberulent, dull purple or grey-green, purple-spotted; angles somewhat denticulate: fls. 3–6, borne at the base of the st.; corolla rotate, less than 1 in. across, outside minutely puberulent, inside transversely rugose, glabrous, not ciliate, dark purple, lobes ovate, acute. S. Afr.

9. bélá, 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 1¾–2 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 whitish, without markings, ciliate on the lobes. A hybrid of European raising. G. C. III. 31: 138; 44: 165.

10. mutábilis, 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 1½ in. diam., glabrous, inside with surfaces, inner face slightly rugose to nearly smooth, the upper third of the lobes light or 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. dis-
STAPELIA


F. TRACY HUBBARD.

STAPHYLEA (Greek, staphyle, cluster, referring to the inflorescence). Staphyleaceae, formerly referred to the Celastracae. 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: Ivs. opposite, 3-7-foliate; Ifts. serrulate, like the Ivs. stipulate: fls. perfect, 5-merous in terminal panicles; sepals and petals 5, of about the same length, upright; stamens 3; pistils 2-3, usually connate below: fr. a 2-3-lobed, inflated, membranous caps., with 1 or 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. trifolia, S. Bumalda and S. paniculata are hardy North, while S. colchica, S. Bolderani, 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 at an earlv age and are sometimes forced, but S. holocarpa is probably even better 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 partially 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-foliate, only occasionally 3-foliate: panicles stalked.
B. Panicle raceme-like, oblong, pendulous: fl.-buds sub-globose.

pinnaata, Linn. Upright shrub, attaining 15 ft., sometimes tree-like: Ifts. 5-7, ovate-oblong, long-acuminate, sharply and finely serrate, glabrous and glaucous beneath, 2-3 in. long; panicles 2-5 in. long, on peduncles about 2 in. long: sepals oval, white, greenish at the base, reddish at the apex, about as long as the oblong petals: caps. 2-3-lobed, much inflated, subglobose, about 1 in. long. May, June. Eu. to W. Asia. G.M. 34, p. 280. — G. 4: 473. H.W. 3, p. 82.

B. Panicle broad, upright or nodding: fl.-buds obovate-oblong.


AA. Lvs. 3-foliate.

B. Middle Ift. short-stalked, stalk 1/3 in. or less long: panicles sessile.

Bumálda, DC. Shrub, 6 ft. high, with upright and spreading slender branches: Ifts. broadly oval to ovate, shorty acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1 1/2-2 1/2 in. long: fls. about 1/2 in. long, in loose, erect panicles 3-5 in. long; sepals yellowish white, little shorter than the white petals: caps. usually 2-lobed, somewhat compressed, 3/4-1 in. long. June. Japan. S.Z. 1: 95.

B. Middle Ift. slender-stalked: panicles stalked.
C. Ifts. after the Ivs.

trifólia, Linn. AMERICAN BLADDER-NUT. Fig. 3680. Upright shrub, with rather stout branches, 6-15 ft. high: Ifts. oval to ovate, acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1 1/2-3 in. long: fls. about 1/2 in. long, in nodding panicles or umbel-like racemes: sepals greenish white, petals white: caps. much inflated, usually 3-lobed, 1 1/4-2 in. long. April, May. Que. to Ont. and Minn.; to S. C. and Mo. Gt. 37, p. 529. Var. paucifólia, Zabel. Low and suckering: Ifts. smaller, broader, glabrous at length: fls. in short, 3-8-fld. racemes: fr. often 2-lobed, 1 1/4-1 1/2 in. long.

Bolderani, Gray. Fig. 3651. Shrub: Ifts. broadly oval or almost obicular, acute, sharply serrate, glabrous, 2-3 in. long: fls. in many-fld. nodding panicles; stamens and styles exerted: fr. 3-lobed, much inflated, 2-2 1/2 in. long. Calif., in the Sierra Nevada region. G.F. 2: 545 (adapted in Fig. 3081). R.H. 1910, p. 305. — A rare shrub, probably not regularly in cult.

CC. Ifts. before the Ivs.

holocárpus, Hemsl. Shrub or small tree, to 25 ft.: Ifts. oval to ovate-oblong, long-acuminate, sharply and finely serrate, pubescent and glaucous beneath, 2-4 in. long, in pendulous slender-stalked panicles 1-4 in. long, axillary on last year's branchlets: fr. pear-shaped or ellipsoid, abruptly acuminate or sometimes lobed at the apex, 1 1/4-2 in. long; seeds light greyish brown, lustrous, 1/4 in. long. Cent. China. — Very floriferous in early May. The name has been misspelled S. lobocarpus. Var. rósea, Rehd. & Wilson. Ifts. whitish tomentose beneath while young, later villous along the midrib beneath only: fls. pink, 1/2 in. long. Cent. China.

S. elegans, Zabel. Intermediate between and supposed to be a hybrid of S. pinnaata and S. colchica: Ifts. usually 5: panicles very
large and nodding. A very free-flowering variety with pinkish tinged fls. is var. Hessei, Zabel.—S. emödi, Wall. Shrub or small tree: lfts. 3, oval to oblong, 2-6 in. long; stalk of terminal lft. about 1 in. long; lfts. in peduncled, pendulous, raceme-like panicles: fr. 2-3 in. long. Himalayas. 

STAPHYLEA

STAPHYLEA BOLANDERI. (X 10)

3681. Staphylea Bolanderi. (X ?)

must retain the name for that part of it which represents the origin of the name, which is exactly what Miller did in "The Gardener’s Dictionary," ed. 8 (1768), retaining the name Statice for those species with a globular head and reestablishing Limonium as the generic name of those species with an open inflorescence. This treatment is accepted by most recent authorities although it is not followed by Pax in Engler & Prantl’s "Natyürlichen Pflanzenfamilien."

Although the individual flowers are small, some of the sea-pinks are very showy because of the great numbers of clustered blossoms and the brilliant colors. The flowers are often scarious and may be treated as everlasting. The evergreen or 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.

STATICE

INDEX TO STATICE.

A. Calyx produced into a spur.

B. Bracts between the fls. very small, scarcely exceeding the fruiting pedicels.

1. fasiculata

BB. Bracts between the fls. about equaling the calices in the interior of the heads.

2. Welwitschii

CC. Lvs. oblong-agate.

3. mauritiana

AA. Calyx not produced into a spur.

B. Tube of calyx usually pilose all over.

C. Inner lvs. of rosette not like the outer.

7. juncea

CC. Inner lvs. of rosette like the outer.

D. Pedicel as long as the calyx-tube.

4. Armeria

DD. Pedicel about half as long as the calyx-tube.

E. Apex of lvs. rather acute.

5. labradorica

EE. Apex of lvs. obtuse.

6. sibrica

BB. Tube of calyx glabrous or pilose only on the ridges.

15. leucophala

CC. Spikelets sessile inside the involucre.

D. Exterior lvs. of the rosette differing from the others.

13. majellensis

EE. Involucrle white, showy.

14. undulata

DD. Exterior lvs. of the rosette the same as the others.

Lvs. oblong-lanceolate or broader.

12. pseudo-

F. The lvs. 3-cornered in cross-section.

8. cœspitosa

FF. The lvs. flat.

GG. Blades 3-5-nerved.

11. plantaginea

H. Involucrle pale brown.

9. montana

HH. Involucrle green.

10. purpurea

For descriptions of the following species and varieties of Statice, see Armeria (Vol. I).


6. S. sibrica, Ledeb. (Armeria sibrica, Turecz.).


9. S. montana, Mill. (Armeria montana, Willd.).


Hoffm., not Hook.). The name pseudomeria 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.


The following species and varieties, all of which are in the trade, are not included under Armeria in Vol. I. According to Otto Kunze and others there is but one species of Statice, S. Armeria, all the others being variants of this polymorphic species. The great confusion in synonymy seems to uphold this view to some extent. It is certainly questionable whether the varieties of S. Armeria, S. plantaginea, and S. pseudo-armeria are all of them distinct.


4. S. Armeria var. variegata, Hubb. (Armeria martima var. variegata, Hort.), forms prostrate masses of bright golden foliage and has heads of rose fls.

5. S. labradorica, Hubb. & Blake (Armeria labradorica, Wallr.). Lvs. glabrous, linear, flat, 1-nerved, rather acute: scapes 1 or 2, low, pubescent: involucral scales herbaceous on the back, the outer ovate, the inner broadly membrane-margined. Labrador and Greenland.

8. S. caspitosa, Ort., not Poir. (Armeria caspitosa, Boiss. A. bella, Hort., not Alboff. A. caspitosa var. vera, Hort.). Forming dense cushions: lvs. very short, narrowly linear, triquetrous, short, white-mucronate: scape subpubescent; involucral lvs. brownish: fls. in small heads, blush-pink or pale lilac. Mountains of Spain and Portugal. B.M. 7596.—S. caspitosa, Poir., equals S. Armeria; probably at least some of the material grown as S. caspitosa is that species.

9. S. montana var. alba, Hubb. (Armeria alpina var. alba, Hort.), is a white-flld. form.

11. S. plantaginea var. alba, Hubb. (Armeria plantaginea var. alba, 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 pink fls. Var. rubra, Hubb. (Armeria plantaginea var. rubra, Hort.), grows 1 ft. high and has red fls. Var. splendens, Hubb. (Armeria plantaginea var. splendens, Hort.), grows 1½ ft. high and has brilliant rose-colored earlier fls. May, June.

12. S. pseudoarmeria var. alba, Hubb. (Armeria cephalotes var. alba, 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. rubra, Hubb. (Armeria cephalotes var. rubra, Hort.), has rosy red fls. Var. splendens, Hubb. (Armeria cephalotes var. splendens, Hort.), grows about 18 in. high, forming large tufts of foliage and has large heads of vivid rose fls.


cartilaginous, folded to channeled, obtuse, 3-nerved: scapes medium height; heads large; involucr

dowed, pale. Italy.


Armeria arbores, Hort., is described in the trade as having thick, woody, much-branched sts., each terminating with tufts of grass-like foliage and reddish, ovate linear, involucral bracts. Hort., is described as a plant about 6 in. high, with bright crimson fls., bearing May-July. In the Flora Italians, Boiss., which is a cespitose plant, with a compressed, head-like spike, with large ovate-ovariable bracts. Var. rubra, Hort., has bright crimson heads: 1–2 ft. high, var. alba, Hort., probably equals S. pseudoarmeria var. alba. Var. hybrida, Hort., is not recognizable from the data at hand.—A. leucophylla, Hort., is described as growing 9 in. high and having pale primrose fls.: not known botanically.—A. magellánica, Hort., is described as a pretty alpine species with bright rose crimson fls.

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KEY TO THE SUBGNERA AND SECTIONS OF LIMONIUM.


B. Stigmodes cylindrical-lv. Subgenus II. SYPHANON. Species 30–32.

C. Duration perennial. Subgenus III. SYPHANON. Species 30–32.

D. Petals only united at the base, if at all, undivided. Subgenus I. VERAALMOND. Species 6–29.

E. Corolla yellow or yellowish white (Section 3 contains a few species of rose fls., but none in the trade-lists and are probably not in cult.). Subgenus II. VERALMOND. Species 6–29.

F. Lamb of calyx lobed or erose: scapes and branches of inf. usually winged or 2-edged-flattened (not winged in Nos. 11, 15, and 16; scapes at base in Nos. 7 and 8). Subgenus III. PSEUDONIMON. Species 6–16.

G. Lamb of calyx lobed or erose: scapes and branches of inf. angled above; branches often articulate. Subgenus II. SYPHANON. Species 18, 19.

H. Corolla rose to purple. Subgenus III. PSEUDONIMON. Species 17.

I. Scapes and branches of inf. winged or acute-angled. Subgenus II. SYPHANON. Species 17.

J. Scapes and branches of inf. tereb. at base in Nos. 7 and 8. Subgenus III. SYPHANON. Species 18, 19.

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N. Scapes and branches of inf. tereb. at base in Nos. 7 and 8. Subgenus III. SYPHANON. Species 18, 19.
3682. Limonium (Statice) Bondeli. The flowers are about 1/4 inch across.

2. collinum, Hubb. (Stdtice collina, Griesb. S. Basseriána, Friv., not Schult. Goniolimon collinum, Boiss.). Perennial, glaucous, about 1 ft. high; lvs. orbicular-obovate, abruptly attenuate-cuspidate, shortly narrowed at base; scape densely corymbose above; branches narrowly 2-edged or winged, 3-angular; spikelets 2-4-fld., distinctly and densely imbricated in short scorioid-capitate spikes: calyx white, tube corymbose, limb pubescent, petals petals linear-lanceolate, limb pubescent, petiole short-obtuse, calyx tube glabrous, lobes oblong, obtuse. S. E. Eu., Asia Minor, and Syria.

3. speciosum, Kunz. (Stdtice speciosum, Linn. Goniolimon speciosum, Boiss.). Perennial, glaucous, about 1 ft. high; lvs. orbicular-obovate, abruptly attenuate-cuspidate, shortly narrowed at base; scape densely corymbose above; branches narrowly 2-edged or winged, 3-angular; spikelets 2-4-fld., distinctly and densely imbricated in short scorioid-capitate spikes: calyx white, tube corymbose, limb pubescent, petals petals linear-lanceolate, limb pubescent, petiole short-obtuse, calyx tube glabrous, lobes oblong, obtuse. S. E. Eu., Asia Minor, and Syria.


6. sinatum, Mill. (Stdtice sinuata, Linn.). Perennial or biennial, 1-2 ft. high, the whole plant glabrous, hairy, the hairs from tubes: lvs. pinnatifid-lirate, sinuses and lobes rounded, the terminal bearing a bristle; scape corymbose, branches elongate, spreading in numerous short, straight, fasciculate spikes: fls. rose; calyx-tube glabrous, lobes oblong, obtuse. S. E. Eu., Asia Minor, and Syria.

7. Bondelii, Kunz. (Stdtice Bondelii, Lest.; also misspelled Bondelii, Fig. 3682. Annual or biennial about 1 ft. or more; lvs. radical, spreading, 3-5 in. long, spathulate, sinuate-lirate, hairy and ciliate, terminated, by a subulate point, tapering below into a short winged petiole, lvs. oblong, obtuse, terminallobe large, subhombdaceous; spikes several, dichotomously branched, rounded and hairy at base; branches triangular, wings narrow, sometimes broad, running out below the forks into 2 or 3 linear appendages; branches 2-edged or winged, dilated upward, forked at the apex, slightly hairy; spikelets 1-2-fld.; bracts with hard green spines, some subulate others semi-hastate: calyx yellow, tube glabrous, limb campanulate, 5-toothed, minutely crenulate; corolla yellowish white. Aug. Medit. region. B. R. 71: G. W. 7, p. 229.—Usually treated as an annual. Var. ciliatissimum, Hubb. (Stdtice sinuata var. ciliatissima, Hort.), has pure white fls. A good plant for edging.

8. Thouinii, Kunz. (Stdtice Thouinii, Yv. S. supélbrac, Pers.) Annual, glaucous, about 1 1/2 ft. high; lvs. sinuate or pinnatifid-lirate, lobes and sinuses rounded, margin short-ciliate; spikes corymbose above, more or less winged, produced below the upper forks into 1-3 triangular-lanceolate rather obtuse appendages; branches strongly dilated from the base upward, running out into acute but short appendages below the spikes; spikelets 2-3-fld., distichous in short secund spikes; calyx white, tube glabrous, lobes subulate-lanceolate acute; corolla yellow. May. Tenerife and Medit. region. B. M. 2363.

Subsection NOBILES. 9. arborescens, Kunz. (Stdtice arborescens, Brous.). Shrub about 2 ft. high; stems and branches pinked, branched only above: lvs. broad ovate-oblong, petiolate, obtuse, mucronate, base attenuate, leafy; scape tall, branched above and subcoriaceous, more or less winged, with the branches narrowly 2-edged; branches very short-ciliate, 3-winged, the wings narrowly dilated from the base upward and running out into 7-8 sinuate-lirate appendages below the spike; spikelets 2-3-fld., laxly imbricated in fascicled short, secund spikes; calyx white, tube glabrous, limb corymbose-paniculate; corolla yellow. July. Tenerife. R. M. 3776. P. F. M. 4:217 (under the name Statice arborescens).
10. *fruticans*, Kunze (Statice *fruticans*, Webb., S. arbores, Brouss., S. fruticosa, Linn.). Shrub, st. short, naked, terete; lvs. at the nodes, ovate, obtuse, mucronate or carinate, alternate to the petiole; scape short, corymbose-pedicellate above, it and the branches puberulent, strongly compressed; branches 2-5-fl., wide at base, narrowly ovate, not or very shortly dilated into short, unicell, roundulate auricules below the spike; spikelets 1.2-fl., very few, imbricated in very short, second spike; calyx bluish, limb acuminate, base slightly dilated, corolla yellow. Summer. Teneriffe. F.S. 4:323. H.U. 6, p. 164. —Closely allied to *S. limmonum*. In the 3 times smaller *Limb. vulgar*, the leaves are 1½-2 in. long, the scapes 4-6 in., 2-edged, not winged and the auricles of the branches roundulate.

1. *macrophylle*, Kunze (Statice *macrophylla*, Brouss., S. Hadl. Hort.; s. Brouss., Subshrub about 2 ft. high; lvs. rather glabrous, very large, sessile, obtuse-patulate, very puberulent; lsa. 3-edged, acuminate, scape tall, oval and very puberulous, corymbose-pedicellate, it and the branches winged; branches 3-angled, wings dilated from the base upward, puberulent, running out into short, obtuse auricules below the spikelets: these or these may be nearly obsolete; spikelets 2-fl., grouped in 2's, erect at the ends of the branches; calyx purple, yellowish, limb obtuse, very puberulent, soft-tomentellous; corolla yellowish white. May. Teneriffe. B.M. 4125. B.R. 31:7. —Cult. in S. Calif. Makes a good pot-plant for winter-flowering in a cool greenhouse. T. D. Hatfield, in G. F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather underrained pots, in a light soil thick with which some charcoal has been incorporated, and given perfect drainage, as excessive moisture at the roots is fatal. Propagation is effected by cutting of the side shoots placed in a cool propagating-bed, or better by layering, which is well accomplished in summer by making a notch in each of the side branches and then burying the plant in the garden soil below the incision."

12. *brassicofolium*, Kunze (Statice *brassicofolia*, Brouss.), Fig. 3683. Subshrub, 1½ ft. high; lvs. slightly short-velvety, margin crenate, base puberulent, petioled, obtuse, terminal lobe largest, oval or rotund, often irregularly lobed, very obtusely cuneate, base subcordate; lateral lobes 2-4, car-shaped, small, alternate, the bases cuneate and somewhat reflexed; scape, angulate, corymbose-pedicellate; branches 2-winged, the wings very broad, coarsely undulate-lobose, running out into large auricules above the fork; branches 3-angled, wings dilated from the base upward running out into short, obtuse auricules, glabrous; spikelets 2-fl., 2-3-fascièd at the ends of the branches; calyx purple, tube glabrous, limb very obtuse, margin undulate-mucronate, corolla yellowish white. July. Anc. Can. Is. B.M. 5162.

13. *imbricatum*, Hubb. (Statice *imbricata*, Webb.). Subshrub, about 2½ ft. high, short, the plant shortly soft-tomentellous: lanceolate in outline, lsa.-runate, lobes on both sides 5-9, the upper larger, rotundate, neto-mucronate, 9-10 in. long, the lower lobes subacute and retuse, scape tall, large, corymbose: branches undulately and broadly winged; branches 3-angled, winged dilated from the base upward running out into short, obtuse auricules, glabrous; spikelets 2-fl., 2-3-fascièd in short spikes; calyx blue, tube somewhat hisrate, limb transverse, obtuse at apex; corolla yellowish white. July. Aug. Teneriffe. F.S. 4:320-321.


15. *Praecox*, Kunze (Statice *Praecox*, Webb.). Subshrub, 2 ft. high, the plant white, corymbose-pedicellate, usually mucronate, about 2½ in. long and the same wide, very coriaceous, base truncate and short-attenuate to a petiole 1¼ in. long, the leaf spreading, branched, 8-angled, base rounded, slightly puberulent; spikelets 3-fl., usually 3-edged, scarcely winged; spikelets, remote, in lax, rather erect, somewhat undulate, puberulent limb, limb puberulent, obtusely 5-angled; corolla pale yellow. Can. Is. —Cult. in Calif.

16. *Perizii*, Hubb. (Statice *Perizii*, Stapf.). Subshrub, less than 2 ft. high; lvs. long-petiolate or rhombic-ovate or base usually truncate, but short triangular decurrent on the petiole; lsa. round, pubescent; tube the base of the branches subcordate, clinate: calyx purple, blue, pubescent; corolla pale yellow. Can. Is. —Cult. in Calif., where it is said to grow to 3 ft.

Section 2. CERNOSTACHYAE

17. *punctatissima*, Kunze (Statice *punctatissima*, Ait.). Subshrub, glabrous, calecareous-punctate: lvs. in a rosette at the base of the scape or fascicled or solitary at the axis of the scales of the scape, obtuse, or retuse mucronate, alternate to the petiole: scape erect or alternately branched, the branches very narrow, roly 3-angled to winged; spikelets 3-fl., distichously densely imbricated, in oblong, scopliod-spreading spikes: calyx lavender, slightly plicate at base of the ribs and limb which is obtusely 5-angled; corolla rose. Sept. Canary Is. B.R. 26:65.

Section 3. PLATYTUMENAE


19. *stolonifera*, Kunze (Statice *stolonifera*, Spreng.). Perennial, about 1 ft. high, glabrous; lvs. obtuse-patulate, puberulous, long-attenuate to the petiole, 1-nerved: scape acutely angled to sulcate, branched a little above the base; branches elongated, strict, sub-corymbose-pedicellate; spikelets 4-5-fl., in straight terminal spikes or secund and scorpioid, lower remote: calyx whitish, tube very smooth, limb 5-lobed, lobes ovate, mucronulate; corolla yellow. April. China, Japan, and Austral.

3683. *Limmonum* (Statice) *brassicofolium*. (× 1)

Section 4. ECLIPMICAE

A. Calyx-limb somewhat 10-lobed, by reason of the minute teeth between the large lobes.

B. Blades broadly ovate or obtate.

Blades oblong-lanceolate.

C. Lvs. glabrous; calyx white or bluish, tube more or less plicate on the ribs.

D. Tube of calyx slightly puberulent.

E. Tube of calyx compact, obtuse.

F. Petiole or scape high.

G. Tube of calyx oppressed-hisrate or ciliate on the angles.

H. Limb of calyx reddish below, white above.

I. Limb of calyx pure white.

20. *vulgare*, Mill. (Statice *Limmonum*, Linn. S. maritima, Lam. in prov. Arg. 3863. Perennial, about 1½ ft. high, glabrous: lvs. oblong-lanceolate, 1-nerved, obtuse, with an incurved mucron from or below the apex, attenuate to a rather long petiole at the base; scape peltate, nearly terminal, puberulent-corymbose above; spikelets 1-3-fl., distichously and densely congested in second, more or less

Section GENUTAE
STATICE

28. reticulatum, Mill. (Stdtice reticulata, Linn. S. bellitifolia, Gourds.). A distinct annual, native of Europe, a whole plant granulate-scabrous; lvs. oblongate or lanceolate-spatulate, often only ½ in. long, obtuse, mucronate or mucous, attenuate at the petiole; flowers, upper pedicellate, on a long stalk; sterile, capillary and many-forked, articulate, rather strict, upper branches densely floriferous, corymbose-paniculate; spikelets 2-3-fld., short and distinctly attenuate, capillary, rather stiff, regularly or capillary, rather stiff, regularly or distichously at the capitula at the ends of the branches: calyx-tube short-conical, ciliate on the angles, limb white, lobes ovate, rather acute, denticulate; corolla pale lilac. July, Aug. Eu., Caucasus, and Siberia.

Section 5. CIRCINAHIA.

29. purpuratum, Hubb. (Stdtice purpurata, Linn.). Subshrub 1 ft. high, glabrous, 1 in. broad, rather loose, short-conical, densely hairy; lvs. less than ½ in. long, acute, entire, obtuse; flowers, spikelets 1-3-fld., short, densely hairy, short-conical, acuminate at the base, very short and distichously arranged in fewish to short spikes: calyx-tube short, calyx lobes ovate, obtuse; corolla rose, rather large. May, June, Spain.

Subgenus III. Siphonantha.

Section 1. ECSTHONANTHA.

30. cæsia, Kuntze (Stdtice cæsia, Girard. S. elegans, Cass.). Perennial, 1-3 ft. high, with large, dense, dome-shaped, blue-gray to white, lvs. all radical, small, ovate to retuse; spikes numerous, rather stout, very much branched at the base; flowers, upper pedicellate, grayish, upper is usually yellow, lobes ovate, rather acute; corolla rose, white. June.

Subgenus III. Siphonantha.

Section 2. PHYLLOSTACHYR.

31. spicatum, Kuntze (Stdtice spicata, Willd.). Annual, about 6 in. high: lvs. soft, in outline lanceolate-oblong, pinnately parted to running, lobes obovate—spatulate, pubescent, glandular: Spike 1-3-fld.; base: scapes erect, surpassing the lvs., terete, slightly papilliferous, bearing long dense cylindrical spikes often interrupted at base, branched; flowers, upper pedicellate, grayish, upper is usually yellow, calyx-tube hispid, limb oblong-acute-dentate; corolla rose or white, lobes ovate, rather acute. Summer. Caucasus region to Persia. G. 3:155; 11:281.

32. Suworowii, Kuntze (Stdtice Suworowii, Regel.). Annual, about 9-16 in. or more high: lvs. all basal, glabrous, long- lanceolate or oblongate, 6-8 in. long, entire or usually coarsely runcinate, the teeth or lobes triangular, acute: scapes several, stout, obtusely angled, bearing a long terminal spike and several distant, sessile lateral ones, 4-6 in. long, nearly ½ in. diam.; spikelets 2-3-fld.; crowded; calyx-tube somewhat glabrous, subscorpioid, green, limb 5-toothed, rose-red; corolla tubular, rose-red, lobes ovate-rotund. July.

Subsection STEBIOCLADAE.

26. minutum, Kuntze (Stdtice minuta, Linn.). Perennial or subshrub, about 2 in. high; glabrous, rarely puberulent, rather cespitose: lvs. rosulate, small, bluish-green, lanceolate-spatulate, obtuse or retuse: scapes dwarf, slender, branched from the base; branches strict, slender, lower ones spicate, the upper corymbose-fascicate; spikelets 2-3-fld., disposed. Ark.; lvs. long, straight terminal spikes: calyx-tube short or puberulent or hispid, limb white, deeply 5-lobe, lobes ovate, plicate, rather obtuse; corolla reddish. July. Aug. S. France.

Subsection HYALOLEPTAE.

27. latifolia, Kuntze (Stdtice latifolia, Smith. S. latifolia map- nigrata, Kuntze.). Annual, 2-5 ft. high; lvs. long, very short, slender hairs: lvs. very large, oblong-elliptic, obtuse, long-attenuate to the petiole: scapes very tall, much branched, terete to angled, paniculately branched; flowers, spikelets 1-3-fld., rather remotely shorter than the lvs., 1-2 in. long, slender, curved, recurved spines: calyx-tube obconical, short, glabrous or slightly hairy, limb white, 5-lobe, lobes triangular acute; corolla bluish and lavender. June, July. Russia, Bulgaria, and Caucasus. G. 1:100; 28:367. Gm. N. 15:162. Deep-rooting so that it should be planted in very sunny positions and undisturbed. Var. album, Hubb. (Stdtice latifolia var. album, Hort.) has pales till 2-½ ft. across: white. Var. roséum, Hubb. (Stdtice latifolia var. rosea, Hort.) is a form with rose-colored lvs.

Stautoniana (named for Sir G. L. Stanton, phy- sician, 1740—1801). Lardizabalaceae. Scandent shrubs, hardy and evergreen, useful for ornamental purposes: lvs. digitately parted, 3-7fts.: lvs. purple or greenish, in axillary corymb-like racemes, monocious; sepal 6, petaloid, the outer broader; petals none; stamens 6:

F. TRACY HUBBARD.†
STAUNTONIA

3685. Stauntonia globosa. (X14)

3685. Stauntonia globosa. (X14)

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.)

hexaphylla, Decne. Fig. 3685. A handsome vine becoming 40 ft. high; lfts. oval, about 2 in. long, stalked; fls. 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 appearance, alluding to the shape of the flower). Syn., Fieldia, Orchidaceae. Epiphytic herbs with leafy stems and without pseudobulbs, grown in the warm-house.

Leaves distichous, spreading, leathery, and flat; fls. borne on lateral peduncles in a raceme which is sometimes short, simple and rather large- and few-fl., sometimes long, lax-branched and quite numerous, small-fl.; sepals equal, free, spreading; petals similar to the sepals; labellum affixed to the base of the column, spreading, concave, not spurred, narrow, the lateral

lobes short, the midlobe rather long-concave and bent in at the tip; column short, thick, not winged and footed; pollinia 2; caps. oblong-clavate, not beaked.—About 10 species. Inde and Ceylon; in Malaya and the Philippines. Treatment similar to vanda.


luchuensis, Rolfe. Scandent herb with sts. 1 ft. long; lvs. oblong, very shortly 2-lobed, 4-6 in. long: scar 6-12 ft., bearing a many-fl. raceme: fls. showy, yellow with brown spots; sepals somewhat narrower; labellum fleshy, slightly 3-lobed, saccate at base. Liukiu Isls. F. TRACY HUBBARD.

STAUROSTigma (Greek, cross and stigma, in allusion to the cross or star-shaped stigmas). Arbores. Tuberous clonalous herbs, adapted to the warm-house: lvs. long-petioled, hastate-cordate in outline, pinnately cut or 1-2-pinnately parted, the pinna sessile, acute: peduncles solitary or several, as long as the lvs.; spathe erect, lanceolate, base convolute, gaping or open above; spadix cylindrical: fls. monocious, all perfect, the male and female contiguous; perianth-tube: berries subglobose, deeply 2-5-sulcate, 2-5-celled, the cells 1-seeded.—About 7 species. Trop. Amer. The oldest name for this genus is Asterostigma. S. conicum, Koch. About 1½ ft. high; young lvs. reniform, pedately cut, the segms. obovate-lanceolate, the older 5-parted, the middle part pinnately cut, elongated-oblong, the lateral parts crenately dentate; the petioles marked with pale violet and dark purple: spathe narrow-lanceolate, very acute; spadix white and purple, the male part dense-fl.; peduncle vivid purple, shorter than the petioles. Brazil. L.B.C. 16:1890 (as Caladium luridum). Variable. S. Lauchnathänum, Koch (Asterostigma Lauchnathänum, 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, whitish with black-purple streaks: spathe deep green within and speckled with brown, reticuated externally, 2-4 in. long, erect, cylindric, sagittate; spadix cylindrace; anthers scarlet; ovules white; spadix similar to the petiole. Brazil. B.M. 5972. S. Rüdtännum, Engl. About 2 ft. high: lvs., the adults, 3-parted, the middle one pinnately cut, the segms. linear-oblong, sessile, abruptly and rather long-cuspidate at the apex; the lower parts short-decurrent: peduncles spotted and variegated; spathe yellowish greenish outside; spadix slender; peduncles many, variegated. Brazil. F. TRACY HUBBARD.

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 erose and often cuspidate, each separately involute around its stamen; stamens 5, opposite filaments, with 2 staminodial filaments distinct, or nearly so; ovary superior, 1-celled with free central placenta, becoming capsular in fr.; seeds many; style and stigma 1. Differs from Lysimachia in the presence of the sterile stamens, and in the evaporation of the corolla.—About 5 species, N. Amer. All perennials. Offered by collectors of native plants, for colonizing, borders and wild-gardens.
STEIRONEMA

A. Lvs. membranaceous with pinnate veins.

Stellatium, Raf. (Lyssimâca stellatâ, Linn.). St. 1-4 ft. high, sparingly branched: lvs. 2-6 in. long, ovate-oblong to ovate-lanceolate, acute or acuminate, base rounded or subcordate: petioles 3½ in. long, coarsely ciliate. Moist thickets, U. S.

lanceolatum, Gray (Lyssimâca lanceolâtum, Walt. L. hybrida, Michx.). Plant 1-3 ft. high: lvs. lanceolate, 1-4 in. long, narrowed into a short petiole, thick, or subsessile, the lower sometimes broader. E. U. S.

AA. Lvs. firm, linear, usually 1-nerved.

quadriflórum, Hitchc. (Lyssimâca quadriflórum, Sch.) L. longiflórum, Pursh. (S. longiflórum, Gray). St. 4-angled, 1-3 ft. high: lvs. thick and firm, sessile, subacute at both ends, 1-4 in. long, smooth and shining: margins slightly revolute; basal often broader; veins obscure. E. U. S. B.M. 660.

K. M. Wiegand.

STÉLIS (an old Greek name used by Theophrastus for some parasitical plant). Orchidâceâ. Epiphytic herbs, some of them adapted to the warmerhouse and others to the intermediate house; sts. cespitose or creeping, with simple branches 1-lvd. at the tip and frequently 1-3-sheathed below the lf., not pseudobulbous: lvs. leathery, often contracted at the base to the petiole while the frequent concave or channeled and pointy margins often times articulate near the base: fls. small to minute, short-pedicelled in an elongated raceme at the base of the terminal lf., second, rarely somewhat distichous; bracts alternate, various; sepals frequently subequal, broad or triangular, spreading, more or less connate; petals much shorter, broad, the margins thickened, the labellum sessile at the base of the column, equal and similar to the petals or narrower and sometimes shortly 3-lobed; column equaling or shorter than the labellum; pollinia 2: caps. small, oval or oblong, not beaked, often 3-edged.—About 200 species, Mex. and W. Indies southward to Brasil and Peru. Treatment the same as for Pleurothallis.


STEMÔNA (Greek, stamen, alluding to the foliaceous stamens). Syn., Rozbôrgia. Stemônaceà; by some the family is called Rozbôrgiaceà. Tall climbing perennial herbs, from a tuberous fusiform root, suitable only for the warmhouse: lvs. opposite, alternately or whorled, ovate, 3–9-constate: fls. solitary, or few and subracemose; perianth-segments. 4, lanceolate, many-nerved; stamens subhygophous, the connexives produced in very long linear-lanceolate appendages; ovary free: caps. ovoid or oblong.—About 15 species, India, China, and Malaya.

935. L.B.C. 50:442.—S. sessípeoâ, Lindl., is about 6 in. high: lvs. broadly oval, shortly petiolate, 1¼–4 in. long: spike 7–10 in. long: fls. pale yellow, sepal and petal ovate-oblong, obtuse; petals oblate; lip oblate, hooded. Venezuela.—S. sendos, Hort., said to have 6 lvs., is offered in the trade. — S. somâta, Reichb. f., has a short st.: lvs. very thick, cuneate-oblong: blact: racem. 1-sided: fls. light ochre; sepals brown at base; petals with a mauve middle zone. Guiana.

F. TRACY HUBBARD.

STELLARIA (Latin, star, referring to the form of the flower). Caryophylláceâ. 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, making 4–9-flowered cymes or rarely solitary; sepals 5, very rarely 4; petals just as many as the sepals, 2–left or rarely lacinate or only 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.

Holostéa, Linn. Easter Bell. A hardy perennial, erect, 6–18 in. high, simple or somewhat branched, from a creeping rootstock: lvs. sessile, oblong-lanceolate, 1½–2½ in. long: fls. white, abundant, in a terminal leafy panicle; sepals one-half or two-thirds 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.

B. Lvs. narrow.

gramíneas, Linn. A slender-stemmed, hardy 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 racemes; petals nearly equal in length. May, June. Eu.; naturalized in Amer. B.B. 2:23. Var. auren, 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, Linn. Chickweed. Fig. 3086. 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 petiolated, 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.
CVII. Effective shrubbery border.—Spireas in good form.
to Austral. S. Curtissii, Hook. f. St. twining, leafing and flowering at the same time: lvs. 4-5 in. long, alternate; the petiole very long and slender: fss. small, apparently unisexual. India. B.M. 7254. Similar to the following. S. tuberosa, Lour. (S. gloriosoides, Voigt. Rostaphoria gloriosoides, Jones. R. gloriosa, Peers. R. viridiflora, Smith). Tubers cylindric, 6-12 in. long: st. woody below; twining, clumping along the ramose, branches terete: lvs. 4-10 in. long, broadly ovate-cordate, acuminate, membranaceous, shining: peduncle 1-2 in. long, usually 2-flid.: fss. erect, fidel; perianth spreading and revolute, segms. lanceolate, acuminate, greenish with many purplish nerves: caps. ovoid-oblong; stamens 4; 1-fld. seeds. Assam. Similar to the following, but petals of the dorsal sepal and petals which are straw-colored with purple spots and in the lip being blotched and having only seven callous teeth. Peru. S. pallida, Lindl. St. wanting: lvs. 2-5, oblong-acuminate, slightly nodose near the base; sepals and petals linear, acute; lip spotted with red, nearly saccate, entire, fleshy, ovate. Guiana. B.R. 24:20.

F. TRACY HUBBARD.

STENOCHLÉNA (Greek, narrow covering). Polyedriöae. A genus of tropical ferns with long epiphytic st., and with usually 1-pinnate fss.: fertile lvs. much reduced in tissue, and bearing the sporangia entirely covering the under sides, sometimes spreading over the margins. The general relationship of the species is with Lomaria, but owing to the way in which the sporangia are borne, they have often been referred to Acerostichum. Culturally long, these are epiphytic plants; they do best on tree fern stems and the like.

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F. TRACY HUBBARD.

STÉNÁ (Greek, narrow, alluding to the form of the pollen-masses). Orchidacée. Epiphytic herbs with short stems and clustered pseudobulbs which bear 1-2 lvs., grown occasionally in the greenhouse: lvs. oblong or narrow, leathery, midrib prominent; scapes short at

the axils of the sheaths, below the lvs. or pseudobulbs, recurved, with 1 rather large, single, sepaliform, free among themselves, spreading, the lateral a little broader; petals similar to the dorsal sepal; labellum continuous with the foot of the column, incept, fleshy, broad, concave, nearly saccate, the lateral lobes minute, midlobe undivided or all broader and fimbriate; column rather thick and erect; pollen 4, oblong-linear: caps.

palustris, Bedd. (S. scardenas, J. Smith). Rootstock widely climbing; lvs. 1-3 ft. long, with pinnas 4-8 in. long; fertile pinnas slender, 6-12 in. long; texture leathery. India. S. 1:224.—A vigorous grower and coarse feeder, much used in cooler houses of large ferneries. It will form a mass of rootstock several feet long if grown on a fern stem, producing a rather pale lvs.

sorbifolium, Linn. Rootstock climbing, often prickly; lvs. 12-18 in. long, 6-12 in. wide, with close veins; fertile pinnas 2-4 in. long, narrow. E. and W. Indies to Brazil.

R. C. BENEDICT.

STENOGLOTTIS (Greek, narrow and tongue, referring to the narrow lisp). Orchidaceae. Terrestrial herbs, with short sts. and tuberiferous or thickened fleshy fasciculate roots, which are suitable for the intermediate house, but not commonly cult.: lvs. radical, narrowly oblong, roseate 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, 5-5-ellipt at the base; column very short and broad; pollinia minute: caps. oblong, erect. Three species, Trop. and S. Afr. S. fimbrilata, Lindl. Lvs. numerous, oblong or narrowly lanceolate-oblong, acute, bright green, usually with few or numerous blackish or purple-black blotches: scapes erect, slender, 6-12 in. high: racemes 1½-6 in. long, lvs. many-fld.: fls. light purple with a few elongated dark purple blotches on the lip; sepals broadly ovate, obtuse or subacute; petals ovate, subacute; lip linear-oblong, 3-ellipt or 3-parted: caps. narrowly oblong. S. Afr. B.M. 5572. S. longifolia, Hook. I. Lvs. numerous, ensiform, or linear-oblong, acuminate, uniformly light green, 2-7 in. long; sepals erect, often spreading; bracts 1½-2½ ft. long, with numerous linear-lanceolate, somewhat recurved sheaths; racemes 4-10 in. long, many-fld.: fls. light purple with a few minute darker dots on the lip, occasionally white; sepals broadly ovate, subobtuse; petals ovate, subacute; lip linear-oblong, 5-fld or 5-parted. B.M. 7186. G.C. III. 16: 599. G.W. 14, p. 653. F. TRACY HUBBARD.

STENOLÖBIUM: Tecoma.

STENOLÔMA (Greek, narrow-fringed). Polyopodiaceae. A generic name for a group of tropical ferns now referred to Odontolosoria, which see.

STENOMESSON (Greek, small and middle, alluding to the corolla-tube, which is usually contracted near the middle). Amaryllidaceae. Bulbose herbs grown in the warm- or coolhouse.

Leaves developing with the fls., linear or broadly strap-shaped: fls. in several umbels, rarely reduced to one, pedicels often recurved, making the fls. pendulous; involucral bracts 2; perianth red, golden, or tawny, tube elongated, subcylindrical, slightly contracted above the base or toward the middle, lobes erect or more or less spreading; ovary 3-celled: caps. subglobose or 3-furred, loculicidally 3-valved; seeds black.—About 22 species, Trop. Amer.

STENOMESSES require a good soil and a sunny house with a temperature never below 45°. During the growing season they should have plenty of water, but when at rest comparative dryness is necessary. The offsets should be removed from the old bulbs before growth commences. The plants continue in bloom a number of weeks in spring and summer.

A. Style shorter than the perianth.


AA. Style longer than the perianth.

flavum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, lanceolate, obscurely petaled, at first compressed on the margin: scape 1½ ft. high: fls. bright yellow, 1½-2 in. long, usually few in an umbel. B.M. 2641. B.R.778 (as Chrysiphiola flavia). F. W. BARCLAY.

STENORHÝNCHUS (Greek for small and beak). Orchidaceae. Terrestrial plants: sepa 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.

speciosus, Rich. (Spiranthes colorata, N. E. Br. S. colorans, Hemsl.). Lvs. elliptic, green; bracts acuminate, oblong-lanceolate, as long as fls.: crimson. Trop. Amer. B.M. 1374 (as Neottia speciosa).

GEORGE V. NASH.

STENOSPERMÁTUM (Greek for small and male element). Sometimes written Stenospermatium. Araceæ. 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 stiptate, cylindric, white: fls. perfect; stamens 4.—About 20 species, natives of the Andes of Peru and of N. Brazil.

multiovulatum, N. E. Br. Three to 6 ft. tall: blades 12-16 in. long, 4-6 in. wide, oblong or narrowly 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). Gramineæ. Creeping grasses with compressed culms, flat divergent blades and broad 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 the sandy soil, which will bind 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 in 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 moving. This grass does not become coarse, does not hold dew or rain, and is particularly good for house lots and lawns. It does not
need as much water as Bermuda or St. Lucie grass. It is propagated mostly by cuttings. (E. N. Reasoner.)

secundatum, Kuntze (S. americànum, Schrank). S. Augustíne Grass. 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. 15:081 (as S. glabrum). Dept. Agric., Dir. Agric. 20, p. 42.

A. S. Hitchcock.

STEPHÁNANDRA (Greek, stephanos, crown, and aner, andros, male stamen, alluding to the persistent crown of stamens). Rosáceae. Ornamental shrubs grown chiefly for their handsome graceful foliage.

Deciduous: lvs. alternate, lobed and serrate, stipulate: fls. slender-pedicelled, small, with cup-shaped calyx-tube; sepals and petals 5; stamens 10-20: carpel 1; pod with 1 or 2 shining seeds, dehiscence 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 stephanandras 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 low. They are well adapted for borders of shrubbery 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. flexuosa, Sieb. & Zuce.). 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, incisedly lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish green, 3/4-11/2 in. long; lvs. white, about 1/4 in. across, in terminal, short, 8-12-ffld., usually panicled racemes; stamens 10. June, Japan, Korea. Gn. 55, p. 141.—"Closely allied to Spiraea and has the spiraea style of beauty. It has long, slender branches which are densely and regularly interwoven in a fan-like manner. Its habit of growth is fountain-like, the branches being gracefully pendent. Its fls. are bright white and, although minute, are so numerous that the plant becomes very showy. It is especially fitted for the back of herbaceous borders or for the front of larger shrubs. Its foliage, which is deeply toothed, is tinted red in early spring and deep glossy green during spring and summer. In the autumn it puts on unusual tints of reddish purple. The foliage becomes so dense that the growth of weeds beneath its thickly set branches is effectually prevented. Prop. by cuttings and layers." (J. W. Adams.)

3688. Stephanandra incisa. (X1/2)

STEINOTAPHRUM

Tanáke, Franch. & Sav. (Neillia Tanáke, Franch. & Sav.). Fig. 3089. Shrub, 5 ft. high, almost glabrous; lvs. triangular-ovate, slightly cordate at the base, abruptly long-acuminate, usually 3-lobed and doubly serrate or lobulate, pubescent only on the veins beneath, 1-2 1 in. long; fls. in terminal loose panicles, slender-pedicelled, 1/8 in. across; stamens 15-20. June, July, Japan. B.M. 7593. Gt. 45:1431. G.W. 4, p. 6.—Handsome shrub much resembling neillia in foliage, coloring in fall brilliant orange and scarlet or yellow.

Alfred Rehder.

STEPHÁNIA (perhaps a personal name; or by some derived from the Greek word for crown). Menispermáceae. More than 30 climbing shrubs (rarely herbs) of the Old-World tropics, as described by Diels in Engler's Das Pflanzenreich, hft. 46 (IV. 94), 1910, differing from Cocculus in the solitary ovary, often more than 3-merous fls., and a nearly basal rather than nearly terminal style-scar: lvs. usually peltate: fls. in axillary, simple or compound clusters, deciduous; 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. herandífolia, Walp., in India, Austral., Afr., and Malayas, has strinate glabrous branches, and ovate or somewhat deltoid obtuse or acute more or less pubescent lvs. 3-6 in. across: fls. in capitate peduncled puberulent umbels of 8-12 rays: drupes red. S. japónica, Miers (Cocculus japónicus, DC.), a common roadside weed in parts of China and Japan, has glabrous lvs. and infl.; probably not cult.

STEPHÁNOPHYŚUM (Greek, crown and bladder, in reference to the shape of the crown). Acanthacées. Herbs with more or less dentate or entire lvs., the fls. 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. Bakieti, 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: panicle terminal, many-fl.d.: fls.
opposite, sessile, scarlet; calyx-segms. narrow, erect, linear-subulate; corolla more than 2 in. long, tubular-funnelform, curved, the lobes triangular; ovary sunk in a large, fleshy, cup-shaped disk. Trop. Afr. B.M. 5111. H.F. II. 3:102.—This species is apparently not known today and has not been recently treated in works on Trop. Afr.

3690. Stephanotis floribunda. (×54)

STEPHANÖTIS (from Greek words for crown and ear, alluding to the five ear-like appendages on the staminal crown). Asclepiadáceæ. Twining 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 umbel-like cymes from the axils; calyx 5-parted; corolla funnelform or salverform, the tube cylindrical and usually enlarged at the base and sometimes 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 inflexed 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 foliage, 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 convenient time. Pot the cuttings singly, in small pots, in a sandy mixture of peat. Place them in a tight case in 70° night temperature. Shade them from the sun and keep the cuttings in a moist condition until they begin to grow. When the small pots are filled with roots, shift them into two or three sizes larger, in a good strong fibrous loam with enough sand added to keep the soil porous. When the shoots have grown to a height of about 2 feet, cut them back several joints. This will make the plants break into several leads. As S. floribunda 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 wanted for a specimen plant, stephanotis 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 to 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. Stewart.)

floribunda, Brongn. Fig. 3690. Glabrous, 8–15 ft.; lvs. elliptic, with a short point, thick and shining green, entire: fls. 1–2 in. long, of waxy 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, containing melon-like seeds which are provided with a tuft of hair. Madagascar. B.M. 4658. G. 6:29, 291; 10:468; 15:622; 25:144; 37:397. Cn. 21, p. 441 (showing a pygmy plant blooming in a small pot and not climbing); 46, p. 208; 55, p. 150; 73, p. 211. G.C. II. 14:160 (a dwarf variety, the Elveston); 24:817; 25:157; III. 17:50. R.H. 1874, p. 308; 1885, pp. 438, 439. H.U. 1, p. 72. J.H. III. 50:165.

S. Thouirei, Brongn., from Madagascar, appears to be the only other species in cult., but it is a plant for the American trade. It has ovate lvs., fls. in 3's, and epals about one-third the length of the corolla-tube.

L. H. B.

STERCÜLLA (Sterculiáa of Roman mythology, from stercus, manure; applied to these plants because of the odor of the leaves and fruits of some species). Sterculiáceæ. Trees grown in the greenhouse, but also outdoors in the South. Leaves undivided, lobed or digitate: infl. paniculate or rarely racemose, frequently axillary, with the terminal fls. commonly feminine and earlier: fls. unisexual or polygamous; calyx 5-deft or 5-parted, rarely 4-merous, often colored; petals none; stamens united in a column which bears a head of 10–15 sessile anthers; pistil of as many carpels as calyx-lobes and opposite them, each carpel 2- to many-celled, the stigmas free and radiating: fr. follicular, each carpel distinct and either woody or membranaceous and sometimes opening and spreading into a fl.-like body long before maturity (Fig. 3691); seeds 1 to many, sometimes arillate or winged, sometimes hairy.—About 100 species, natives of the warmer regions of the world, some abundant in Asia. Sterculias have very various foliage, the lvs. of different species being simple, palmately lobed or digitate. The fls. are mostly in panicles or large clusters, sometimes large and showy, varying from greenish to dull red and scarlet. The species are grown mostly for street and lawn trees. The kinds that are generally known in this country are S. platanifolia, S. diversifolia, and S. acerifolia, the last two known in Calif. as brachychiton. All are easily grown from seeds. By Ben-tham & Hooker, Brachychiton is merged in Sterculia; by Schumann in Engler & Prantl it is kept distinct. See Brachychiton.

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KEY TO THE SPECIES.

A. Carpels expanding before maturity into fl.-like bodies, exposing the seeds ...... 1. platanifolia

AA. Carpels not becoming fl.-like.

a. Les. all digitate and spreading ............... 2. fortitida

b. Les. entire or only lobed (sometimes compound on some branches of Nos. 8 and 9).


1. *platanifolia*, Linn. f. (Firmiana platanifolia, Schott & Endl.). JAPANESE VARNISH TREE. CHINESE PARASOL TREE. Fig. 3691. Strong-growing, smooth-barked, round-headed tree of medium size, with deciduous foliage: lvs. very large, glabrous, cordate-orbicular, palmately 3-lobed or heart-shaped; lvs. the lobes sharply-pointed: fls. small, greenish, on reflexed calyxlobes, in terminal panicles: carpels 4 or 5, bearing globular pea-like seeds.—Said to be native of China and Japan. Hemsley admits it to the Flora of China, and Sargent says in Forest Flora of Japan that it is one of the several Chinese or Korean trees grown in Japan. Bentham states it is common in Hongkongis, says that it is native to China. Franchet and Savatier, in Enumeratio Plantarum Japonicarum, admit it as an indigenous Japanese species. Now a frequent tree from Ga. south. Hardy also at Washington, D. C. Excellent for lawns and shade. A peculiarity of this tree is that before maturing the frs. are filled with a brownish black fluid which when the pods burst is liberated. Var. *variegata*, Hort., has lvs. variegated with creamy white. Intro. into Calif.

2. *fetida*, Linn. Tall, handsome tree, with all parts glabrous except the young foliage: lvs. crowded at the ends of the branchlets, of 5-11 elliptic, oblong or lanceolate, entire, pointed, thick lifts.: fls. large, dull red, in simple or branched racemes, appearing with the lvs.: fr. large and woody follicles, glabrous outside, often 3 in. or more in diam. and containing black seeds the size of a hazel nut. Trop. Afr. and Asia to Austral.—Grown in S. Fla. In its native countries the seeds are said to be roasted and eaten.

3. *apetala*, Karst. (S. carthaginensis, Cav. Helicidæ apetala, Jacq.). Tree, about 40 ft. high; lvs. cordate-rounded, much longer than large, glabrous above, velvety beneath, lobes elliptical, obtuse, or oblong: fls. yellowish white with purple spots, about ½ in. across. Mex., Cent. Amer., and Colombia; intro. into Jamaica and Porto Rico.


5. *colorata*, Roxbg. 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 ½ in. across, tubular, clavate, orange-downy outside, pisea within: follicles 2-3 in. long, stipitate, glabrous, membranous. India.—Intro. into Calif.

6. *acrifolia*, A. Cunn. (Brachychiton acrifolium, F. Muell.). BRACHYCHITON. FLAME TREE. Evergreen tree, reaching a height of 60 ft., glabrous: lvs. long-petioled, large, deeply 5-7-lobed, the lobes oblong-lanceolate to rhomboid, glabrous and shining: fls. brilliant scarlet, the calyx about ½ in. in. large, in large showy clusters: follicles 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*, Roxbg. Large tree, the young parts yellow-pubescent, the bark ash-colored: lvs. large, cordate-ovate, acute, 7-nerve: fls. about 1 in. across, in few-flowered clusters shorter than the lvs., and which arise from the leafless axils, the calyx tomentose and the segments linear-lanceolate: follicles 5 in. diam., glabrous, with winged seeds. India.—Intro. into S. Fla.

8. *diversifolia*, Don (Brachychiton populneum, R. Br.). BRACHYCHITON. Tall tree, glabrous except the fls.: lvs. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes 3-5-lobed on the same tree, all parts acuminse: fls. tomentose when young, bell-shaped, greenish red or yellowish white, in axillary panicles: follicles 1½-3 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.). Large, deeply 3-lobed or divided, glabrous leaves, narrow, sometimes with short lateral ones: fls. salmon-color; calyx smaller and more tomentose. W. Austral.—Offered in S. Calif.

9. *rupéstris*, Benth. (Delabèchea rupéstris, 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, 5-6 in. long, or digitate, consisting of 5-9 oblong-lanceolate, sessile lfts, often above 6 in. long: calyx about 4 lines long, campanulate, tomentose both inside and out: follicles ovoid, acuminate, about 1 in. long, on stalks longer than themselves. Austral.

*S. acuminata*, Beauv.—Cola acuminata.—S. Russelliana, Hort., is said to be an aralia-like plant with the main st. and petioles pale yellow or green and the narrow divisions of the lvs. very dark green. Offered in the trade but not known botanically.

F. TRACT HUBBARD.

**STEREOSPERMUM** (Greek, hard seed). *Bignoniaceae*. About 12 species of tropical evergreen trees in Afr. and E. India, with handsome once- or twice-pinnate foliage and large bignonioid-like fls., pale yellow or rose-colored to purple, in large and loose terminal panicles; calyx campylenate, 2-5-lobed or 5-toothed; corolla funnelform-campanulate, with round crisped or toothed lobes; stamens 4, included; disk cupulate: caps. terete or 4-angled, 2-valved; seeds in 2 rows, with the thick nutlets deeply impressed in the thick spongy septum. Only the following species seems to be in cult.

*S. suaveolens*, DC. Tree, 30-60 ft.: lvs. simply pinnate, 12-18 in. long; lfts. 7-9, broadly elliptic, acuminate or acute, entire or serrulate, hairy white lying, about 5 in. long: panicle many-fld., viscos-pubescent: calyx campylenate, with 3-5 short lobes; corolla 1½ in. long, pale or dark purple pubescent outside, with completely crisped lobes: caps. 18 in. long. India.—Adapted for tropical or subtropical regions only and prop. by seeds or cuttings, also by air-layering.

*S. sinicum*, Hance.—Radermachia sinica.

ALFRED REHDER.
STERIPHÔMA (Greek, foundation, alluding to the large peduncle of the fruit). Capparidaceae. Unarmed shrubs with the branches and infl. stellate-pubescent, grown in the warmhouse: lvs. long-petioled, with 1 lf. which is lanceolate, entire; the petiole thickened at the top: fls. showy, orange, in terminal racemes; the pedicels bent or curved down, 1-fld.; calyx-cylindrical, 2-4-lobed at the top; receptacle very short, expanded into a ring-like disk; petals 4, sessile; stamens 8; ovary ovate or oblong; berry globose or angular, ciliate, pulpy.—Four species, Trop. Amer.

paradûxum, Endl. (S. clemomodes, 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-fl., 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. 5758. F.S. 6:564-565. Gt. 57, p. 242.

STERNBÉRGIA (named for Count Caspar Sterngberg, a botanist and writer, 1761-1838). Amaryllidácæ. 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 or lanceolate, erect-spreading; filaments filiform; fr. ovate, ovoid or oblong, scarcely dehisc. 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. 10:158 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 full.


BB. Blooming in spring.

Fischeriana, Roem. Has the habit of S. lutea, but differs in season of bloom and stipitate ovary and caps. WM. Watson says (G.F. 8:144) that the fls. are a brighter yellow and as large as the largest forms of S. lutea. Caucasus. B.M. 7441. Gn.W. 22:307; 24:131.

AA. Fls. and lvs. appearing at different seasons.

b. Lvs. linear: fls. small.

colchicifóra, Waldst. & Kit. Bulb about ½ in. through: lvs. appearing in spring, 3-4 in. long: fls. yel-

low, in fall; segms. about 1 in. by 2 lines broad.


BB. Lvs. strap-shaped: fls. large.


F. W. BARCLAY.

STEUDNÉRA (bears the name of Steudner, a German botanist). Aràccææ. About 5 or 6 perennial herbs of E. Asia, sometimes seen under glass in choice 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, recurring 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. colociasifolia Koch. St. short and fleshy: lvs. green above and paler beneath, the petioled often colored: spathe yellowish, purple or reddish inside; spadix whitish, erect, one-third as long as the spathe. S. discolor, Bull. (S. colociasifolia var. discolor, Hort.), has purple-blotched lvs., and spathese 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 infl.

STEVEÑSONIÀ (named after one of the governors of Mauritius). Palmáceæ, tribe Aràccææ. A monotypic genus of tropical palms from the Seychelles. Tall trees, spiny throughout or at length nearly smooth, with ringed caudex: lvs. terminal, spreading-recurved, the cuneate-ovoblate blade convex, bifid, oblique at the base, plicate-nerved, the margins split, segms. deeply cut, the midnerves and nerves prominent, scaly beneath; pediole plano-convex; sheath deeply split, scaly, spined; spadix erect: peduncle long, compressed at the base: branches thickish: spathes 2, the lower one persistent, prickly, the upper one smooth, woody, club-shaped, deciduous: fr. ellipsoidal, small, orange-colored. For cult., see Palm.

grandifólia, Duncan (Phanícophórium sechellirum, Wendl.). Caudex 40-50 ft. high, very spiny when young, less so when old; petiole 9-18 in. long, pale green; blade cuneate-ovoblate, shortly bifid, about 6-7 ft. long and nearly as broad: spadix 3-6 ft. long, bearing many yellow lvs. Seychelles. I.H. 12:433. B.M. 7277. Gn. 26, pp. 175, 520.—Probably not cult. in Amer. The name Phanícophórium (Turk.-Palm) commemorates the alleged theft of one of the original plants from Kew by a gardener in 1857. Phanícophórium is antedated by Stevensonia, although a nomen nudum.

JARED G. SMITH.

N. TAYLOR.†

STÉVIA: for the Stevia of florists, see Piquerìa. True Stevias are described in horticultural literature, but it is not known that any of them are now in the Ameri
can trade.

STEWÀRTIA (in honor of John Stewart, Earl of Bute, a patron of botany; 1713-1792). Sometimes spelled Steàtria. Ternátræmáceæ. Ornamental woody plants chiefly grown for their large and showy white blooms. Deciduous shrubs or trees with smooth flaky bark: lvs. alternate, short-petioled, serrate: fls. axillary or subterminal, short-stalked, with 1 or 2 bracts below the calyx; sepals and petals 1 or sometimes 6, the latter obovate to almost orbicular, usually connate, with crenulate margin, connate at the base with each other and with the numerous stamens; styles 5, distinct or
conenate: fr. a woody, usually hirsute caps., loculicidally dehiscent into 5 valves; seeds 1-4 in each locale, 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 midsomer 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.


c. Bracts beneath the calyx large and Y-like.

sinensis, Rehd. & Wilson. Shrub or tree, to 30 ft.: lvs. oblong-elliptic to elliptic-obovate, acuminate, serrulate, glabrous or sparingly pubescent beneath, 2-4 in. long: fls. with large serrulate or entire bracts at the base, white, 2 in. across; stamens connate at the base, pubescent: fr. subglobose, pointed, ½in. across. Cent. China.

monadelpha, Sieb. & Zuec. Shrub or small tree: lvs. oval to oval-oblong, acute at both ends, remotely serrulate, slightly pubescent beneath, light green, 1½-2½ in.

3694. Stewartia pentagyna. (×½)

long: fls. white, 1½ in. across, with flat, spreading, obovate petals; stamens connate at the base; anthers violet: fr. about ½in. across. Japan. S.Z. 1:96.—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, Brow. of 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, or 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. 7045. R.H. 1879:430. G.C. III. 4:187. Gm. 43:172. G.F. 9:35 (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'Her. (Malachodendron ovatum, Cav.). Fig. 3694. Shrub, 6-15 ft. high: lvs. ovate to oblance-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. & Ga. to Tenn. and Fls. B.M. 3918. 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. 4-4½ 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 Stigmaphylum, 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, 5-glandular; petals clawed, unequal, glabrous, stamens 10, unequal, 6 perfect, 4 without anthers or deformed; ovary 3-celled, 3-lobed, dorsal lobe gibbous; samaras 1-5; 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. 15:77. Gn. 33:170.—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 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. It is said that in S. Calif. it must have shade, protection from dry or hot winds, and an open soil. Under the right conditions it flowers admirably.

littale, A. Juss. A tall leafy climber: lvs. opposite and alternate, long-petioled, 2-5 in. long, varying in shape: fls. yellow, in profusion, borne on pedicels ¼-1½ in. long; peduncles axillary, solitary; corymbs terminal, simple or compound; corolla 1 in. diam. Autumn. Argentina. B.M. 6625.

STILLINGIA (for Dr. Benj. Stillingfleet, an English botanist of the eighteenth century). Euphorbiaceae. Shrubs or herbs, chiefly of the American tropics, one rarely cultivated and used in medicine.

Glabrous, juice milky: lvs. alternate, simple, short-petioled to sessile, the petiole and bracts biglandulose: fls. in terminal spikes, monocious, apetalous, the staminate above with the 2-3-lobed calyx imbricate, stamens 2-3, filaments free, the pistillate few, at the base of the spike; ovary 2-3-celled, 1 ovule in each cell; base of the caps. persistent as a 3-pointed piece; seeds usually carunculate.—About 25 species. Related to Sapinum and Hura. The root of S. sylvatica is used in medicine. The plant is occasionally grown and will 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 serrate, acute or obtuse: spikes 2-3 in. long: fls. small, yellow. Spring to fall. Va. to Texas.

S. schizopetalum=Sapium schizopetalum. J. B. S. NORTON.

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-fld.; glumes membranaceous, longer than the indurated lemma; lemma with a sharp hairy callus below and a stout persistent twisted 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 long-awned, 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 aawn, ½-1 in. long.

capillata, Linn. Similar to S. spartea: fls. more numerous but smaller in every way; lemma about ½ 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; fls. plumose, about 1½ in., tapering to a slender point; lemma nearly 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.

BB. Fr. or mature lemma, excluding the short awn, less than ¼ in. long.


spländens, Trin. (Lasiagrostis spländens, Kunth.). Culms 3-6 ft.: panicles rather dense, about 1 ft. long, nodding; spikelets numerous, small, the glumes less than ¼ in., pearly and shining, tinged with purple at the base; lemma ½ in., villous, the awn ¼-½ in. Steppes of W. Asia.
AA. *Avena* or *pedicelis plumose.

b. *The pedicelis plumose.*

elegantissima, Labill., Fig. 3695. Culms 2–3 ft., erect from horizontal rhizome; lvs. narrow and erect; panicle very loose, 6–8 in. long, the capillary panicle branches and pedicelis plumose; spikelets 4–6 lines long; awn 1½ in. long. Austral.—Thrives in sandy soil.

BB. *The awns plumose.*

pennata, Linn. *Feathering Grass.* Fig. 3696. Culms 2–3 ft., in bunches: glumes narrow 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 *S. gigantea.* Sync. Conn. Fl. and Siberia. Gn. 9, p. 190. V. 3:247. R.H. 1890, p. 489.


**STIZOLOBUM** (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-foliolate: fls. 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 (0 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).

As a 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 pedate lvs. With corolla lvs. 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 covered 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,* Kunzle) 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,* Kunzle), which has very long racemes with purple flowers, and late-ripening pods covered with a velvety pubescence; and the Yokohama (*S. Hassjoo,* 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...
STIZOLOBIUM

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 mostly 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 has shorter racemes and blooms much earlier; and varieties of _S. chloroperum_, 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_, Bort. (Fig. 369h), 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 velvet pubescence. All are annual climbers, and bloom 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 cow-tie or cowage, _S. pruriens_, Medie. (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 troublesome blisters. In the West Indies a decoction of these hairs is often used as a remedy for intestinal worms.

Only varieties with a minimum growth of these stinging hairs are ever cultivated for either ornament or for forage.

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 successfully on the meal made of the beans ground in the pod, but persons have been made sick by eating the green cooked beans, and chickens have been killed by raw or uncooked beans. Because of its vigorous growth, the velvet bean promises well as a soil-remover, as 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 (1/4 to 1/2 inch diameter) have marking which suggests the easiest.

S. M. TRACY.

STOBÆA (named for D. Stobaæus, a Swedish patron of Linnaeus). _Compositae_. Somewhat shrubby plants or herbs commonly with aspect of thistles as to the foliage.

Leaves usually dentated, dentate, pinnatisect, lobes dentate and spiny: heads small to large, solitary or somewhat corymbose; rays usually yellowish. About 70 species, mostly in the central and southern United States. It is considered to belong to a section of the genus _Berkheya_, and so named below.

B. membranifolia, Hubb. (_Stobæa membranifolia_, DC.). St. herbaceous, erect, cobwebby above: lvs. thin membranaceous, glabrous above, white-tomentose beneath; radical long-petaled, bordered with slender spines, oblong or elliptical, spinulate; cauleine more copiously woolly beneath, more or less sinuose or pinnatifid, decurrent in ciliate-spinose sinuose--wings: heads solitary: fls. pale yellow. July, Aug. S. Afr.


B. Rádula, Hubb. (_Stobæa Rádula_, Harv.). St. herbaceous, erect, angle-furrowed: radical lvs. obvolute-oblong, obtuse, tapering to the base, some somewhat petaled, roughly setose at first then seaboars with hard points above, white-woolly beneath; cauleine lvs. small, narrow-oblong or linear, very spiny, decurrent in long, very spinose st.-wings: infl. racemose-corymbose; heads short-radiate. S. Afr.

F. TRACY HUBBARD.

STOCKS. Popular florists' flowers, single and double, white, bluish, pink, purple, yellowish, valuable for cut-flowers (Fig. 369i). They are divided into two groups, summer and winter stocks. The former are annuals and therefore bloom the first summer; the latter are biennials and bloom the second year, or, if sown very early, late in the fall or the winter of the first year. Fall or intermediate stocks are between these two groups; they are heavily branched and named _Matthiola_; also _Cheranthus_ for the closely related wall-flowers (also _Wallflower_). Virginian stock is a very different plant and is not a florists' flower; it is grown for its small fragrant single fls.; see _Malcolmia_.

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 free of manure, 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 saesh 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. If
the sun 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 contains an admixture of well-rotted soil or the soil taken from river-bottoms. The pots are put out to root in high with an outside diameter of 7 inches. When 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 tilt-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 cold. 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 quite small. The commonest size of these 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 some time 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 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-saving 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 desirable 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.

STORAGE

STOKÉSIA (Jonathan Stokes, M.D., 1755–1831, English botanist). *Compositae*. **STOKES’ ASTRER** is one of the choicest and most distinct of American hardy perennial herbs, although little planted.

Heads many-fl.; marginal fls. much larger, deeply 5-cut: involucre subglabrous; outer leafy, the inner with foliaceous, pectinately spinulose-ciliate, spreading appendages; receptacle fleshy, flat, and naked: achene 3–4-angled, smooth; pappus of 4–5 thread-like, deciduous 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 chichory. The heads are 3 or 4 in diameter, at the edge of the involucre. The involucre is composed 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 not hardy to South Carolina; but the following winter 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 Woolson and Keller testify, will decay if water stands on the soil in winter. Moreover, the plant has been praised by

Meehan 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 horticultural 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-flowered form is now on the market.


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 transport them from the place of production, the development 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 diseases and the application of refrigeration to the transportation 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 conditions, 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 product a short distance and 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 marketing or period during which the product may be sold, were refrigeration 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 fancy prices. The conservation of the surplus crops through storage brings 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-year-round staple food, as supplies are easily held from one season to the next. Perhaps the most striking advantages to both the grower and producer are manifest. If all the apples produced 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, lemons, and oranges. Many other vegetable crops 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 young 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 held in cold or cool storage much longer than would otherwise be the case. All of these examples are mentioned to indicate the wide application of storage to horticultural industries.

There are several different methods of conserving or preserving food products. Among these methods may be mentioned curing, drying, salting, smoking, canning, use of chemical preservatives, and by refrigeration. Of these the last method is the only one by which the products are held in their original or "fresh" condition. The methods in which the character of the product. Cold-storage conservation aims to hold the product in such a condition that it may be used as fresh. If the storage does not accomplish this, it falls short of its principal object.

Two kinds or methods of storage are recognized at present: These are (1) cold storage, and (2) common storage, sometimes known as "dry storage." The objects of these two methods of storage and their accomplishment are the same. "Cold" storage is designated as artificially cooled storage, or the holding of the products in rooms or buildings which are artificially refrigerated, i. e., the cooling is effected by means of machinery or ice. "Common" storage is the term applied to storage without ice or mechanical refrigeration, the cooling effect being obtained from the natural low temperature of the outdoor air. The aim of common storage is to "conserve the natural cold" in buildings which are specially constructed and equipped with proper ventilating devices or openings. It is difficult to determine the exact refrigeration in the case of storage as "dry" storage. Both cold and common storage must be dry, excessive moisture in either case being detrimental. A possible explanation of the term "dry" in this connection is the fact that in the first cold-storage houses ice was the refrigerant with necessarily more or less dampness about the plant; while in common storage, no ice is used ordinarily and consequently there is no dampness from this cause.

Contrary to general belief, the use of cold storage is not confined to products such as lemons, which have to be kept in cold storages for long periods of time. Contrary to the popular belief, the Chinese have practised cold-storage methods for centuries. They are able to hold grapes from one season to the next by storing them in deep cellars which are kept cold with baskets of broken ice placed among the baskets of fruit. He found also that the Chinese fruit merchants keep perishable fruits in large thick-walled earthen jars, in the bottom of which a layer of broken ice is kept and over this, in wicker baskets, the fruit is held. The jar is covered by a wooden felt-covered lid. It is a long step from these ancient Chinese ice-cooled cellars and jars to the modern mechanically refrigerated storage house, but it is certainly of interest to find that the ancients understood the fundamental principles of the conservative of foods through the reduction of their temperature. The dangers of the use of cold-stored food products have been over-emphasized. The present high cost of living has been at least in part ascribed to the supposed ingenious practice of "cornering" foodstuffs during their normal seasons at low prices, and holding them in storage to be sold at arbitrarily high prices. While there is no doubt that attempts have been made to corner foodstuffs in this way, experience shows that the attempt has been uniformly disastrous financial failures so far as the promoters were concerned. As will be shown later in this article, the holding of fruits or other foods in storage is rather expensive and not so simple as it seems to be at first sight. Not all products are uniformly suitable for storage and unless the greatest care is exercised both in selecting the product and preparing it for storage, serious losses from deterioration are certain.

Another unfortunate fallacy, that cold-stored products are necessarily inferior as such, has become widely prevalent, due to campaigns in newspapers and magazines with a view mainly of casting odium upon stored products. Almost everything is doubted that much poor cold-stored food materials have been sold, but canned foods and vegetables have frequently been foisted upon consumers. The fallacy lies in attributing the deterioration alone to cold storage. Such deterioration can usually be traced to the poor condition of the product at the time it was placed in storage, to improper methods of preparing the product for storage, or to attempts to hold it too long. The application of the low temperature is not detrimental unless the temperature is low enough to injure the product by freezing. No product can be improved through cold storage. If it is in poor condition when it is placed in storage, it will be in much poorer condition when it is withdrawn. If it is in good condition at the time it is stored, it will remain in first-class condition throughout its normal life, provided always that the storage plants or rooms have been properly operated.

Many fallacious arguments have been offered tending to prove that holding in cold storage is itself sufficient to render a given food product unwholesome. The argument that because some cold-stored products at times have been placed on the market, as admitted in the preceding paragraph, the condition of the goods was due to the three causes above enumerated and not alone to the application of refrigeration. The attempts to hold supplies which have deteriorated before they are placed in
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 in 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 foods 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, but it is not likely that the obstacles to the development of refrigeration. It is questionable whether the adoption of an arbitrary length of time for holding all products is wise or safe. Not only does the length of time vary for different classes of goods, but within the same class the condition 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 wholesome condition. Thus, not all apples of a given variety may be held the same length of time. The length of the period of successful storage will depend upon the condition of the fruit, its stage of maturity, the care with which it has been handled, and also the promptness with which it has been cooled. The same principle holds true for all other fruit and vegetable products. It would seem, therefore, that some provision for the inspection of food products to determine their fitness for storage would be wise and would result in preventing many losses now sustained through the storage of unfit goods. So far, none of the laws passed or proposed makes this provision.

This argument is not offered to defend the cause of cold-storage warehousemen. They have not been entirely free from blame in the past. The possibilities and the advantages of cold storage should be fully appreciated and the public is entitled to the use of refrigeration in horticultural industries will undoubtedly become more and more urgent, and the use of this important adjunct to modern fruit-growing is bound to extend its scope and receive wider application in the future.

Cold storage is a modern economic necessity. 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; later generally refined carbon dioxide gas was used. The gas 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 constantly being made and the advantage 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 of vaporization of the gas for a given amount of power. One of the essential qualities of the gas which may be used for this purpose

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 a simple and economical method of first manufacturing the ice and the consequent inconvenience in handling it are avoided.

There are two kinds or styles of cold-storage plants—the general warehouse, provided with cold-storage equipment for handling all classes of commodities; and the storage plant constructed specially for the storage of a particular class or commodity, such as 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 is divided among 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 can be utilized during the year. This is hardly feasible with fruits, with the possible exception of apples which are now used by many large commercial plant operators. In the case of even in the case of apples, there cannot be a full use of the equipment continuously, 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 may be 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 fruit-growers independent of buyers' or speculators' manipulations of prices or marketing facilities.

Mechanical refrigeration depends on the compression of a gas or vapor. The compression exerted heats 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 all refrigeration plants. 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 constantly being made and the advantage 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 of vaporization of the gas for a given amount of power. One of the essential qualities of the gas which may be used for this purpose

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 these last named system. In the use of the first, ice alone may be the refrigerating medium, since the ice may be used to obtain lower temperatures than are possible from ice alone. In the application of the ice-and-salt

STORAGE

STORAGE
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 easiest to handle. It may be liquefied at a lower pressure and temperature than the dense vapor condenses if it is placed in the presence of 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 water is needed for condensation. These conditions are not always obtainable within ordinary means. Carbon dioxide has the advantage of being a non-irritating gas. If there is a leak, 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 a 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 now 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. It is well, however, 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 yield given results 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 delicate in many respects.

The 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 by the dense vapor condenses it into liquid ammonia. This liquid is ordinarily run into a receiver or reservoir, where it is kept for use as needed. From the receiver, the liquid ammonia is forced into what is known as expansion coils. These coils consist of series of pipes into which the liquid ammonia is allowed to enter. The liquid is at the low temperature and changes from the liquid to the gaseous state, and in changing its state and expanding absorbs considerable heat from the surrounding 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 as described above.

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 aqua-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 heavy 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 liquefication, it is allowed to expand in coils and the gas is then returned to the compressors or a series of absorbers. These absorbers contain cool water which readily absorbs or dissolves the ammonia gas. From the absorber, the solution is pumped into the heating tank, again heated, and the process repeated.

When one contemplates the installation of refrigerating machinery, there are many important factors to consider. One of these is the supply of water needed for condensation. 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 located in some exposed place. In these towers, the water is run through screens which break it into many 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, above 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 low temperature 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 mixture.

The gravity-brine system, the invention of Madison Cooper, acts as the reverse of a hot-water heating system. It depends upon the density of a cold liquid, and its consequent downward flow when confined in a system of pipes. The system consists, first of all, of coils of pipes filled with a strong solution of calcium chloride brine. One end of the pipe system is contained in a tank which holds ice and salt. The cooling effect of the brine results in greatly reducing the temperature and increasing the density of the brine. From these "primary" coils the brine is conducted into what is known as secondary coils which are placed in the rooms or chambers to be cooled.
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 "ice-and-salt system." In this the brine 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 of 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 meltage is necessary, and in arranging for this meltage 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 ice-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 meltage 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.

In the direct-expansion system, the expansion pipes in which the gas is allowed to expand and thereby produce the refrigeration, are located in the storage rooms. 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 rooms; 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 plants in operation which work satisfactorily and without any leak has 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 cooled brine is circulated around the coils by means of pumps. In applying this method, there is, first, what is known as a brine-cooler in which the actual cooling of the brine takes place; the cold brine is then
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 quality 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 room's equipment for refrigeration, and the number of 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 also has a decided advantage, 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 lay them located at the upper part of the room. Ordinarily, the dependence for the circulation of refrigeration throughout the room is on 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 throughout the room is maintained. 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, circulation of pipes are in general and in 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 brine can be forced through them.

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 by means which, otherwise, 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 ice. The brine in the coils and 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 the room. Attention must be given to the fact 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 expense of piling in high stacks 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. After the size and the cubical 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 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 must be 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 shape. When this is necessary, it will require considerably more insulation or power, as suggested. The capacity of the plant must be determined by the nature 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, conduction, and convection. 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, however, may be made out of 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 room is 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 means to prevent the actual transmission of the heat from the outside to the inside of the room. The laith a filler breaks up the air currents within the insulation of storage rooms. Therefore, the rooms are constructed in such a way that the walls act as barriers against the transmission of outside heat into the room, or the loss of heat of the storage room to the outside in extremely cold weather. The best insulation against heat transmission, as far as it is possible to arrange storage rooms with vacuum walls, the heat leakage into the room would be very slight, and after the rooms were once cooled to the desired point, it would not require machinery of great capacity to maintain a low temperature. It has been found difficult, however, to maintain a vacuum under ordinary circumstances. The outer air pressure is constant and leakage of air into the vacuum walls, although slight, gradually destroys the insulating effect. Attempts at vacuum construction on a large scale have not been successful.

Air spaces, that is, walls made air-tight so that the air is closely confined, 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 transmitters 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. By merely thickening the walls, therefore, does not act as a sufficient insulation. The insulating effect of air spaces is considerably 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 fillers 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. Fillers 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. Fillers or fillers are effective as insulation 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. Vermin-proof; there should be no induction 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 its 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 ½ to 1 inch in thickness.

Linofelt is a patented material manufactured from
flax fibers. It is prepared in sheets or quilts, from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick, somewhat like cotton-batting. 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 82 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 material 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 their entrance. Sawdust from different woods has about the same insulating effect. The sawdust must be thoroughly dried, otherwise its efficiency as insulation is greatly impaired and, in addition, there is danger of fermentation and heating, and even spontaneous combustion. It is more difficult to dry out 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 shavings 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 elastic 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 a loose condition, much will depend upon the method of constructing the walls. Not only is it necessary to use the lumber and insulating material in a dry condition, but unless the walls are properly built, the insulation will not remain dry any great length of time. Walls that are not practically air-tight allow the outside air to gain entrance into the walls and 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 insulating 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 covering both inside and outside 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. The use of reasonable care in the application 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 of life processes are continually proceeding and the degradation of the tissues as the product remains in a normal condition. The various processes of ripening depend upon the chemical and physiological changes within the
organization. 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 organism 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 show that the temperature factor is the most important from the standpoint of the rate logically the life processes. 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 slowing of the rate and a consequent increase of the length of the life span. This is the essential physiological principle upon which the cold storage of fruits, vegetables, and other storage crops depends.

The most satisfactory temperature for storage purposes is one which is low enough to reduce the life activities to a minimum but not sufficiently low to stop them entirely. 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 even of the same variety may have different 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 maybe 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 should 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, some fruits such as grapes, plums, peaches, and some varieties of grapes have very rapid life activities, while the less perishable fruits such as apples, pears, and the citrous fruits have a very low rate of life activities. This condition affects the storage period of a given fruit even under the most satisfactory condition. 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 hardier 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, mangoes, 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 citrous fruits, 45° to 50° F., are the most satisfactory temperatures. Citrous 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 citrous 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°, citrous 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

3703. Diagram showing proper method of ventilating a storage cellar.

important problem has been undertaken and, consequently, the fundamental factors governing the general principles of humidity conditions in storage rooms have not been definitely determined. Much shriveling of fruits in cold storage has been due largely to excessive evaporation on account of the free transpiration activities of the fruits. Transpiration, or the giving-off of moisture, occurs freely at high temperatures, less freely at low temperatures. The moisture, however, is being constantly given off even at low temperatures.
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 wilting 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, or, as it is often said, that cold stored fruits are necessarily 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 carefully conducted, than is common storage. Any excess of moisture in the cold-storage room makes some defect in the construction of the plant, or in its operation. It has been said that cold-stored fruits are either too wet or too dry and that moisture is 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 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 or flues into the room and 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, cool 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, by the remainder of the period 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 this period of temperatures may 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 these spells are not so cold.

3704. Diagram showing ventilating air space and proper positions of ventilators in a common fruit storage house.
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 for 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 not been favorable. 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 extreme winter weather. 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 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 structures, and, as such, do not require special construction and special means be provided for ventilation, the cellar is not an efficient fruit-storage chamber, except for short periods of time and for the protection of the products against freezing in winter. Cellars are difficult to ventilate unless special appliances are used. They may be ventilated by means of the usual ventilation system, and in many places of such systems are controlled according to differences in temperature, otherwise there will not be any appreciable movement of the air. Wind flues may be used; these are flues which have a funnel-like arrangement at the top, so designed that the mouth of the funnel is kept to the wind by means of a vane. The pressure of the wind entering the funnel creates a circulation of air through the cellar. In some instances these wind flues are found to work the reverse way during periods when the wind does not blow. In ventilating a cellar, there must be an outlet opening corresponding to the inlet opening. This is to allow the escape of the warm or foul air from the room. If it is possible to provide openings on all sides of the cellar, a current of air can be easily circulated through the room, especially if there is a breeze. The intake flues should open near the floor of the cellar. Fig. 3703 shows the proper placing of the inlets and outlets designed to ventilate cellar rooms. There should be a large number of openings to facilitate the ventilation of the cellar as rapidly as possible. Cellars are useful only for relatively high-temperature storage, and the necessity for insulating the walls of them is not sufficiently appreciated. The insulation must be sufficient to protect the cellar against the comparatively high temperature of the earth; otherwise, the temperature of the storage room cannot be held materially below the earth temperature.

**Common-storage rooms are frequently very cheaply constructed.** The idea is prevalent that any old shed can be made to serve the purposes of a common-storage room for fruits or other products. The insulation is poor and, as a consequence, there is great fluctuation in the temperature. Proper insulation in the construction of a common-storage room is really more important than that for cold storage because there is no means of regulating the temperature except by ventilation or change of air, while the cold-storage room has artificial or mechanical means, the capacity of which can be increased to offset the heat leakage. To be effective, all common-storage plants must "conserve cold," and the necessity to provide efficiently against heat leakage through the walls, therefore, becomes doubly urgent.

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 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-brine 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 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 insulation 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.
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 canners 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, Fameuse, Yellow Bellflower, Jonathan, Grimes. The following winter varieties are the ones of most importance for storage purposes: Baldwin, Ben Davis, Winesap, Yellow Newtown, Gano, Rome Beauty, Esopus, Northern Spy, Stayman Winesap, Banana, Ortley, Delicious, Lawyer, Rhode Island Greening, Northwestern Greening, and York Imperial.

The varieties of pears which may ordinarily be used for storage are: Bosc, Easter, Anjou, Clairgeau, Comice, Howell, Winter Nelis, Duchess, Sheldon, and Kieffer.

Factors underlying successful storage.

By means of investigations of the United States Department of Agriculture, the factors which promote 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-
storage

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.

Differences of one to three months in the storage quantity of various varieties of the same type are found to be due to the place of production. Mention has already been made of the storage weakness of the Yellow Newtown and other varieties grown in the Central Pacific coast district of California. The same varieties grown in the Pacific Northwest and in Virginia and the rest 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 qualities; 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 poor color; the green, poorly colored apples produced under such conditions do not have high market value. Such crops are subjected to the trouble known as storage-scald; the loss from this source may be avoided and the storage quality of the fruit may be much improved by better orchard methods. 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 fruit from irrigated and from non-irrigated districts grown without it another. The varieties are different 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 dependent on rain, and where the moist soil is well supplied with moisture, the work must be thoroughly and properly done; otherwise, the moisture supply in the soil will be deficient, and the 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 conditions of soil, climate, and other natural factors 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 important from the storage standpoint. It is necessary that this work be thoroughly and properly done, as insect and disease injuries render the fruit liable to deterioration. The insect or disease may be of itself 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.

Storage is affected not only as to the quantity of the crop. In seasons of unusual drought, for example, the fruit may be so weakened that its storage qualities may be seriously impaired. On the other hand, unusually wet seasons result in the production of sappy fruits which deteriorate rapidly. In seasons of unusual drought, the orchardist is placed in an advantageous position, seeing to it that the application of the water is properly adjusted. The effect of frost may be beneficial or otherwise: A crop may be thinned to such an extent that its condition may be somewhat improved since over-production by the tree may result in weak fruit, while the thinning will improve this condition. On the other hand, where the frost is sufficient to destroy most of the crop, the remaining fruits may be sappy and overgrown and otherwise weak. The frost-injured fruits themselves have not as high storage qualities. During an unfavorable season, fruit which has been placed in storage must be carefully watched throughout the storage period. Such fruit should be checked to determine the length of time it is held. The effect of storage is such that attempts to hold the fruit beyond its normal life period result in serious losses. Fruit of low vitality, when the limit of its life is reached, will deteriorate very rapidly after withdrawal from cold storage. It is important, therefore, not to wait until the fruit is ready to break down before withdrawal.

Fully matured well-colored fruit keeps best and longest. Early notions that fruit for storage should be picked in an immature condition are erroneous. The fruits which are picked before full maturity have low storage qualities. There is serious deterioration from storage and, in the case of some fruits, a definite relationship between the occurrence of scald and the state of maturity at which the fruit is picked. This disease is a peculiar browning or scalding of the skin of the fruit. It does not extend into the flesh except under very severe conditions. Immature fruit is seriously affected while fully matured fruit of the same variety may be held without deterioration from this cause.

Full maturity means that the “ground color” is plainly developed, the flesh of the fruit firm, and the seeds fully grown and colored. This principle is correct for all fruits with the possible exception of most stone fruits and prunes. Over-maturity may be avoided. A designation of the proper stage of maturity 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. This is a wrong practice, as some fruits mature before others, and if allowed to remain until all are colored, may become over-ripe or over-mature. It is best to make more than one picking, especially with the earlier ripening varieties. Fruits on the outer branches exposed to full light ripen first and the best results in storability are obtained when these are harvested separately, unless the trees are well and properly pruned.

Reference has been made to the importance of cooling the fruits promptly and rapidly, in connection with the ripening processes and life activities and the effects of temperature on these factors. Delay in storage, which results in over-riping, may cause injury which shortens the storage period from one-third to one-half. Experiments with apples held at a comparatively high temperature for a period of ten days or two weeks before cooling, showed that fruit thus treated could be held only from one-third to one-half as long as the same varieties promptly stored and cooled after pick-
STORAGE

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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 said to result directly if the season happens to be 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.

One of the most important points in the handling of 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 rate of cooling. This rate 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 at all 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 and 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 on the fruit and when the temperature is above freezing it 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 loss both in common and cold storage and occurrence of this trouble is due almost exclusively to rough handling. The blue mold does not grow upon the sound skin of a healthy fruit. The importance then, of handling the fruits with extreme care throughout all the processes of picking, grading, and packing cannot be too strongly emphasized. Bruises or breaks in the skin may mean a decayed fruit. This general principle has been established through a long series of careful investigations and cannot be violated under any circumstances.

There are other decays which affect apples and other fruits: the principal diseases affecting apples are brown- or ripe-rot, 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 decays occur on the trees as canker spots and the spores which inhabit the fruits develop from these cankers. Control of the cankers by cutting out or spraying at an early stage 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 scalded appearance of the skin. These physiological troubles have been found to be due, at least to some extent, to rough handling or to pressing. A physiological breakdown also occurs in fruits which is approached by a result more or less seriously in fruit which has been delayed in cooling after picking. Physiological breakdown also occurs in fruit which is held beyond its normal life limit.

Ordinary storage-scald has already been referred to. The nature of this disease is unknown but it is supposed to be due to the action of enzymes upon the skin of the fruit. There is another form of scald, which is of a better term, has been designated as “soft scald.” Ordinary storage-scald does not soften the skin except in the most advanced stages. The soft scald produces a softening of the skin and also of the flesh directly beneath the skin. It occurs also in more or less distinct areas or zones, sometimes extending completely around the fruit. The nature of this disease is obscure and, so far, storage treatment, orchard treatment, and temperature effects do not seem to have any bearing on it. It has been attributed to the freezing of the fruit in storage and while definite effects from the effects of freezing have not been obtained, it is possible that in storage rooms of uneven temperature conditions portions of the rooms may have temperature conditions sufficiently low actually to injure the fruit.

For discussion of precooling, see the article Transportation.

A. V. Stubenrauch.

STOVE PLANTS. The term “stove” applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of bricks. Such structures came to be called stovehouses or stoves, and the plants grown in them “stove-plants.” (A “greenhouse” was in those days an unheated glasshouse in which plants were merely kept alive over winter.) These terms still exist in England, but are applied to strictly tropical plants or those requiring a warm temperature for their successful culture in glasshouses. In this country such plants are usually spoken of as warmhouse or tropical plants.

In England, at the present time, more distinction is made in the names applied to plant-houses than in this country. For example, “greenhouse” in England means the coolest glasshouse only, while in this country the name is usually indiscriminately applied to all glasshouses. The names applied to plant-houses in England are therefore: stove, for tropical plants; intermediate house, for plants hailing from warm-temperate climates; greenhouse, for those plants requiring the least degree of heat. A conservatory or show-house is one in which plants are placed while in flower and usually kept at a cooler temperature. These terms may be greatly modified to suit local conditions; for example, glasshouses are sometimes named cool-temperate house, warm-temperate house, tropical house, palm-house, acacia- and succulent-house, experiment-house and propagating-house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stoved plants is too heterogeneous a subject to be treated exhaustively in a single book, because the stove contains thousands of dissimilar plant treasures from the tropics, especially those found at low altitudes. In general, the stove is the house which requires the most expense and care, the greenhouse heat and atmosphere more or less. For the general principles of its management, consult Greenhouse Management, p. 1408.

Edward J. Canning.
**STRAWBERRY**

*Strawberry* (for WM. Fox-Strangways, English botanist). *Rosaceae*, tribe *Pomier*. Ornamental woody plants grown for the handsome foliage and the attractive flowers and fruits. Evergreen trees or shrubs: Ivs. entire or serrate, with subulate stipules: fls. white, in terminal many-fl.d. corymbs, 5-10 in.; cal. 5, generally obovate, clawed, stamens about 20, styles 5, connate to the middle or higher; ovary 5-celled, the cells 2-ovuled: fr. a small pome, crowned by the persistent incurved calyx-teeth, the cells usually 1-seeded.—Two or 3 species in China and Himalayas. These are handsome evergreen small trees or shrubs with generally oblong large, glabrous leaves. *Fragaria virginiana* Lvs. petioles 2-5 in. long, glabrous: petioles subulate at base, corymbs 3-4 in. across; stamens about as long as petals, with red anthers: fr. subglobose, scarlet, 2½-4 in. across. *Fragaria chiloensis* Lvs. elliptic-oblong to oblong-lanceolate, usually wavy on the margin, 1½-2½ in. long; corymbs 1½-3 in. across, sometimes nearly glabrous. B.M. S.418.

**STRATÖTES** (Greek, soldier, referring to the sword-shaped leaves). *Hydrocharitaceae*. *Water Soldier*, or *Water Aloe*. Perennial hardy aquatic herb of small ornamental value but considerable botanical interest: st. very short, stoloniferous; Ivs. clustered, all sessile, submerged, linear-lanceolate, fleshy, acute, margin with many pointed teeth: spadix extending above the water, 2-lv.d.: fls. white; fr. 2 to several in a spathe, pedicelled, perianth 2-3-merous; stamens 11-15; pistils rudimentary or none; female fls. solitary in the spathe, short-pedicelled, perianth similar to male; staminodes many, linear; ovary oblong, somewhat 6-celled: fr. on a recurved pedicel, laterally exserted from the spathe, ovoid, acuminate.—One species, Eu. The plant has a distinct calyx which is not the rule among monocotyledons.

One of the peculiarities of stratotes is that in summer the whole plant rises to a point near the surface when it is only partly submerged, and later in the season drops below the surface. Young plants do not act thus. It is propagated by side shoots from the base of the leaves. Toward fall and early winter these shoots are merely bulblets and are readily detached from the plant and are in a good condition for traveling. It is not desirable for the aquarium on account of its spiny leaves. (Wm. Tricker.)

*aloides*, Linn., is the only species in the genus. It is sometimes called *Cran’s Claw* or *Freshwater Soldier*. In England the planting of this species is discouraged from the fact that it spreads too rapidly. Peduncles rising from among the Ivs. 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. 1, 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 Alpiners, and in raising new varieties. Division of the crown is useful for propagating varieties that are practically runnerless, especially the Bush Alpine and Pan-American. The runner plants, either transplanted or allowed to remain where they 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. Good results 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 intense the cultivation the sooner 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 plow, disc-harrow, cultivator, or hoe, and in stirring the soil to provide favorable conditions for the rooting of new runners. It is customary, also, to mow 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 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
which start in the spring of 1916 are fit for planting in the late summer or fall of 1916 or in the spring of 1917. These plants have many long, fresh, light-colored roots. Fig. 3714 shows such a plant, with the roots trimmed for planting. Fig. 3715 shows a plant that has borne this plant bore fruit, say, in 1915, and has thrown up a new crown in 1916. The old dead crown is seen at the right. The young growth is lateral to this old crown. The roots are relatively few and are hard and black. These plants sometimes make good plantations under extra good care, but generally they should be avoided.

Two- or 3-inch pots are sometimes plunged under the new runners in June and July, and they become filled with roots in two or three weeks. These pot-grown plants are excellent for fall setting in the home-garden, but they are seldom employed in extensive commercial practice on account of their expense. Almost as good results can be secured by setting strong layer plants. (Fig. 3716.)

In Florida and in the coastal plain of Georgia, Alabama, Louisiana, Mississippi, and Texas, beds need to be reset annually, in September or October; plants set at this time produce a good crop in the following February, March, and April. The plants may be produced at home, but more commonly are secured from the North.

In hill training, each plant is allowed a space by itself, cultivation is given both ways, and no runners are allowed to set. Hill or stool training is practised commercially in Florida, the Gulf States, and on the Pacific coast, and, to a slight extent, in northern market gardens. It is the most practicable method under irrigation, and in a very humid climate. The chief disadvantage is the heavy expense of removing all the runners. Hills give choice berriers than narrow matted rows, but the yield is not so heavy. For commercial results, plants are generally trained in narrow rows. The old method was to plant in rows 3 to 3½ feet apart and the plants from 12 to 15 inches apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a wide matted row. In this system some plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits, and is now passing away. The largest and highest colored fruits are found on plants along the outside of the rows; therefore have as many outside rows as possible. This may be accomplished by having rows closer together and much narrower. The rows are made from 30 to 36 inches apart and the plants from 18 to 24 or even 30 inches apart in the rows, much depending on the prolificacy of the variety as a plant-maker. If the plants used for a new bed are strong and April until growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually "bedded-in," i.e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing. In the "narrow matted row," which is now used more than any other method of training, the runners are allowed to set at random until they have made a row 12 to 24 inches wide; subsequent runners that eneroach upon the tilled middles are cut off. In the "spaced row," the early runners are set by hand at more or less regular distances apart until a row 12 to 24 inches wide has been formed; thereafter all other runners are cut off. In the "hedge row," two to four runners are set from each mother plant, and are kept in alignment, forming a single, double, or triple hedge row; all other runners are removed. The drift is steadily away from the matted row toward the spaced row and hedge row. Surplus runners are pulled off or are cut off with a knife, hoe, or one of the many types of runner-cutters that 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. Sometimes 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, brakes, 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 that it is often burned as the readiest means of getting rid of it. When not mulched in that region, the plants are likely to be killed outright or to start with a very weak growth. Mulching for winter protection is not necessary south of Virginia and Missouri, but mulching to keep the fruit clean is as profitable in the South as in the North. The fruiting mulch is applied after the plants begin to bloom. Pine “straw” is used most. A large handful is dropped upon each plant; the leaves soon push through. Rarely is it desirable to cover the entire area between the rows. On the Pacific coast, strawberries are not mulched, as it is not necessary for winter protection, and it would interfere with irrigation.

Strawberry flowers may be either perfect or imperfect, and the nature of the flower is characteristic of the variety. In some kinds, the flower is perfect or hermaphrodite (having both stamens and pistils) and is consequently self-fertile. These are commonly called staminate varieties. In others it is pistillate, producing little or no pollen, and requiring a pollen-bearing variety to pollinate it. (Fig. 3718.) There are only staminate or sterile flowers, although such forms were common about 1840. The perfect-flowered varieties differ greatly in the amount of pollen they produce. Some, as the Crescent and Glen Mary, bear so few stamens that they are practically pistillate or sterile. Any variety will fertilize any other variety if it bears sufficient pollen. Some varieties are self-fertile at the same time. The variety used as a pollinator does not affect the shape, color, and quality of the fruit of the pistillate sort, as was once thought. 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 between the rows. The latter varieties, every third row should be a pollen-bearing kind. Pistillate varieties as a class are somewhat more productive and harder than staminate varieties as a class; but this fact has little weight, since some staminate 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 staminate, as is now the case in England. The horticultural bearing of the sexual characters of the strawberry flowers 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 achenes or “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 “nubbin,” or imperfect berry, is the result (Fig. 3719). 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, also. 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 1898, when Samuel Cooper of Kent, Connecticut, and 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 descendents of the Pan-American are true everbearers; they yield a small quantity of berries throughout the summer from an initial planting. 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 or near markets. 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:

3718. Sexes of strawberry flowers: at the left a perfect flower; at the right a pistillate flower; in the middle, stamens few.

3719. Strawberry nubbin.
Many northern growers raise berries at a much less cost, and a few exceed this sum, especially when located near a large town where rents are high; but it would be safe for one about to engage in strawberry-growing to figure close to this total, aside from the cost of fertilizer.

A Michigan grower estimates that the cost of producing and marketing an average yield of 200 sixteen-quart crates to the acre is $1.06 a crate; and the average net return $88 a bushel, giving a profit of $88 an acre. This is fairly representative of field culture in the North. The high cost of production in Florida is in marked contrast. As reported by a Plant City grower it is:

<table>
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<th>Cost</th>
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</tr>
<tr>
<td>Interest on equipment</td>
<td>10.00</td>
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<td>Plants</td>
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<tr>
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<tr>
<td>Cultivation</td>
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</tr>
<tr>
<td>Picking 3,000 quarts at 2½ cents</td>
<td>75.00</td>
</tr>
<tr>
<td>Grading and packing at 1 cent</td>
<td>30.00</td>
</tr>
<tr>
<td>100 crates at 15 cents</td>
<td>15.00</td>
</tr>
<tr>
<td>3,000 boxes</td>
<td>11.00</td>
</tr>
<tr>
<td>Hauling to station</td>
<td>10.00</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$276.00</strong></td>
</tr>
</tbody>
</table>

Still another phase of strawberry economics may be observed in southern California. There it costs 32½ cents to produce and market a pint box of strawberries, and the average selling-price is about 5 cents. Although yields of 10,000 to 15,000 quarts to the acre are common, the expense of picking is very heavy, since the season lasts six to eight months, and it costs $150 an acre to set a new field, since it requires 30,000 plants to the acre. These examples serve to illustrate the very wide range of conditions. The average yield, according to recent census statistics of the United States and Canada, is 1,700 quarts to the acre. The average selling-price, net to the grower, is 6 to 7 cents a quart. Authentic yields of 25,000 to 37,000 quarts to the acre have been secured under intensive culture.

New varieties of strawberries are raised from seed with the greatest ease. The generations of strawberries are short and new varieties soon find favor. The varieties change so frequently in popular estimation that it is impracticable to recommend a list of them in a work like this. The first great American berry was the Hovey, introduced in 1838. (Fig. 1861, Vol. III.) The most popular single variety has been the Wilson (Fig. 3720), introduced in 1854 and still popular in Canada and the northern Pacific states. It held almost undisputed control of the market from 1860 to 1880, when the Crescent and Sharpless secured recognition. 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 Prolix, and Charles Downing. European varieties do not succeed here; notable exceptions are Jucanda, and Triomphe. Over 1,800 varieties of North American origin have been introduced but less than 150 of these have attained prominence. The one best-adapted to 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, Bu b a c h, Brandywine, Clark, Warfield. At least fifty others are grown to a considerable extent. The accompanying pictures (Figs. 3720-3723) show types of American strawberries.

The strawberry has been in cultivation but a short time, 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 as a transplanting 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 Hautbois types of strawberries (F. vesca and F. moschata) were introduced then from Europe, but did not become popular; preference was given to transplanted wildings of the Scarlet. These species have never been grown here except by a few amateurs. Commercial strawberry-culture began soon after 1800, 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
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 extension of railroads, in commercial planting. The “strawberry fever” that swept over the country between 1855 and 1870 has not been equaled in intensity by the boom days of any other fruit. The inevitable reaction came between 1870 and 1885. This was emphasized by the heavy losses from shipping berries long distances without refrigeration. The experiments of Parker Earle, of Cobden, Illinois, resulted in the first successful use of the modern refrigerator-car system, in 1887, and made possible the great-strawberry districts of today, many of which are over 1,000 miles from their markets. There are now approximately 150,000 acres of strawberries in the United States, and 14,000 acres in Canada. The value of the crop is $20,000,000 annually. 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 1909, are Maryland, 14,292 acres; Tennessee, 10,761; Missouri, 9,018; New Jersey, 8,684; Michigan, 8,051; Arkansas, 7,361; Ontario, 7,702; Delaware, 7,194; Virginia, 6,880; Sussex County, Delaware, has the largest county acreage, with 6,494 acres in 1909.

There are several serious fungous diseases and insect pests of the strawberry. White grubs are controlled by avoiding newly plowed sod land when setting the bed; weevil, by planting largely of pistillate varieties or profuse-blooming 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 smaller strawberries ripen 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 in the South, sandy and gravelly loams are considered best. A warm quick soil, although poor, is preferable 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 by the 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.

Those that are adapted to strawberry-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 a ton 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 new plants are allowed to form. The plants are set 12 to 14 inches apart in rows 3 to 3 1/2 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 3 1/2 feet apart, and runners are allowed to form plants along the row in a strip a few inches wide. This system is practised 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 3 1/2 to 4 feet apart. The runners are allowed to form plants 3 to 4 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 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 in the soil 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:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on investment (land and equipment)</td>
<td>$8.00 to $15.00</td>
</tr>
<tr>
<td>Preparation of land</td>
<td>5.00</td>
</tr>
<tr>
<td>Manure or fertilizer</td>
<td>10.00</td>
</tr>
<tr>
<td>Plants</td>
<td>10.00</td>
</tr>
<tr>
<td>Setting plants</td>
<td>8.00</td>
</tr>
<tr>
<td>Cultivating and hoedding</td>
<td>15.00</td>
</tr>
<tr>
<td>Mulching</td>
<td>15.00</td>
</tr>
</tbody>
</table>

**Total for growing:** $76.00 to $142.00

**Picking, grading, and packing 2,000 quarts:** $40.00 to $70.00

**Crates and boxes:** 20.00

**Hauling to station, loading, etc...** 5.00

**Total for picking, packing, grading, etc...** $65.00 to $105.00

**Total for growing:** 75.00 to 142.00

**Grand total:** $141.00 to $247.00

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 conditions in the strawberry belt found in the long dry summer, which enforces dormancy as early as June on light loams in the more arid localities of the interior. Such soils 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 and 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-
ing without irrigation results either in failure or only partial satisfaction and the venture is seldom to be commended. It is usually so easy, however, to secure the small amount of water necessary for home production, and the plant when fairly treated is so highly produc-

tive, that a general exhortation to strawberry-growing on an irrigation basis is fully warranted. There are several species of strawberries indigenous to California, and they are of both littoral and alpine types. Albert F. Etter, of Ettersburg, Humboldt County, California, has worked continuously with these species for more than twenty-five years, by selecting seedlings, and by crossing the species among themselves and with the leading cultivated varieties. He has established an Ettersburg group of new varieties, which for vigorous growth of plant, resistance of drought and true everbearing habit are very notable. Some of them have strictly evergreen foliage under California conditions. For abundant fruiting and general firmness of fruit, some of these varieties have shipping and canning characters new to the strawberry. Etter describes his work in detail in the Pacific Rural Press of San Francisco for March 4, 18, and April 1, 1916.

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. 3730) is the most widely approved variety in the state and is standard in southern California, Excelsior and Klondyke standing next in popularity as early varieties, and Americus and Iowa as autumn-fruiting varieties. In the central regions of 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 incline 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 imperious 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 winter months, the Missouri River. Southern California supplies the southern portion of this district, while the growers 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 more 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 arid 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, Haverland, Crescent, Cumberland, Jucunda, and Parker Earle are also commended 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 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 scaled 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 will occupy the land for at least two seasons, such tall-growing crops as corn, pole beans, or asparagus should not be planted too near. Soils often govern location to a great degree. While the strawberry will thrive in almost any soil it is better to choose one which has good water-holding capacity, for although the strawberry will make splendid plant growth in light soil the fruit will not be so good or large if there is a lack of water at the fruiting-season. While artificial 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, be sure that the bed is not placed in a depression where water collects during the winter.

The preparation of the soil is very important, for a finely rooted plant like the strawberry needs soil well pulverized and free from clods of earth. The land should be planted at least one year with some crop which will require good cultivation. Avoid planting on sod land or land where witch-grass and perennial weeds are abundant. Spading to a depth of at least 1 foot and mixing through the soil a good liberal amount of well-rotted manure will be good preparation for the strawberry-bed. There is, however, on soil naturally rich in nitrogen, danger in putting on too much manure, as an excess will often produce foliage but not fruit. Other fertilizers should be added during the season as the plants grow. Mixed fertilizer should contain about 3 per cent of nitrogen, 10 per cent of phosphoric acid, and from 5 to 6 per cent of potash. All of the artificial fertilizers should not be applied at one time. It is best to make at least three applications during the season as the plants grow and the amount will be governed by the growth of the plants. Artificial fertilizers should not be spread on the foliage. Remembering that, one pound of the mixture given above in three applications should be ample for six plants during the growing season.

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, productiveness, 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
foliage should be chosen. Such varieties are generally to be relied upon. In choosing varieties one should secure those which do well in one's vicinity, for in some cases quality in a variety depends to a large degree on environment.

It is always best to plant at least three varieties so that a long season will be assured. While it is impossible not to have varieties overlap, an abundance at one time during the season is no detriment, for at this time preserving may be done and there are so many ways in which strawberries can be used that an abundance should be sought.

The strawberry is bisexual in its bloom and therefore it will be necessary to choose varieties which have perfect flowers or have those of both sexes in order to insure perfect pollination. Sex in strawberries does not seem to have any direct bearing on quality or productiveness, although there is a common fallacy that pistillate varieties are most productive and stamine varieties of the better quality.

In the matted-row system of planting, the plants are set 4 by 2 feet apart, and allowed to run so that a row from 2 to 3 feet wide is formed. This is probably the easiest way in which to grow the strawberry. There is great danger, however, that too many plants will be allowed to grow in this system and, in consequence, through overcrowding, the fruit will be small and rather poor. In this system, plants should not be allowed to set closer than 6 inches apart and all runners which are made beyond those necessary to cover the ground when at this distance should be removed.

In the hedge- or narrow matted-row system, set plants 3 by 2 feet apart, and allow each to make four or six new plants, which are set so that there are practically three separate rows with the plants in the row about 8 to 10 inches apart. All other plants and runners are removed.

In the hill system, the plants are set in various ways, first in straight rows, 3 feet apart, and the plants in the row from 12 to 20 inches apart, or plants are set in beds 14 by 14 inches or 18 by 18 inches or even 20 by 20 inches apart, and from three to four rows are set, depending on the variety. In this system, all of the runners are removed from the parent plant and the bed is generally allowed to remain for about three years.

To obtain strawberries earlier they may be raised in frames as other perennials are grown. The plants are set in August or September about a foot apart in rich garden loam and given good cultivation. The frames should not be more than 8 inches deep. Hill culture is preferred in this system and plants are protected during the winter by a light mulch. Glass frames are put on early in March, careful cultivation given, plenty of air and careful watering. This method will advance the crop two to three weeks ahead of the outdoor crop. Such varieties as are suitable for greenhouse culture should be planted in the frames.

Growing strawberries in a barrel, or rather on a barrel, is practised by those who have very limited space, and while there are many drawbacks to doing this successfully it can be accomplished with care. A clean cider barrel should be used and several 1-inch holes bored in the center of the bottom and a ring of 1½-inch holes about 8 inches apart are bored in a circle of 8 inches between the rows of holes. If the holes are started near the bottom, it will be possible to get three rows of holes and about eight holes around the barrel. Good strong 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 1½-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 and fill the barrel with the compost 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 either too deep or too far above ground. The crown should be on the barrel and the surface of the soil. After 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
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-mature 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 added at this time and up to the time the fruit is well set, being careful not to water during the day. It is less objectionable to water after the fruit is set than before, as water is then less likely to injure the fruit than before. Watering of the 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 clustering habit and to keep the fruit in a good state of satisfaction to strawberry-lovers to have fruit after the regular season 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. 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 become heat-tolerant and 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.

**Wilfrid 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 convenience and simplicity of the method; 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 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 forcing will be 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-

3732. A good winter strawberry plant in bloom.

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 or 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 blooming 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-meshed window-screen wire cut into suitable squares. These squares may be laid on 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 to 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 Mecklinburgh-Strelitz, a patron of botany). *Musaceae.* Bird-of-Paradise Flower. Perennial herbs, adapted to the warmhouse, grown for the banana-like foliage and the very odd showy flowers. Rhizome sometimes subterranean, sometimes an erect woody st.: lvs. large, long-petioled; scape terminal or in the upper axils, short-exserted from the sheaths of the lvs.: bracts large, spathe-like, boat-shaped, acuminate, solitary at the end of the scape or 2 slightly distant: petal long-exserted; sepals free, long, carnate; petals very dissimilar; stamens 5; ovary 3-celled, many-seeded.—About 5 species, S. Afr. The genus has been monographed by K. Schumann in Engler's Pflanzenreich, 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.

A. Plant nearly stemless.

b. 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; if-stalks all radical, 2-3 times as long as the lvs.; scape higher

**Strelitzia**


**AA. Plants with finally tall woody sts.**

**B. Base of lvs. cordinate: interior petals white.**

**augústa, Thunb. (S. augústa, D. Dietr.). Becoming** 18 ft. high: lvs. at the summit of the st. 2–3 ft. long, oblong, acute; pediole 4–6 ft. long: peduncle short, from a leaf-axil: spathe deep purple: fls. on short purple pedicels, all parts of the fl. pure white; petals round at the base. B.M. 4167; 4168. G.C. III. 35:402.

**kewénsis, Hort. (S. augmented x S. Regína). Plant** about 5 ft. high: lvs. as in S. augmented but the blades 2 x 1½ ft.: fls. vertical, pale watery yellow, more resembling those of S. Regína, but the small hooded petal is more like the other parent as are the lilac-pink patches at the base of the sepals. Garden hybrid. G.C. III. 47:217; 54:87.

**BB. Base of lvs. obtuse: interior petals blue.**

**Nicolai, Regel & C. Koch. Resembling S. augmented in habit and foliage, but the fls. and spathe are much larger and the petals are hastately combined and blue in color.** B.M. 7038. F.S. 13:1356. Gt. 7:235. F. Tracy Hubbard.

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**Streptocarpos (Greek compound, meaning twisted fruit). Geaneridées. Cape Primrose.** Herbs, frequently villous or lanate, adapted to greenhouse culture; choice plants, grown for the showy bloom. Stemless, with 1 or more spreading radical lvs. or rarely with a st. and opposite lvs.: peduncles scape-like or axillary, sometimes 1–2-fld., sometimes cymose, several-fld.: fls. pale purple or blue, showy; calyx 5-parted; corolla-tube elongated, cylindrical or spreading above, limb obliquely 2-lipped, posterior lip 2-cleft, anterior larger, 3-cleft; perfect stamens 2; disk short-annular; ovary superior, imperfectly 4-ovulate; style 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 Rexii. 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 J. D. 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. Rexii, the name it now bears. It appears to have been nearly thirty years after the intro. of S. Rexii 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 intro. of other species. The chief stimulus to the systematic breeding of these plants seems to have been the intro. of S. Dunni, 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 1854 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. Rexii, had been introduced from the Cape region. With the three species, S. Rexii, S. parviflorus, and S. Dunni, 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 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 Tydaea." 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.

Benthum and Hooker's treatment divides the Ges-
neriaceae into two great tribes: Gesneriæ, with ovary more or less inferior and fruit a capsule; Cyrtandreae, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. B. Clarke in vol. V of De Candolle’s "Monographie Phanerogamarum," contains the genera Streptocarpus, Episcia, Cyrtandra, Eschysanthus, Ramondia, and others. Streptocarpuses are of three groups: the stemless monophyllous species, with one prostrate leaf from the midrib 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 primula-like leaves (whence the English name "Cape primrose"); 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. Rexii, S. Galpinii, S. Dunnii, 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. Dunnii, 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 stowe or warmhouse 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 profound 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.

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1. cauléscens, Vatke. Caulescent, hirsute; lvs. long-petioled, oval-oblong, entire, rather repand, apiculate, obtuse, base contracted to the petiole, puberulent above, villous beneath; fls. blue, ½ in. across; calyx bicolored, lobes linear; corolla up to nearly ¾ in. long, 6 times longer than the calyx, limb strongly unequal. Trop. Afr. B.M. 0814.

2. Rexii, Lindl. (S. Gaudeni, Hook.). Fig. 3734. Acaulescent; lvs. several, suberect, 8 x 2 in., oblong, crenate, hairy on both surfaces: scapes several, 4–12 in. high, 2–1-fld.: calyx-lobes narrowly oblong, hairy; corolla 2 in. long, about as wide, blue or mauve, tube 1¼ in. long, very narrowly linear-funnel-shaped, lobes a little unequal. S. Afr. B.M. 3005; B.B. 1173. L.B.C. 14:1305. F.S. 12:1214. Var. biflorus, Ortgies, differs in having stouter 2-fl. scapes. Gr. 6:204.

3. cyanèus, S. Moore. St. prostrate, slightly elongated, bearing 4 lvs.: lvs. linear-oblancoolate, narrowed below the middle into a narrow petiole-like portion, apex obtuse; scape always 2-fl.: fls. varying from pale lavender or blue to rose-pink or rosy mauve, with a few stamens of red on the 3 lower lobes and a blotch of yellow in the throat; calyx-lobes linear-oblong, pilose-pubescent; corolla about 1¼ in. long, puberulent outside. Transvaal. B.M. 8521. G.C. III. 55:31.—Allied to S. Rexii.

4. parviflorus, Mey. Acaulescent: lvs. several, spreading or suberect, nearly or quite sessile, elliptic, up to 9 x 3½ in., crenate and bullate, shaggy, dark green above, nearly white beneath: scapes several, 6–10 in. high, reddish, shaggy, bearing 3–10-fl. cymes: fls. about ¾ in. across; calyx glandular-pubescent, lobes narrowly oblong; corolla-tube glandular-pubescent, ¾–5¼ in. long, cylindrical, obscurely widened upward, purplish outside, mouth a little oblique, lobes orbicular, white. S. Afr. B.M. 7036.

5. luteus, C. B. Clarke. Lvs. several, petioled, elongate-oblong, 8–13 x 2–2½ in., obtuse, attenuate at base, crenate, villous 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: caps. densely silky. S. Afr. B.M. 6636 (as S. parviflorus).

6. Junodii, Beauverd. Acaulescent, cespitose: lvs. 4–6, rugose, base attenuate, villous, veins prominent beneath: peduncles erect from the f.-axis, pilose, 3–4½ in. high: fls. 3–6, pendulous, blue-lilac; calyx 5-parted, segms. unequal, linear, recurved; corolla hirsute outside, 1½–2 in. long, arching, limb 5-petomed,
oblique, lobes rotund, the lower yellow-blotched at base. S. Afr.

Section III. Unifoliati.
A. Corolla-tube broader than long: 7. Galpinii
AA. Corolla-tube longer than broad.
B. Fls. rose to reddish: 8. Dunnii
BB. Fls. bluish or purplish.
C. Tube of corolla linear-cylindrical: 9. polyanthus
D. Corolla-tube 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 much 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, bulbate between the reticulate veins, midrib thick and villous beneath: corolla rather numerous, clustered, produced serially, stout, 1 ft. or more high, bearing many-flld., second panicles: fls. 1½ in. long, pale brick-color to rose, short-pedicelled, incised or nodding; calyx-segments linear-oblong; corolla curved, tubular-funnel-shaped, puberulent, lobes short rotund, ciliolate. S. Afr. B.M. 6903. G.F. 3:600 (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, obscurely crenate, hairy on both surfaces: scapes 1–3, up to a foot or more high, rather stony, ovate-oblong, obtuse, margin irregularly lobulate and crenate, bulbate between the reticulate veins, midrib thick and villous beneath: corolla rather numerous, clustered, produced serially, stout, 1 ft. or more high, bearing many-flld., second panicles: fls. 1½ in. long, pale brick-color to rose, short-pedicelled, incised or nodding; calyx-segments linear-oblong; corolla curved, tubular-funnel-shaped, puberulent, lobes short rotund, ciliolate. S. Afr. B.M. 4850. Gt. 6:206.

3735. Streptocarpus Dunnii. (X about 3/4)

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: peduncles several,


12. Wendlandii, Sprunger. Fig. 3736. Acaulescent: Lf. solitary, attaining a size of 30 x 24 in., crenate, closely hairy, red-purple beneath: scapes several, 1–2½ ft. high, forked; infl. 6–8 in. long, 30-flld.: calyx-lobes linear, hairy; corolla violet-blue, tube about 1 in. long, slightly curved, limb 1½ in. across, oblique, lobes broad and entire. S. Afr. B.M. 7447 (part of which is copied in Fig. 3736). G.C. III. 22:273. Gn. 45, p. 511; 50, p. 394. J.H. III. 28:223. 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. achimeniflorus, Hort. Acaulescent: lvs. several, radiating or opposite, rather elliptical, somewhat fleshy, brilliant light green: fl.-st. stiff, most often 1-flld.: 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-flld. white form. Var. giganteus, Hort., is offered as a lavender-blue form. Var. roseus, Hort., is offered as a soft delicate rose form.

14. Bruantii, Hort. (S. Rexii × S. polyanthus). Lvs. very large, not cordate, very velvety, bright green: scapes up to 14 in. high: fls. about double the size of
those of *S. polyanthus*, about 1 1/2 in. long, blue or bright mauve, throat yellowish white. Garden hybrid.


Acaulescent: fl. solitary, 2 x 1 1/2 ft., rich olive-green and brownish to olive-purple, bell-shaped, fl. st. 1-2 ft. high, several from a fl.: fls. numerous, long-tubular, bright red-purple. A garden hybrid.

16. *kewensis*, Hort. (S. Retzi × S. Dunnii). Fig. 3737. Lvs. 2 or 3, large, but not so large as those of *S. Dunnii*, oblong or elongate-ovate, bright green: fl. st. numerous, each 6-8-fld., forming a tolerably compact mass: fls. bright mauve-purple, striped with dark brownish purple in their throat; corolla about 2 in. long, 1 1/2-1 3/4 in. across. Garden hybrid.

17. *Watsonii*, N. E. Br. (S. luteus × S. Dunnii). Fl. solitary, similar to but smaller than that of *S. kewensis*, scapes several, bearing 10-16 fls. each: fls. about 1 1/4 in. long and 1 in. across, bright rose-purple, with a white throat, which is striped with brownish purple. Garden hybrid. G.C. III. 2: 2215.

The following species are either little known or have not found their way into general cult.: S. armata, Baker & Moore, is closely allied to *S. Dunnii*, differing in having a corolla much less funnel-shaped and shorter, with less spreading lobes; originally described as solitary-fl., but lvs. are said, to have developed in the cult. plant. S. Afr.—S. Bänkels, Lynch (S. Wendlandii × some hybrid), has 2 lvs. about 19 x 13 in. for the lower, the second somewhat smaller; fls. blue. Garden hybrid. G.C. III. 56: 192. —S. biflorus, Pucci, is a name appearing in horticultural journals for *S. maculata, var. barbata*, which is a hybrid, the female parent of which is *S. polyantha*, the male the above-mentioned S. biflorus, it is said to have flowers-oblanceolate, lanceolate: several to 2-4 pale lilac fls. F.S. 23: 2429.—S. Bigelovii, Lynch (S. Wendlandii × S. cyanus), has 2-3 lvs. the largest of which is 15 x 9 in. and another is 12 x 7 in. bright green, in some cases reddish toward the tip, in others with the color here and there; spacers 9-10, each with 5-14 fls., about 14 in. high; fls. about 1 1/2 in. across, lavender or bluish purple; petals marked with dark purple stripe. Garden hybrid. G.C. III. 56: 260.—S. cantabrica, Lynch (S. Wendlandii × S. cyanus), has several lvs. which are 7-8 x 3 in. in the small 1/2-2-fl., conspicuous hairy: calyx-segments linear-lanceolate; corolla 2 in. long, about 1 1/2 in. across, tube funneled-shaped, lobes rounded or heart-shaped: 7 deeply colored lines, limb deep rose. Garden hybrid. G.C. III. 59: 151.—S. Gaudini, Hort., is offered in the trade.—S. Greeni, Hort. ex Wilson (S. Saundersii × S. reisi), is a dwarf and more compact than the former; the scapes many-fl.: fls. pale lilac-blue. Garden hybrid. G.C. II. 17: 305. Said to be the first hybrid streptocarpus.—S. Hislopii, Engl., resembles *S. caulescens*; plant about 1 1/2 ft. high, producing a large number of stts., each bearing 6-8 dark violet-blue fls. 1 1/2 in. long, spotted with white on the midlobe of the lower lip. German E. Afr. (Section I.) B.M. 8150.—S. hybridus, Hort., is a name applied to garden hybrids in general.—S. Kretz, Hook. I. Acaulescent; fl. 4-6 in. high, stout, erect, hairy: lvs. 1-3 in. long, broadly ovate, obtuse, ovate or lanceolate from both surfaces, base rounded or cordate; petiole 1/2-3/4 in. long: scapes axillary, very slender, 3-4 in. high; fls. drooping, opposite: calyx-segments lanceolate, pubescent; corolla 3/4 in. long, pale lilac, tube hairy, uperurred, broad and subsespalanulate, mouth expanded, lobes short rounded, eiliate. Trop. E. Afr. B.M. 6782. (Section I.) Allied to *S. caulescens.—S. Lichtensteinianus*, Hort. (S. Wendlandii × S. Watsonii), has 2 lvs. 1 prostrate and the other smaller and erect: fls. numerous, lilac-blue. Garden hybrid.—S. Mahii, Hook. f. Acaulescent: if. solitary, 1 ft. or more long, flat on the ground, ovate-oblong, crenulate, tip rounded, base cordate: sepalae many, crowded, densely pilose: calyx-segments: pubescent, linear, corolla violet, tube 3/4 in. long, pubescent, decurved, somewhat inflated above; lobes rosetulate. Br. Cent. Afr. B.M. 7837.—*St. multiformis*, Laing., is a seedling of *S. Retzi*, with up to 30 large blue-purple fls., which have darker purple lines in the throat and running up onto the lower lip. Garden hybrid. G.C. III. 18: 211; 32: 327. I.H. 43, p. 67.—S. orientalis, Craib. Caucauleant; solitary, erect, simple, 6-16 in. high, leafy: lvs. ovate to elliptic-ovate, apex obtuse, base cuneate, crenate or crenate-severate, 1-3/2 x 2-4 1/2 in., both surfaces glabrous or pubescent, white-glabrous, hairy outside: corolla purple outside, paler within, tube 1 1/2 in. long, limbus about 3/4 in., above, bluish white, reflexed-spread, wide oblong, tip rounded. Siam. B.M. 8536.—S. Vietchii, Hort., is offered in the trade.

F. TRACY HUBBARD.

**STREPTOPUS** (Greek, twisted stalk, referring to the peduncles). *Liliaceae*. **Twisted stalk**. Perennial herbs, with the aspect of Polygonatum, 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 axils, nodding, rose or white; perianth campanulate, segments: linear-oblong or crenate at base: corolla ovate, 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.

### *S. 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-fld.: fls. about 3/4 in. long: berry red, 3/4 in. thick. May-Jul. Moist, rich woods in the northern states, S. to Ga.

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STREPTOSOLEN (Greek, streptos, twisted, solen, tube, with reference to the form of the corolla-tube).

Solandraceae. Scabrous-pubescent shrub, suitable for greenhouse culture and for outdoors, as an ornamental, in the extreme S. Lvs. entire, not large, rufose: fls. orange-red, pedicelled, in a terminal corymbose panicle; calyx tubular-campanulate, shortly 5-lobed; corolla-tube elongated, spirally twisted below, widening above, limb spreading, 5-lobed, lobes broad, very obtuse; perfect stamens 4, didymous; ovary stipitate, 2-celled: capsules flat, leathery, valves 2-celled. One species, Colombia.


STRIKLANDIA (named in honor of Sir C. W. Strickland). Amaryllidaceae. Perianth narrowly funnelform, tube short, segms. ob lanceolate, equal; stamens not distinctly filamentous, united half-way up in a cup, lanceolate above it, without any teeth between; ovary globose, 3-lobed, 3-celled: caps. short, deeply 3-lobed, loculicidally 3-valved; seeds many, small. One species, Andes of Ecuador. S. eucrosioides, Baker (Lepiriza eucrosioides, Baker). Bulb ovoid, 2 in. diam.; tunics brown, membranaceous: lvs. 2 to a st., produced after the fls., thin, green, oblong, 6-9 in. long; peduncle slender, terete, 1 ft. high: fls. 3-4 in an umbel, horizontal or cuneate; spathe-velvets lanceolate; perianth-tube green, lobes red, laxly nerved, not keeled nor tipped with green. Andes of Ecuador. G.C. III. 30:285. Cult. as for Phadranassa.

STROBILANTHES (Greek, cone and flower, referring to the inflorescence). Acanthaceae. Herbs or shrubs, erect, sometimes tall, glabrous, scabrous-pubescent or villous; greenhouse, or out-of-doors in extreme South. Most species strongly separated, entire or toothed: fls. blue, violet, or white, rarely yellow, solitary at the axis of the opposite bracts, sessile or short-pedicelled, sometimes in dense or interrupted terminal spikes or the peduncles clustered at the axis; calyx deeply 5-cleft or almost 5-parted, segm. 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: anther at or near the base.—About 200 species, India, Malaya, China, and Japan, also 1 in Trop. Afr. Adapted to the greenhouse.

Strobilanthes are mostly erect half-shrubby plants cultivated for their flowers and foliage. Only young, well-grown plants are attractive, the older ones becoming weedy and unattractive. Some species are grown as ornamental foliage bedding plants, but they are not so desirable for general use as the coleus, the slightest cool weather changing the color of their leaves to a very undesirable shade. In the greenhouse they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much syringing. Under unfavorable conditions they lose their leaves and become unsightly.

anisophillus, T. Anders. (Goldfussia anisophylla, Nees). Branches somewhat zigzag; lvs. broadly lanceolate, acuminate, serrulate, opposite, but one of each pair much smaller than the other: fls. purplish and white; corolla funnel-shaped, very broad at the mouth, with a somewhat irregular 5-lobed limb. India. B.M. 3404. B.R. 955 (as Ruellia persicifolia). R.B. 29:36.—Similar to S. isophillus in habit and use.

callous, Nees. Shrub, 6-8 ft. high: lvs. elliptic-lanceolate, acuminate, puberulous, narrowed into a long, slender petiole which is winged to the middle. In short, oblong spikes, large, pale violet-blue; corolla-tube very short, dilated into a subcampanulate throat and expanding into a limb 2 in. across: lobes orbicular, undulate. B.M. 7535.—A native of W. India, where it forms a shrub 6-8 ft. high; said to flower in its third year.


isophyllus, T. Anders. (Goldfussia isophylla, Nees). Also a much-branched, bushy shrub: lvs. 3 ft. high, swollen at the joints: lvs. short-petioled, opposite, narrowly lanceolate, distantly serrulate or entire: peduncles axillary, shorter than the lvs., bearing several fls.: corolla 1 in. long, funnel-shaped, blue and white; limb 5-lobed; lobes emarginate. India. B.M. 4363. B. 5:244.—Used either for bedding or for pots. Blooms profusely either in winter or summer, according to treatment.

Micholitzi, Ridley. Subshrub, 2-4 ft. high: st. 4-angled, dilated at the nodes: lvs. lanceolate or ovalate-lanceolate, 6 x 2 in., one of the pair much larger than the other, acuminate at both ends: racemes axillary, very numerous, cone-like, ½-3/ in. long; bracts rounded, white, tipped with green: fls. white, projecting slightly from the cone. Sumatra.

S. curvifolius, Nees. Shrub, 2-6 ft. high, glabrous, except the more or less hairy tips of the branches; lvs. ovate-linear, extrafloral nectaries in the leaf in, the other 3 x 1½ in., ovate, serrulate; spikes terminal, solitary: fls. pale purple. India. H.U. 6. p. 196.—S. gloenophyllus, Anders. Shrub, with branches often horizontal and hairy upward; lvs. ovate and acute, complanate (flattened), serrate, hairy or villous above; fls. purple, about 2 in. long. India. B.M. 2819 (as Goldfussia glandulosa).—S. Wildkotii, Nees. Weak subalpine shrub with angled branches: lvs. elliptic, acuminate; fls. blue, in pairs or solitary. Himalaya. B.M. 5:119 (as Goldfussia glandulosa).—HEINRICH HASSELBRING.

F. TRACY HUBBARD.†
STROMANTHE (Greek, couch and flower; said to allude to the form of inflorescence). *Marantáceae*. Perennial herbs grown in the greenhouse for the foliage.

Stems leafy, erect, from a thick horizontal rhizome, somewhat branched, the base covered by the long leaves: leaves short-petioled: infl. rather lax, terminal on a long peduncle, more or less compound, rarely narrow, almost raceme-like, frequently 1-flowered; leaflets spathe-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. 45). Closely allied to Calathea, Maranta, Phrynium and Thalia. It agrees with Maranta in the foliations the leaflets being somewhat thick, its ovate-oblong, short-acuminate, base obtuse or subacute, leathery; cymes terminal, sessile, few- to 12-fl.: fr. white or tinged with pink, large, sepals broad, oblong or ovate; corolla-tube 1½ in. long, lobes broad, ovate, ½ in. long; ovary glabrous; follicles obtusely acuminate. *Trop. Afr. B. M. 7390.—S. grandiflorus, Schrad. (= *S. grandiflorus*, Sendt).—*S. sanguinea*, Koern. (Roupiella grata, Wall. & Hook. J.). Small glabrous tree or shrub: lvs. oblong, short-acuminate, petioles pressed to the leaf sides, usually reduced to a single fl.: sepals obtong to lanceolate-oblong, erect; corolla wide, purplish with or without, milk-white or cream within, the lobes ovate, produced to filiform tails about 6 in. long. Trop. and S. Afr. B. M. 7390.—*S. griseov. Franch. (Roupellia grata, Wall. & Hook. J.).—*S. dichotoma*, DC. Erect shrub with stout branches: lvs. elliptic-oblong or ovate, 3½ × 2½ in., obtuse, acute or acuminate, rather coriaceous: cymes much shorter than the lvs., dichotomous,

few-fl.: sepals subulate from an ovate base; corolla-tube and throat ¼ in. long, whitish tails 5–7 in. long, purple; follicles very large, 8 × 2 in., divergent. Ind. Malayasia, and Java. H. U. 2, p. 225. —*S. griseov. DC*.—*S. dichotoma*, DC. Erect shrub with stout branches: lvs. elliptic-oblong or ovate, 3½ × 2½ in., obtuse, acute or acuminate, rather coriaceous: cymes much shorter than the lvs., dichotomous,

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few-fl.: sepals subulate from an ovate base; corolla-tube and throat ¼ in. long, whitish tails 5–7 in. long, purple; follicles very large, 8 × 2 in., divergent. Ind. Malayasia, and Java. H. U. 2, p. 225. —*S. griseov. DC*.—*S. dichotoma*, DC. Erect shrub with stout branches: lvs. elliptic-oblong or ovate, 3½ × 2½ in., obtuse, acute or acuminate, rather coriaceous: cymes much shorter than the lvs., dichotomous,
celled; caps. included in the persistent calyx, globose.—One species, Staph. Calif. Var., like Staph. monticola, but with the stamens and the perianth distinctly 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. S. californicum, Torr. (Brodiaea volubilis, Baker). Fig. 3740 (adapted from Pacific R. R., Rep.). In many ways it resembles Brevoortia Ida-Maia, except that the scape is climbing to a height of 6 ft., and bearing an umbel of delicate rosy pink fls. The scape twines readily about any stick or bush that stands near it. Lvs. 1 ft. or more long, keeled, 3-5 in. or less broad: corrn about 1 in. diam. Cent. Calif. B.M. 6123. G.C. III. 20:687. Cult. as for Brevoortia Ida-Maia. CARL PURDY.

STROPHOLIRION: Mattesocia.

STRYCHNOS (an old Greek name used by Theophrastus for some plants belonging to Solanaceae). Loganiaceae. Seedent shrubs with short tendrils, or trees, of economic importance; some of the species have been introduced into the southern United States. Unisexual, in scandent species some axils bear short clavate tendrils, the adjacent lf. being often suppressed; cymes terminal or lateral; bracts small; fls. white to yellowish; calyx 5-lobed; corolla 5-4-5-4-eleft, tube short or long or hardly any, lobes valvate; stamens 5; ovary 3-5-celled (or 1-celled above); berry globose or ellipsoid. About 220 species, mostly of both hemispheres.

Nux-vomica, Linn. Tree attaining a height of 40 ft.: lvs. ovate, 5-nerved, glabrous, 3½-2 in.: cymes terminal, short-peduncled, 1-2 in. diam.; pedicels hardly any: fls. numerous; corolla-lobes glabrous; berry 1½ in. diam., globose, many-seeded. India.—The seeds yield the drugs, nux-vomica and strychnine, and the bark is somewhat used as a tonic.

potatôrum, Linn. Tree attaining a height of 40 ft.: lvs. elliptic, 2½-1 in., 3-nerved, subsessile, glabrous or nearly so: cymes axillary, nearly sessile, 1 in. diam.: berry ½-3 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.

spinôsa, 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 short, dense; corolla-lobes deltoid-obovoid: fr. edible. Trop. Afr., Asia. Reported as intro. into S. Calif., but not successful.—S. Salicaria, Linn. Tree, 30-40 ft. high: branchlets armed at the nodes with curved pungent spines; lvs. oblanceolate, ovate-acuminate, glabrous: cymes lax, many-fl., from the tip of the branches; sepal ovate; corolla-lobes ovate; fr. shaped like an orange. Trop. Afr. Reported as intro. into S. Calif., but not successful.

F. TRACY HUBBARD.

STRYPHINODÉNDRON (Greek, astringent and tree; the bark has a puckery taste). Leguminosae. Unarmed trees, usually with thorny branches; in the greenhouse and also outdoors in the extreme S.: lvs. twice pinnate, lfts. small, many-paired, frequently rather broad; fls. small, hermaphrodite or somewhat polygamous, borne in short-peduncled, axillary spikes, 5-merous, sessile; calyx campanulate; petals connate to the base, 4-5, free; ovary short-stipitate, many-ovuloid: legume linear, compressed, thick.—Nine species in Trop. Amer.

guanense, Benth. Branchlets subterete, they and the pediôles rusty-tomentellous: pods 6-12 pairs; fls. with 8-10 pairs of divisions, oblique, oval-oblong, 4-6 lines long, shiny above, reddish beneath: corolla smooth, about 3 times as long as the calyx; pod straight or slightly incurved. Guiana and intro. into Fl. a.

S. ferox-bundum, Benth. (Acacia pulcherrima, Wildl.). Spineless; pods short, ovate-oblong; lfts. much describes M. guanense beneath; pediole pubescent and with 2 convex glands at base; spikes thin, axillary, filiform: fls. 3-parted, pilose. Brazil.

STUARTIA: Stuwartia.

STYLIUM (styles, a column, referring to the body formed by the union of the stamens and style). Dilleniaceae. Species are mostly woody perennials of many perplexing 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 Candelole, but Candelole is itself confused. In 1865, La Billardière founded the genus for the plants which a few months earlier were named Stylidium, Swartz, by Wildenow (Sp. Pl. iv. 146). As the first application of the name Candelole was thus invalidated, La Billardière, in 1866, used Candelole for a genus belonging to Dilleniaceae; this is the group described on page 653, Vol. II, now included in Hibbertia by Gilg in Engler & Prantl’s Pflanzenfamilien and replaced in 1878 by Bentham in Flora Australiensis and by Bentham & Hooker in Genera Plantarum. Although the name Stylidium, Swartz, is antedated by Stylidium, Loureiro, founded in 1790 on a plant of the Corneaceae, Swartz’s name stands, since Loureiro’s Stylidium belongs as a synonym to the genus to the 28 species of this chapter (PI. I). According to the International Rules, as well as on the principle of fifty years of accepted usage, it is correct to retain Candelole for the Dilleniaceae (page 653) and to use Stylidium 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 Canodole of 1866 and make Stylidium a synonym, and in this case the Candelole of 1806 would become Eledone of Durand if it is retained as a genus distinct from 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 Stylidium, Swartz, and of Candelole of 1806, and Forsteropsis would apparently be the name to be used for the Stylidium of Swartz, while Eledone would replace Candelole. The latest monograph, Mildbraed, in Engler’s Pflanzenreich, hft. 35 (iv. 278. 1905), adopts Stylidium, Swartz. It may be said in passing that the generic name Candelole has also been used for plants distinct from either of the groups we are here considering, but these applications are of later origin.

The Stylidium are of very minor importance horticulturally and scarcely appear in the American trade, although S. adnatum has been listed in southern California. The species are difficult of determination in Australia. Mildbraed describes 109. Most of the species "form a rosette or 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 form. The stem is glabrous, and the scape is formed above the old tuft, each crowned by a new rosette and scape, and sometimes several successive tufts of leaves, separated by short stems or branches, may be observed." The plants are more or less lobelia-like, with pink, purplish, yellow, or white fls. in racemes, panicles, or cymes; corolla irregular, from 10 to 14 lobes ascended 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, Mull.,) has mostly very narrow or linear lvs. scattered along the st., the upper ones crowded in a terminal tuft; fls. pink, nearly sessile in compound racemes or spike-like panicles: sta. 12 in. or less long.—*S. Brunonianum*, Benth. (Candollea Brunoniana, Mull.,) Tufted or rarely proliferous, the radical lvs. linear to oblanceolate: scape 12-18 in. high, with whorls of narrow lvs., and bearing many small pink fls., the corolla-throat appendaged. B.R. 28:15. H.U. 4:72.—*S. ciliatum*, Lindl. (S. saxifragoides, Lindl. Candollea cilata, Mull.,) =*S. piliferum.—S. richsoni,* DC. (S. mucronifolium, Hook. Candollea richsonii, Mull.,) Low, the scapes 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 raceme or panicle. B.M. 4528. F.S. 6:605 (as S. Hookeri). J.F. 1:59.—*S. praeminiifolium*, Swarts (S. Armeria, Labill. Candollea graminifolia, Mull.,) Tufted or somewhat proliferous, the scapes 6-18 in. high: lvs. rather rigid, linear, sometimes dentilate: fls. pink, nearly sessile in a raceme or interrupted spike. B.R. 90. B.M. 1918. J.F. 3:286.—*S. piliferum*, R. Br. Tufted, lvs. linear and hair-pointed, the plant with yellow glandular hairs; scape 6-12 in. high, bearing a raceme or panicle of yellow or whitish or pinkish fls., the corolla-throat not appendaged. B.M. 5883 (as S. ciliatum); 4529 (as S. saxifragoides). J.F. 1:54.

L. H. B.


**STYLOPHORUM** (Greek, style and bearing, in reference to the persistent style). *Papaveraceae*. Hardy, perennial herbs, with stout rootstocks and yellowish sap: lvs. radical, pinnatifid or none; caudine few, lobed or cut: fls. yellow or red; peduncles elongated, solitary or somewhat fascicled; buds nodding; sepal 2; petals 4; stamens many; ovary 2-4-placenta: caps. frequently stipitate, ovoid, oblong or linear, dehiscent from the apex to the base. —Three species, according to Fedde, one from N. Amer., the other two from China.

diphylum, Nutt. (*Papaver Stylephorum*, Hort.). *Celandine Poppy*. Fig. 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, Jun. *Moish Shade, W. Park, B.R. 1:272. J.H. III. 34:475. Gm. 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.

**STYLOPHYLUM** (Greek, style or column and leaves). *Crassulaceae*. A genus separated from Cotyledon and composed mostly of new species: basal lvs. linear, elongated, base sometimes broad clasping: calyx 5-lobed, the lobes ovate, equal and small; corolla campanulate, not anglecl, white, red, or yellowish, the lobes broad, thin, and spreading, united below into a tube: carpels 5, united below, generally strongly spreading as in S. *Caryophyllaceae*.

—Twelve species all from Calif. S. *Orcuttii*, Rose. Rather stout and very glaucous, woody at base: lvs. linear: calyx-lobes obtuse; corolla-tube shorter than the calyx, the lobes rather broad and somewhat keeled, rose-colored, not at all tinged with yellow. S. *Calif. and adjacent islands.*—This plant was distributed as *Cotyledon attenuata*, which is probably a different species.

**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, 3-loculed at the base, 1-loculed at the apex: style slender: fr. a drupe, mostly subglobose, fleshy or oftener 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). *Styracaceae*, pp. 17-88 (1907). *S. Benzoin* yields the benzoin, a balsamic exudation of the wounded tree; storax, a similar gum-resin, was formerly obtained from *S. officinalis*, but the storax of today is a product of Liquidambar.

Storaxes are handsome shrubs of graceful, usually loose and spreading habit with numerous white and mostly fragrant, often pendulous, flowers in racemes 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 tenderer; *S. grandifolia* is hardy 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 produced in cultivation, sown 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.

a. *Fla. in many-fl. racemes; lvs. 2-10 in. long. 

b. *Young branchlets, petioles, and racemes grayish-tomentose. 

grandifolia, Ait. Shrub, 4-12 ft. high: lvs. oval to obovate, shortly acuminate, usually narrowed toward the base, denticulate or almost entire, glabrous above, grayish-tomentose or pubescent beneath, 2½-6 in. long; fls. fragrant, in loose racemes 3-6 in. long or sometimes in clusters; corolla fully ¼ in. long, with spreading, oblong petals: fl. subglobose, about ¼ in. across.

**bb. Young branchlets, petioles, and racemes soon glabrous.**


**AA. Fls. in few-fl.d clusters or short racemes:** lvs. ½-3 in. long.

**b. Lvs. ½-1 in. long, serratate or denticulate, tomentose beneath.**


**bb. Lvs. 1-3 in. long.**

**c. Petals 5-8: lvs. pubescent beneath, entire, usually obtuse.**

**officinalis**, Linn. Shrub or small tree, to 20 ft.: lvs. broadly oval or ovate, obtuse or acutish, entire, stellate-pubescent, at least when young, 1-2½ in. long: fls. in few-fl.d tomentose clusters: pedicels about as long as calyx: corolla 2½ in. long, with 5-7 oblongate petals; stamens 10-10, with the filaments pubescent and connate at the base. April-June. Eu., Asia Minor. L.B.C. 10:928. Var. californica, Rehd. (S. californica, Torr.). Shrub, 5-8 ft.: corolla usually 1 in. long, sometimes with 8 petals; stamens connate nearly one-third. Calif.

**cc. Petals 5: lvs. almost glabrous, acute.**

**d. Pedicels about as long as calyx, puberulous.**

**americana**, Lam. (S. glabrum, Cav. S. lavitatum, Ait.). Shrub, 4-8 ft. high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1-3 in. long: fls. nodding, in few-fl.d clusters: pedicels about as long as calyx or little longer, puberulous: corolla about 2½ in. long, almost glabrous, with spreading or reflexed, lanceolate-oblong petals; calyx-teeth minute, acute. April-June. Va. to Fla., west to Ark. and La. B.M. 921. L.B.C. 10:960. B.R. 952 (as Halesia parviflora). Var. pulvulenta, Perkins (S. pulvulenta, Michx.). Lvs. stellate-pubescent, at least when young: fls. on tomentose pedicels. S. Va. to Fla. and Texas. B.B. (ed. 2) 2:723.

**dd. Pedicels ½-1 in. long, glabrous.**


**ALFRED REHDER**

**SUCCULENTS**

**SUCCULSA** (succise, præmorse; cut off at the lower end, referring to the root). Dipsocarpea. 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 pala (involucres) subtending the florets in the head, and by other technical characters. To this genus or group belongs the "teufelsabbiss" 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-elongate and acuminate, entire, the lower ones somewhat auriculate: heads ovate, with lilac-violet or ochroleucus fls.; scales of involucre in 2 series. **S. pratenstis**, Moench. (Scabiosa Succus, Linn.), may be cult.: root præmorse (as if cut off): radical lvs. ovate-lanceolate, acuminate and entire, the cauline ones connate: scales of involucre in 2 or 3 series.

**SUCCULENTS:** Planting, page 2672.

SUKSĐÖRFIA (W. N. Suksdorff, botanist of Washington state). Saxifraga cucumerifolia. One species as recently delimited, a slender perennial, S. violacea, Gray, growing on wet cliffs and rocks, Mont. to Ore, and Wash.: glandular-pubescent, the rootstock bearing bulbilts: fls. small, pink, in few-fl. panicles on leafy axial shoots: st. 1 ft. or less high. lv. reniform, 5-7-round-lobed, the lower ones petioled and the upper ones on the st. sessile: sepals, petals, and stamens 5, the anthers almost sessile.

SULLIVANTIA (William S. Sullivant, American bryologist). Saxifraga cucumerifolia. Slender perennial herbs, useful in wild-gardens and for colonizing, but scarcely in cult. Four species are now recognized, all natives in the U. S., mostly local, allied to Saxifrages: rootstock horizontal, short: fls. perfect, white or whitish, regular, small, in a panicle on a nearly leafless scape-like st.: lv. mostly basal, reniform to orbicular, shallowly lobed and coarsely toothed, long-petioled: sepals 5; petals 5; clawed; stamens 5, the filaments subulate, shorter than the petals; carpels united below the peaks, forming a direct follicles, the styles beaded. S, Sullivantii, (B.) Saxifraga [?] Sullivantii, Torr. & Gray. Sullivantia ohiosis, Torr. & Gray. Fl.-st. 6-16 in. high, growing on limestone cliffs in Ohio and Ind. S. Hopemanii, Coult., differing in 3-nerved rather than 1-nerved sepals and much smaller stature, grows from Wis. and Minn. to Colo.

SUMACH: Rhus.

SUNDEW: Drosera. S.-drop: Primula; also Ænothera fruiticosa and allies. S. Rose: Helianthemum.

SUNFLOWER: Helianthus. Since the publication of Volume III some progress has been made in the study of the breeding of sunflowers, and an account of the principal results follows: The investigations of A. H. Church, of Oxford, have shown that the typical unbranched monochephalous sunflower (Helianthus annuus, Linn.), which is not known in the wild state, has come down to us unchanged from ancient times, and existed in cultivation in pre-Columbian America. It has been observed that the earliest written record of its use as early as 1567. (American Naturalist, XLIX (1915), page 609.) It is found that “marking factors” exist in rays of annual sunflowers, which give rise to different patterns when the anthocyan colors are introduced. The system of markings in H. annuus and varieties is quite different from that of H. paludosus and varieties; and the red varieties of H. cucumerifolii produced by Herb, of Naples, have rays redened at the end, or have a red stripe down the middle of the ray, or may have the whole upper surface of ray deep brownish pink, and the under side entirely clear light sulfur-yellow. (Journal of Heredity, VI (1915), page 542.) In a culture of red sunflowers (H. annuus, variety) at Boulder, Colorado, a collarette form has been obtained in some numbers, both in the chestnut and wine-red colors. The ray-florets have extra lobes, which are small and directed inward, the structure being like that of the collarette dahlias, though less regular. The type will doubtless be improved in course of time. (Gardeners' Chronicle, November 6, 1915, page 205.) Varieties are now obtained, but have not yet been sufficiently selected and isolated, with two or more rows of rays, 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. annuus, and again crossing the resultting plants with vinous H. annuus, 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, No. 3, 1896) hybrid sunflowers and perennial sunflowers were recorded, but without details. The hybrid H. annuus × H. scaberrimus (rigidus) was listed by Thellung in 1913. In 1913 Leonard Sutton in England used the pollen of H. rigidus (H. scaberrimus) on the red variety of H. annuus, and obtained fertile seed. The F₁ had the characters of the perennial parent, but Sutton reports that an F₁ plant has been obtained with small streaks and splashes of red. In 1914 Mrs. Cockrell used the pollen of the perennial H. pumilus on vinous H. annuus, 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 an annual. The largest of the first lot of plants from the H. pumilus × H. annuus cross flowed out the mixture, and the plant of 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 with caustic potash. (Since this was written, one of the hybrids has flowered showing the collar lattice character, and the lobes forming the collar are largely red.) This hybrid plant has a closely close resemblance to the 12 bushes known as Daniel Dewar. The broad leaves with well-developed peltioles are, however, like those of H. pumilus and H. annuus, not Daniel Dewar. The strongly serrate margins resemble H. annuus. At the present time the hybrids between annual and perennial sunflowers present many problems, and are exceedingly puzzling. 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 perennials in the strictest sense, the others reproducing by underground and seedling roots, with broad crowning 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 horticultural forms. The nature of these lesser types, however, will depend upon the success with which they may be perpetuated. If crossing has taken place, the various combinations arising may have been perpetuated and increased by the system of vegetative reproduction by “earth-branches,” 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 perennials present a great diversity of forms, though they appear to be far less numerous than are the migrants. T. D. A. Cockerell.

SURINAM CHERRY (Fig. 3743), Eugenia uniflora (B. 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, where it is called pitanga. In Cuba it is cultivated under the name of cerezo de Cayena, or Cayenne cherry; in Florida it is a common garden plant, and is hardy as far north as Putnam County, according to Reasoner. In recent years the fruit has been grown for market. In California the plant does not seem to fruit very freely, and has never become generally cultivated, though it is sufficiently hardy to be grown in the open ground throughout the southern part of the state.

The branches are rather thin and wiry: the leaves
subsessile, 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 1/4 inch in diameter, solitary in the axis 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 bicellular. See page 1162.

The fruits are 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 connection they are often used in Brazil for hedges, for which purpose they are excellent.

F. W. POPENOE.

SUTHERLANDIA (named for James Sutherland).

Leguminosæ. Tender canescent shrubs, hardy in the extreme S., otherwise grown in the greenhouse; lvs. unequally pinnate; lfts. many, very entire, without stipels; stipules small, narrow: fls. 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 standard; stamens 1, free from the standard, the others comitate 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.


F. TRACY HUBBARD.†

SWAINSONIA (named for Isaac Swainson, an English horticulturist of the latter part of the eighteenth century). Often incorrectly spelled Swainsonia. Leguminosæ. Glabrous or subapressed-pilose herbs or subshrubs, adapted to greenhouse culture or out-of-doors in the extreme South. Leaves odd-pinnate; lfts. many without stipels; stipules frequently herbaceous, base broad, rarely bristle-like: fls. blue-violet, purple, red, 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 somewhat twisted; keel broad, incurved, obtuse; stamens 9 and 1; ovary sessile or stipitate, many-ovuled: legume ovoid or oblong, turgid or inflated, coriaceous or membranaceous.—About 30 species, Austral. Differs from Colutea chiefly in smaller stature and the large lateral stigma. By far the most popular kind is S. galegifolia var. albiglora.

A. Standard with prominent oblique or longitudinal callic: pod stipitate, thin, inflated. (S. Maccullochiana probably has no callic; cf. under A.)

B. Calyx densely white-tomentose.

Graejana, Lindl. (S. grandiflora, R. Br.). Perennial or subshrub, 2-3 ft. high: sts. erect or ascending, young shoots and lvs. white-tomentose, becoming glabrous: lfts. 11-21, oblong, obtuse or retuse, 1/4-1 1/2 in. long: lfts. large, pink, in long, erect, pedunculate racemes; calyx dense white-tomentose, teeth short; standard 3/4 in. diam., with 2 prominent, erect, plate-like callic, wings shorter, keel incurved, obtuse: pod stipitate, inflated up to 1 1/2-2 in. long. Austral. B.M. 4416. B.R. 32:60. H.F. 3:72.

Bb. Calyx glabrous or nearly so.

galegifolia, R. Br. (Vicia galegifolia, Andr. Colutea galegifolia, Sims. & Osbornii, Moore). Small gla-
brous: attractive shrub, with long flexuose or half-climbing branches: lfts. 5-10 pairs and an odd terminal one, small, oblong 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. Austrail. B.M. 792. H.F. II. 4:276. J.F. 3:304. J.H. III. 49:547.—An old-time garden plant, at one time rarely the 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 late winter bloom in summer; these plants may then be transferred to the house for winter bloom, although maiden plants are to be preferred. By yearly cuttings this plant 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.


In 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 commonly grown at the end of a rose- or carnation-border, or trained on a trellis. It likes a humus rich soil, and liquid manure. When allowed too much root-room, the plants become very large and are slow to bloom, wherefore a large pot or tub is preferable to the border.

Var. violacea, Hort., has rose-violet fls., and is somewhat dwarf. S. coronillaefolia, Salish, probably represents this form or something very like it. B.M. 1725. S. coronillaefolia is an older name than S. galegifolia, and if the two names are considered to represent the same species the former should be used.

Var. rosa, Hort., has pink fls.

AA. Standard without callosities; pod various. (S. Mac
culuchiana may have calli.)

B. Lfts. glabrous above, puberulent beneath.

Macullochiana, F. Muell. Shrub, erect, up to 8 ft.

high, pubescent: lvs. pinnately compound, 8-10 pairs

of lfts., which are elliptic or obovate, mucronate, rather

glabrous above, puberulent beneath; stipules obliquely
deltoid; raceme many-flowered; fls. reddish purple; standard

ovate, pubescent; wings oblong, rounded, base auriculate;

keel slightly curved, obtuse; pod 2 in. long, stipitate.

N. W. Austral. B.M. 7995.

BB. Lfts. more or less pubescent on both surfaces.

c. Fls. violet-purple: lfts. 9-15 pairs.

cessartiaefolia, DC. (S. Froebelii, Regel.) Perennial, 1-1 1/2 ft. high; sts. diffuse or ascending, glabrous except

the bloom shoots and foliage which are more or less

gray-appressed-pubescent: lfts. 9-15 or rarely more,

oblong, obtuse, mucronate or almost acute, 1/4-2/4

rarely 1 in. long; stipules rather broad: fls. rather small,
violet-purple, in short racemes, sometimes reduced to

umbels or heads; calyx more or less pubescent with

black appressed hairs; standard nearly 3/4 in. broad

without the calyx; fls. shorter; keel mostly obtuse,

almost hood-shaped; pod sessile, inflated, 3/4-1 in.

Austral. Gt. 3:59.

cc. Fls. lilac-violet: lfts. 6-10 pairs.

ecallidea, Sprague. Herb, erect, about 2 ft. high,

pubescent: lvs. 5-5 1/2 in. long; lfts. 6-10 pairs, elliptic,
oblong, obtuse or retuse, sometimes mucronate, 1/4-3/4

in. long, pubescent on both surfaces; stipules deltoid at

base, apex subulate: racemes axillary, 4-5-fld.: fls. lilac-

rose: standard without cali, 7-8 lines diam., much

longer than the wings; keel broad, obtuse; ovary silky.

W. Austral.

S. alta, Hort., is mentioned in the horticultural journals as a form

with snow-white fls.; possibly only a variation of S. galegifolia.

G.W. 3, pp. 333, 334; H. p. 13. Var. grandiflora, Hort., is offered in

the trade.—S. atracococca, Carr. Similar to S. Ferrandii but with

larger 1vs.; infl. large; peduncle slightly purplish: fls. purplish red,

standard base-splotched 2-stip. slightly convex, with a white spot

at base, keel brilliant red-violet. A horticultural form.—S.

Ferrandii, Hort. Perennial, 12-20 in. high, much branched: lvs.

compound, unevenly so; lfts. numerous, elliptic, apex rounded,

glabrous: fls. in axillary racemes; peduncle short and arched; stand-

ard broadly expanded; wings much reduced; keel small. Probably of
garden origin. Var. alta, Hort., has pure white fls. Var. coronifera,

Hort., has carmine-pink fls.—S. grandiflora var. alta, Hort., is

offered in the trade, very probably is a form of S. galegifolia.—S.

rosea var. grandiflora, Hort., is offered in the trade.—S. splendens,

Hort., appears in the trade.

F. Tracy Hubbard.

SWEET ALYSUM: Alyssum maritimum. S. Bay of general

literature is Laurus nobilis; in America, Magnolia glauca. S.

brier: Rosa rubiginosa.

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, hairy stems and leaf-

stalks, small, fragrant white flowers, and large brown

seeds of transient vitality. The leaves, which have an

aromatic, anise-like, slightly flavory odor, character-

istic 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. Though easily propagated by division, best results are

obtained from seed sown in the autumn either sponta-

neously 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 sauces. At the time of the Renaissance, many herbs of the nineteenth century were grown and cultivated in gardens and kitchens that are now new or have been limited use. However, no group of garden plants during this time has been truly appreciated for its value. 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 wild herbs, to which ignorance may be charged the improper handling, not only by the grower, but by the seller and buyer by the final purchaser. With the public ready to the uses of herbs, improvements in growing and in marketing them 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. How 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 then 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 packed, can be shipped in the spring season. In the German market a city, a consignment of "black" parsley is sent, which is for sale at the market. Wherever the herb-gatherer is employed to dry them 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 special information, see articles on the following: Anise, Angelica, Balm, Basil, Caraway, Coriander, Dill, Fennel, Hyssopus, Mentha, Origanum (Marjoram), Parsley, Sage, Samphire, 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; for structure of the flower, see Legume; see also Orobos.

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 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 native of the island of Sicily and was first described by Father Francisceus Cupani, a devout Italian monk and enthusiastic botanist, in a small tract 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 Amstelodamensis" (1697-1701).

From this description it is learned that the flowers had purple standards and sky-blue wings, were fragrant, and that the plants were only a foot and a half of height. In 1771, Bumm 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 from which, he says, occurred frequently in gardens, Bumm proceeded to make a new species, Lathyrus zeylanicus, 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 appear to have been the only cultivated varieties until 1763, when the black and scarlet varieties were catalogued. In 1837 the first striped variety, in 1860 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 1865 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 1872. The Picotee (1875) was the first of the rose-pink varieties. Until 1880 (about 158 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, veronica, hollyhock, or the rose. There were nine distinct varieties in 1860, and although many new names appeared during the next twenty years, these mainly represented supposed improvements of the existing colors. It is very probable that not more than fifteen distinct varieties of sweet peas existed when Henry 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 before 1875, nevertheless the flower was lacking in many respects. The petals in later 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 line 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. Begun in 1876, 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 Bronze (1887). These were followed each year by 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 tripled, they have never attained the beauty of the variety Dorothy Eckford (1903). The increased size of many of Eckford's varieties led to the name Grandiflora sweet peas, 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 bicentenary 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 of the Grandiflora varieties recognized 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 Ferry 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 growers looked forward with anticipation for Eckford's annual set of novelties. Meanwhile in England there was not yet the keen interest in sweet pea that had taken hold of America. The popularity of the sweet pea in America was Eckford's constant incentive to better things, but gradually England came more generally to appreciate this flower with the result that since the waved form appeared the sweet pea has surpassed the popularity it attained in America. The demand for seed was satisfied when it was found that California had superior advantages for seed production. When the Eckford novelties were grown in California, they sometimes proved to be unfixed, and some of these variations, together with the results of some artificial crossing, gave the growers some new varieties. Many of the best striped, as well as marbled varieties, are of American introduction.

The most striking novelty in sweet peas, the dwarf or cupped type, was found in California in 1893 and was offered to the seed trade under the name Cupid in 1895. The first variety was white-flowered. This was followed by other varieties, and soon all the colors then known in sweet peas were to be found in the dwarf type. The Cupid sweet pea grows only a few inches high, forming a dense mass. The drooping is the result of the internodes of stems, a reduction in the length of the internodes of stems. The flowers were of the open and hooded form, borne upon short stems, and characterized by little or no fragrance. They appear to thrive under more drought and heat than the ordinary type. They have not succeeded very well outside of California, for in a season of normal rainfall in the East, the plants are injured by lying on the moist ground. The appearance of the dwarf sweet pea offers perhaps the best example of synchronous variation on record. This remarkable variation appeared in California, Germany, England, and France within the period of two years prior to its announcement here by Burpee.

'The Cupids were followed by the bush varieties which were considered to be intermediate in growth. This class did not gain much favor and soon disappeared. The snapdragon varieties, which had been reduced in size and in contact with the wings, giving the blossom the general effect of a snapdragon, were offered in 1897 but attracted little attention.

The winter-flowering type is the most important of all those originating in America. This type has been perfected in this country and has tremendously enhanced the financial value of the sweet pea as a cut-flower. No other country can begin to approximate the extent of the industry of sweet pea growing under glass.

**Development of the waved varieties.** (Fig. 3745.)

At the time of the bicentenary of 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. It seemed to realize 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 for Countess Spencer in honor of the wife of his employer. The parentage of this variety, although doubted by some, has been given as (Lovely x Triumph, 1898) x Prima Donna, 1890. It was shown at various English shows for three years prior to its introduction. Countess Spencer was such an improvement in sweet pea that it was 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 clematis. The effect of this 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 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.

![Diagram of sweet pea flowers](https://example.com/sweetpea_diagram.png)

3746. Forms of sweet pea flowers: 1, hooded; 2, waved; 3, open. (X3)

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).

<table>
<thead>
<tr>
<th>Garden type</th>
<th>Winter-flowering type</th>
<th>Dwarf type (Cupid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open form</td>
<td>Open form</td>
<td>Open form</td>
</tr>
<tr>
<td>Hooded form</td>
<td>Hooded form</td>
<td>Hooded form</td>
</tr>
<tr>
<td>Waved form</td>
<td>Waved form</td>
<td></td>
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</tbody>
</table>

The open form may be further separated into notched and rounded standards; the hooded varieties according to the degree of hooning; 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 the form of the flower into grandiflora or waved, and into thirty-seven color sections as follows: Bicolor; Bicolor Blush (Darles); Light Blue; Dark Blue; Blush-Pink; Lilac-Blush; Carmine; Cerise (Pale); Cerise (Dark); Cream, Buff, and Ivory; Cream-Pink (Pale); Cream-Pink (Deep); Crimson; Faney; Lavender; Lavender-Pale; Maribled and Watered; Maroon; Maroon-Red; Mauve (Pale); Mauve (Dark); Orange-Pink; Orange-Scarlet; Picotee-edged (Cream Ground); Picotee-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 Ground);

The bright sunshine and summer heat 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 repaid in 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 promotes available fertility, 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 liminous 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 (Pale) 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
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 trenches 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 seeds may be sown 2 inches deep and 2 inches apart. After the plants have started, but before they begin to stoop, they should be thinned so that the plants stand 3 to 4 feet 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 18 inches apart, using care to keep the ball of earth intact and without interfering 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 is seldom 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 may be improved 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 earned 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 later 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 developed by Arkwright, 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 Sim 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 thoroughly 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 variety of 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 as good a price in the larger cities as the waved varieties.

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 5 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 linear 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 2½-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, 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 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 quickly 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 show signs of weakness, 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, 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 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...
will usually destroy them. Plants that are frequently syringed with cold water are seldom infested with insects.

**Fusiform Rots.**

The most prevalent fungous pest affecting sweet peas under glass appears to be the Fusiform Rots. These are due to the presence of various species of fungi that have little or no root-system, due to the fact that new roots are constantly destroyed. The leaflets often turn yellow with white edges, finally drying 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 many cases of Fusiform Rot the diseased plant can continue to live with its very limited root-system. There are some other root-rot 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 failing.

Sweet peas grown in the open garden may be attacked by the Fusiform Rots. Powdery mildew can be controlled by the application of sulfur. The former attacks the leaves, stems, flowers, and pods, but is most frequently found on the latter which are attacked at any stage of development. The affected parts wilt and die. The disease can be carried over winter upon the seeds. The prompt destruction of infected plants, as well as the burning of all old vines in the fall and the use of clean seed or treating the seed before sowing, will do much to lessen the danger from this disease. The Fusiform Rots, which may be allied to or identical with the trouble known as streak in England, is a rather baffling disease to the growers. 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 cease 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. BElL.

**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 2,200 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 1,500 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 460 different names, resulting from different growers finding the same sports, or from varieties which were not improvements on existing varieties of the same color. 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 being obtained. This difference of yield between the Grandiflora and the Spencer type is due to the fact that 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 yet 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 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 seeder 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 pointed. 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, and 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, only about 90 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 seeding is done between November and January. The seeds are 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 3 to 4 inches 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 novelty 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. The only time this is not done is when the cutting is to be done. The cutting of the pods is to be done when the pods are large and plump. When 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 thrashing 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 its 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 subtropical regions, is restricted in its range of cultivation more by climate 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 conditions, together with its great food value, which is considerably 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 Convolvulus 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 vegetative means.

Roots to be used for seed purposes, selected at the time of harvest, are usually small, from 1 to 1¾ inches in diameter, of uniform shape, and characteristic of the variety. These roots are cured and stored under conditions most certain to insure an adequate supply of seed material, which, at the northern limit of the cultivation 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 seed-supply should not only be selected as above stated but it should be chosen from healthy plants and, in addition, should be carefully examined for disease. All specimens showing the slightest trace of decay or rot of any kind should be discarded.

The soil for the plant-bed, whether it be in the open or a manure- or fire-hotted, should be free from recent manuriation—preferably with a turning. Should sprouts be taken which grow from the bedded seed roots are known as "draws" or "sets." These are chiefly used for planting in the field, but roots, or pieces of roots, may be and sometimes are used. In the warmer sections of the United States, if the seasons are long, it is a common practice to grow enough early draws or sets to plant an area large enough to give a sufficient quantity of vine cuttings to plant the commercial area. This is a good system as it insures disease-free plants, so far as the root-rots are concerned, for setting the field. An even closer approach to a let-alone system is followed in some sections. Instead of harvesting and storing seed and propagating sets, a portion of last season's crop is allowed to remain unharvested over winter and it is from the volunteer plants of such an area that a supply of vine cuttings for the commercial plantation are secured to insure an adequate supply of the crop to the market.

Sweet potatoes are for the most part long-stemmed, creeping, or viny plants. They can be planted in hills but are more often set on parallel ridges thrown up 30 to 36 inches apart. The ridges are often made by throwing two furrows together over a trench in which well-rotted stable-manure has been scattered, or in which commercial fertilizer containing a liberal percentage of potash has been placed. On such ridges the draws are usually planted, either by the use of a hand dibble, tongs, or transplanting machine, 14 to 16 inches apart.

The subsequent culture consists in keeping the area free of weeds with horse-drawn implements as long as the growth of the plants will permit even by the use of a vine-lifter, after which all large weeds are removed by hand.

The signal which summons all hands to the sweet potato harvest is the first frost which causes the leaves to blacken. The home-garden plantation will be harvested with potato forks or with a turning. After the vines have been cut away with a hoe, but the commercial area will be entered with a special digging-plow with rods in place of a moldboard and two rolling coulers so arranged on a cross-piece fastened to the beam of the digger that they cut the vines on either side of the ridge, thus preventing their interference with the operation of digging. As soon as the roots have been turned out and have dried in the sun, they should be carefully gathered, so as to avoid breaking or bruising, into one-half- or five-eighths-bushel hampers and hauled on spring wagons to the curing and storage house.

In the home the roots are in the house, care being taken to avoid breaking or bruising them. Some growers spread layers of pine straw between each 12- or 15-inch layer of roots placed in the storage house. This practice is less common at the present time since especially designed storage houses have come into general use.

The storage houses in most general use both North and South are frame structures built entirely above ground, although there are a few houses at the North that possess a basement or semi-basement story used for the storage of sweet potatoes. These frame structures are so built that their contents are exposed in the least possible degree to outside changes of temperature. While the buildings are not insulated, they are provided with paper between the sheathing and the clapboarding, and on the inside under the sheathing. In the more exposed situations, either back plaster or a strip of paper is used between
the studding in addition to the construction above noted. The floors as well as the ceilings are made as nearly frost-proof as possible and to add still greater safety the roots are not placed on the main floor of the building itself but upon slit floors raised at least 2 inches off the main floor. Besides adding a factor of safety against frost, these slit floors serve another important function, that of facilitating the distribution of heat throughout the heap of roots during the curing process. The partitions between the bins should also be double-slatted in order to act as ventilators or chimneys so that the ventilation of the material in the bins may be insured as well as more rapid and more uniform curing.

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 atmosphere and Bin 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 depend on the use of bins with slit floors separated by hollow slit partitions. A convenient arrangement is so to construct the storage that each bin holds one carload or other unit quantity, depending on marketing facilities. In no case should sweet potatoes once placed in storage be rehandled or disturbed in any way until the contents of that particular receptacle, be it hamper, crate, or bin, have been prepared for immediate delivery to the market. Sweet potatoes will not tolerate sorting or handling of any kind while in storage. The successful keeping of sweet potatoes in storage, therefore, depends on care in using disease-free seed or sets, careful handling of the roots from field to storage, a frost-proof storage provided with adequate heat for curing and ventilators for insuring rapid change of air during the curing-period as well as at subsequent periods when atmospheric conditions demand it, and the storage of the house so placed, at time of storing, that any given unit may be discharged without disturbing the remainder of the material in storage. At harvest-time, and at all subsequent periods, except in severe weather when there is liability of injury from frost, sweet potatoes should be distributed in double-headed or burlap-covered, ventilated barrels. Such containers are economical, are more convenient to handle than crates or hampers, and form a satisfactory market unit. Bags should never be used, as when perishable freight or express is liable to frost-injury, strong hampers holding one and one-half bushels or one-half barrel are often used as containers for sweet potatoes. Such packages are prepared for shipment by first lining them with a tough grade of paper, and, after the container has been filled and covered, wrapping it with a similar material. One of the great handicaps to the sweet potato industry at the present time is the highly perishable nature of the crop, making it difficult for those who do not have the best of facilities to market the crop during severe weather except to nearby markets.

There are two important types of sweet potatoes grown in the United States, one with a dry mealy flesh and another with a fleshy of a soft, moist, sugary consistency when cooked. The northern markets generally prefer the dry mealy varieties with yellow color, while the soft, moist sorts, either light or deep yellow in color, are preferred by the southern markets. The commercial grower will therefore grow the sort or sorts demanded by the markets in which he expects to dispose of his product. His own likes and dislikes should not be given any weight in choosing market sorts.

Among the dry mealy-fleshed sorts may be mentioned: Sterling, Jersey, Early Carolina, and Triumph; characteristic representatives of the other class include such sorts as Nancy Hall, Georgia, Pumpkin Yam, Dooley, and Porto Rico.

L. C. CORBETT.


**SWERTIA** (named for Emanuel Swert, a bulb-cultivator of Holland and author of "Florilegium," 1612). Also spelled Sweer- *tia*: *Genista*. Erect, simple or branched, perennial or annual herbs, some of which are hardy, others adapted to the greenhouse; mostly border or rock-garden plants.

Leaves opposite, or radical in the perennial species, long-petioled, some of the cauline leaves alternate; fls. blue, rarely yellow, arranged in racemose panicles or laxly corymbous; calyx 4-5-parted, segments linear or lanceolate; corolla-tube very short, rotate, glandular-pitted, lobes 4-5, overlapping to the right; stamens 4-5; ovary 1-celled: caps. desiccating by 2 valves at the sutures.—About 85 species, widely scattered about the world but mainly from S. Asia.

*V. Nectariferous pils destinute of a fringe.*

**dilatata**, Benth. & Hook. (Ophelia dilatata, Ledeb.). A tender perennial about 1 ft. high: st. winged and angled, branching from near the base: lvs. glabrous, ovate-lanceolate, 3-nerved, rather obtuse, rounded at the base, short-petioled: fls. 4-merous, blue, in a dense, fastigiate umbel; corolla-labellums rounded at the apex and bearing at the base a single ovate, nectariferous pit destinute of a fringe. E. Asia, Japan.

**AA. Nectariferous pils with a fringe.**

**Pits oblong.**

**punctata,** Baguen. Perennial: stts. ascending from the base, many-fld.: lvs. several, alternate, elliptic-oblong, acutish; lower attenuate to a broad petiolo: fls. erect,
SWERTIA

SYMBEGONIA (name refers to the union of parts of the flower). Begoniaceae. 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. S. fulvo-villosa, 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 reddish fleshy stem and oblong, fleshy, somewhat pubescent leaves. 3-5-seeded fruits.
SYMPHORICARPOS

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. levi-gatus with heavy clusters of snowy white fruits at the tips of the arching branches, and S. orbicularis 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. orbicularis, and S. occidentalis, are quite Hardy North, while S. mollis, S. rotundifolius, and S. oreophilus are hardy as far north as Massachusetts; S. microphyllus is tender. They are

3752. Symphoricarpos occidentalis. (X ½)

excellent plants for borders of shrubbery 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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mollis, 4, and suppl. pauciflorus, 3.
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variegatus, 1.
variglottis, 1.

A. Fr. red; fls. campanulate.


SYMPHORICARPOS

aa. Fr. white or pinkish.
b. Fls. campanulate.
c. Style and stamens exerted.

2. occidentalis, Hook. Wolfberry. Fig. 3752. Shrub with upright rather stiff branches, 1-4 ft.; lvs. oval or ovate, entire or undulate-crenate, thickish, grayish green and pubescent beneath, chiefly in axillary clusters or spikes ½-1 in. long; corolla campanulate, pubescent inside, pinkish white, ¾ in. long; fr. subglobose, white, about ½ in. long. June, July; fr. Sept. Ill. and Mich. to Brit. Col. south to Colo. and Kans. G.F. 3:297 (adapted in Fig. 3752). G.C. III. 49:104. Gn. 75, p. 508.; S. occidentalis var. Heperi, Dieck), is very similar and differs chiefly in the thinner lvs. less distinctly veined beneath and more often undulate-dentate and in the somewhat shorter stamens and style; it is possibly a hybrid between this and the following species, found in Colo.

c. Style and stamens included.

3. albus, Blake (S. racemöns, Michx. Vaccinium album, Linn.). Snowberry. Waxberry. Shrub with upright slender branches, 1-3 ft. high; lvs. oval to elliptic-oblong, obtuse, pubescent beneath, on shoots often sinuate-lobed, ½-2 in. long; fls. in terminal spikes or axillary clusters; corolla campanulate, pinkish, about 1½ in. long; fr. globose or ovoid, snow-white, ½-1½ in. long. June-Sept.; fr. Sept.-Oct. Nova Scotia to Alaska south to Pa., Idaho, and Calif. Var. levigatus, Blake (S. racemöns var. levigatus, Fern.). Taller, to 6 ft., with glabrous usually larger lvs. and larger clusters of frs. Que. to Wash., south to Va., often escaped. L.B.C. 3:230. B.M. 2211. G.W. 8:115. Gn. 77, p. 527. C.L.A. 15:33. G. 29:169; 35:709 and G.M. 56:763 (as S. mollis). Var. ovatus, Rehd. (S. ovatus, Spaeath). A form of the preceding with broadly ovate, bluish green lvs. mostly about 2 in. long and 1½ in. broad, rounded or ovate at the base.—The snowberry generally cult. as S. racemöns is the var. levigatus, while typical S. albus is sometimes grown as var. pauciflorus, but the true var. pauciflorus, Blake, is a low shrub with smaller lvs. with grayish white pubes- cence beneath and only 1-3 fls. at the end of the branchlets; it is found from Lake Superior to Alberta and south to Colo. and Ore., and is apparently not in cult.

4. acutus, Dipp. (S. mollis var. acutus, Gray). Low diffuse or procumbent shrub; branchlets velutinous or puberulous; lvs. elliptic to elliptic-oblong, acute at both ends, soft-pubescent, grayish or whitish beneath, often irregularly dentate, ½-1 in. long; fls. in terminal few-fl. clusters and solitary or in 2's in the axis below; corolla pinkish or white, about ½ in. long; fr. subglobose white, ½-1½ in. long. June, July; fr. Aug., Sept. Wash. Calif. west to Idaho, Colo., and N. Mex.

BB. Fls. tubular or funnelform; style and stamens included.

C. Anthers reaching about the middle of the corolla-lobes.

5. rotundifolius, Gray. Upright shrub, to 3 ft.; lvs. orbicular to elliptic, entire or lobed, usually puberulous above, grayish and pubescent beneath, ½-1 in. long; fls. in 2-5-fl. terminal clusters and axillary; corolla pinkish, ½-1½ in. long, the tube pubescent within: fr. white, subglobose. June, July. Wash. Calif. and N. Mex.

6. oreophöllus, Gray. Upright shrub, to 4 ft., with slender spreading branches; lvs. oval to elliptic, usually puberulous above, slightly puberulous beneath, in terminal clusters or spikes; corolla pinkish, nearly ½ in. long, the tube almost glabrous within: fr. white, ovoid. June, July. Ore. to Calif. and Ariz. I.T. 3:98.

c. Anthers as long as corolla-lobes.

7. microphyllus, Kunth (S. montanus, Kunth). Upright shrub, to 3 ft.; branchlets glabrous or puberu-
SYMPHÖNICARPOS

SYMPHYANDRA (Greek, anthors grown together). Campanulaceae. Perennial herbs with a thick caudex, most of them hairy.

Leaves broad, usually cordate, dentate, the radical ones long-petioled, the cauline alternate, few or small: ffs. usually nodding, rather large, racemose or laxly panicled, white, yellowish or bluish (?) calyx-tube adnate, hemispherical or turbinate, limb deeply 5-lobed or -parted; corolla campanulate, 5-lobed; ovary inferior, 3-celled, from the 8 species and Asia Minor and one reported from Korea. Its special botanical interest lies in the fact that the anthers are grown together into a tube, which character tends to annul the distinction between the Campanula and Lobelia families. Otherwise the genus is much like Campanula, and used for similar purposes.

a. Calyx without appendages.

Höffmannii, Pant. Much branched, 1-2 ft. high, pilose: branches decumbent: ffs. oblanceolate, acute, doubly dentate: ffs. white, pendulous, 1½ in. long, 1 in. or more across, borne in a large leafy panicle; calyx-tube hemispherical, without appendages, segments linear, ovary superior, 5-celled, style short, corolla campanulate, hairy inside. Bosinia, B.M. 7298. Gm. 57, p. 303. G.C. III. 4:761. R.H. 1910, p. 285.—Under favorable conditions in England this plant has maintained a succession of bloom from July–Dec. In America the plant is said to be liable to exhaust itself in blooming, thus behaving like a biennial. It has large fleshly roots, which is a drawback, and sows itself. A plant of good habit and well worth cultivating.

b. Calyx with appendages.


ossética, A. DC. Perennial, rather glabrous, 6 in. or less high: sts. leafy, rather stout, incurved-pendulous: ffs. acutely double-dentate; radical rather long-petioled, subcordate ovate or oblance-aceuminate; intermedium lint. subulata, pedicelles filiform, stoutly or rather simply racemose: dfs. pale blue: calyx glabrous, segms. very broadly lanceolate, acuminate, appendages acuminate and short: corolla glabrous, tubular-campanulate. Caucasus.

S. pendula, Bieb. Perennial, pilose: sts. fleshy, 6-12 in. high; ffs. ovate, 3-fld.; corolla campanulate, white, tubular-campanulate. Caucasus, B.M. 1871, 280.—S. Wänners, Heuff. Perennial, hispidulous: sts. 1-3 fil., 5-in. or more high: ffs. oblanceolate, acute serrate or somewhat laciniate; radical long-attenuate to the petiole; calyx pubescent at the base, sessile; infl. thyrsoidly branched, branches 1-3-fld., dfs. blue; calyx glabrous, segms. broadly and cleft-lanceolate, appendaged; corolla long-campanulate. S. E. Eu. Gm. 65, p. 410. F. Tracy Hubbard.

SYMPHYTUM (Greek, to grow together, in reference to the supposed healing virtues). Boraginaceæ. Comfrey. Erect often hispid herbs, usually hardy in all but the far North, sometimes known for the variegated foliage of some species.

Roots sometimes tuberous: ffs. alternate or several radical ones; the cauline sometimes deciduous; the upper sometimes strongly approximate, almost opposite: cymes terminal, usually single or twice bilabiate or simple unilateral racemes: ffs. yellowish, blue, or purplish, pedicelled; calyx 5-lobed or -parted, lobes or segms. linear: corolla broadly tubular, lobes 5, very short; stamens 5; ovary distinctly 4-lobed: nutlets 4, obliquely ovoid, erect, rugose.—About 25 species, Eu., N. Afr., and W. Asia. Monographed by C. Bucknall in Journal of the Linnean Society, vol. 41 (1915). Of easy cult. in any good soil. The shade of overhanging trees is not objectionable. When grown for the beauty of the variegated foliage, the flowering sts. may be removed with advantage. Useful in borders.

a. St. branched: ffs. generally numerous.

b. Calyx divided to or below the middle.

c. Lvs. deciduous on the st.

dooffinéle, Linn. (S. bohémicum, F. W. Schmidt). Perennial, about 3 ft. high: root thick: st. branched, white-pilose: ffs. slightly pilose, basal and lower cauline ovate and cymes. on this species it is not known to Culpeper, upper oblong-lanceolate, all broadly deciduous at base: ffs. white, yellowish, purple, or rose, in drooping cymes. Eu., Asia. Var. argéntum, Hort., is offered in the trade as growing 2 ft. high, with silver-variegated foliage and drooping blue ffs. Var. aérum, Hort., is offered in the trade as a scarlet-fl. form. Var. bilaméne, Hort., is offered in the trade. Var. purpureum, Pers. (S. officinale var. bohémicum, Don), has reddish purple ffs. Eu. Var. variegatum, Hort., has lvs. widely margined with creamy white. F.S. 18:1901–1902.

D. Calyx-segms. obtuse: upper lvs. subpetiolate.

ásperum, Lepech. (S. aspérinum, Donn). Prickly Comfrey. Fig. 3753. Perennial, 3-6 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 rotundate; upper subpetiolate, base cuneate: ffs. at first rose then blue, smaller than those of S. officinale. Russia, Caucasus, Persia. B.M. 929.—Has some forage value. There are horticultural forms, blue-, Buckel-, or margined lvs. known as S. aspérinum aérum-variegatum, and S. aspérinum var. variegatum.


peregrinum, Lede. Perennial, about 3½ ft. high: st. erect, tall, branched, prickly, prickle slightly retrorse: lower lvs. long-petioled, ellipt-lanceolate, acuminate, about 10 x 4½ in.; upper lvs. sessile, all
SYMPLOCOS

softly hispid; petioles decurrent; fls. sky-blue; buds pinkish; calyx 5-parted almost to the base, segms. 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.


SYMPLOCUS


SYMPHYTUM

oblong, attenuate to the petiole; upper lvs. narrowly and shortly decurrent: 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.

b. Lvs. nearly glabrous.


BB. Lvs. hispid.

grandiflorum, DC. Perennial, about 1 ft. high: st. rather simple, base glabrate, otherwise reflex-spreading, hispid: lower lvs. long-petioled, subcordate-ovate, acute, decurrent along the petiole; uppermost lvs. opposite, oval, decurrent on the st.: fls. yellowish white, in a few-fld. raceme; calyx lobed below the middle, lobes linear; corolla-lobes broad and obtuse. Caucasus.

G.W. 7, p. 294.

F. TRACY HUBBARD.

SYMPLOCARPUS

(Greek, referring to the aggregate fruit). Araceae. Spathyhela is the older name, but the other is retained by the "nomina conservanda" list of the Vienna rules. Skunk Cabbage. A hardy swamp-loving perennial herb which pushes up its hooded spathes in very early spring or even before the first of January in favored situations.

Spadix globose or oblong, entirely covered by fls., the ovaries of which are embedded in the spadix; perianth of 4 hooded sepals; anthers 2-celled; style pyramidal, 4-sided; ovary 1-loculed, with a solitary, suspended, anatropous ovule; berries in large heads, 1-seeded.—Only one species. See Krause, in Engler's Pflanzenreich, hft. 37 (IV. 23 B), 1910.

The spathes are 3 to 6 inches high, usually grow in clumps, and the variation in their coloring is a never-failing delight. They are mottled with purplish brown and greenish yellow, the former color sometimes becoming bright red, the latter ranging from dark green to bright yellow. These spathes are produced several weeks before the leaves appear, and they inclose odd flowers which are described below in detail. Just when the skunk cabbage flowers is a matter of some debate; the sta-

mens are generally out in February or March. The hollow 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.

fetidus, Linn. (Spathyhela fetida, Nutt.). Skunk Cabbage. Fig. 3754. Lvs. numerous, 1-3 ft. long, 1 ft. wide, ovate, strongly nerved; spathe preceding the lvs., colored as described above: fr. ripe Aug., Sept. Nova Scotia to Minn., south to Fla. and Iowa; also in Asia. B.M. 836 (as Pothos fetida); 3224. V. 23:186. A.G. 14:367.

WILHELM MILLER.

SYMPLOCUS (Greek, sympluscos, entwined or connected, the stamens being connate at the base). Including Hopoa and Loddia. Styracaceae. 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
hardy as far north as Massachusetts, is generally cultivated; it is a shrub or small tree with abundant white flowers in small panicles, 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 moist soil and shady situations.

The evergreen species all have slender and tender shoots, and propagation is by seeds, which usually do not germinate until the second year, and by greenwood cuttings into late glass; also by layers.

**SYMPLOCUS**


**SYNDESMON**


**SYNDESMON**


**SYNDESMON**

mone quinquefolia, appearing below the basal lvs.

K. C. DAVIS.

**SYNECHANTHUS** (Greek, *continuous and flower*,
alluding to the arrangement of the infl.). *Palmæce*.
Unarmed gregarious palms, grown in the greenhouse:
trunk slender, an-
nulate, often stolo-
niferous: lvs. termi-
nal, equally pinnati-
sect, segms. broad
or narrow, mem-
ranaceous, acum-
nate, plicately
nerved: spadices
several, long-
and slender-
peduncled,
the floriferous erect;
spathe
several,
tubular,
membranac-
aceous, persistent:
lvs. green or the
male purplish, mi-
ute, 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. Three
species
Cent. Amer.
and Colombia. S.
*fibrosus*, Wendl.

3757. Synechanthus ballantoides. (**×3/5**)

Trunk 4 ft. high, green: lvs. 4 ft. long, erect and spreading;
ifs. numerous, 1-1½ ft. long, spreading and rather
pendulous, linear-lanceolate: spadices one-third as long
as the lvs.; the branches many, very slender, forked:

**SYNCHION** (Greek name, said to refer to the
cohesion of the ovaries). *Aralæce*.
Tropical American woody climbing or creeping plants,
with milky juice and sts. rooting and If.-bearing at the
nodes: lvs. sagittate,
becoming with age pedately 5-6-parted, on long
petioles, with a persistent accrescent sheath; peduncles
short: spathe yellowish or whitish green; tube small,
ovoid, persistent; spadix shorter than the spathe:
stamine fls. with 3-4 stamens, pistillate fls. with
oblong-ovoid 2- or abortively 1-loculed ovary; seeds
solitary in the locules, obovoid or globose, black.
—About 10 species, W. Indies and Mex. to Brazil. Mono-

**podophyllum**, Schott. A tender creeping plant:
lvs.
becoming 5-7-pinnatisect, 4-6 in. long;
petioles becom-
ing 15-20 in.
tube of the spathe 1-1½ in.
blad of the spathe 2½ in.
lgn, greenish outside,
white within.
Mex. The typical form is probably not in cult.
Var. *albolineatum*, Engl. (S. *albolineatum*, Bul.),
has whitish coste and lateral nerves. Offered by John
Saul, 1893, presumably as a tender foliage plant.

F. W. BARCLAY.

**SYNTHYRIS** (Greek, *together and little door or cage*,
the valves of the capsule long adhering below to the
short placeniferous axis). *Serothpluræaceae*.
Hardy herbaceous perennials, glabrous or pilose: rhizome
thick: lvs. radical, petioled, ovate or oblong, crenate
or incisely pinnatisect: peduncles scape-like, simple: fls.
raecemose 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, obstate or emarginate, 2-grooved.—
About 15 species, natives of W. N. Amer. Synthyris is
nearly related to Wulenia of S. E. Eu. and the
Himalayas, but the anther-cells are not confluent and
the seed more dissimilar. The region they are
summer-blooming plants with small purplish or flesh-
colored spikes or racemes. Border plants.

**SYNGONIUM** (of doubtful meaning; probably from
*syrinx*, pipe, because pipes are made from the straight
stems of Philadelphus by removing the pith, and the
name Syngonia had been originally applied to Phi-
adelphia but was transferred to the lila. Philadelphus
is still popularly called Syngonia). *Oleaceæ*. LILAC.
Ornamental woody plants grown chiefly for beautiful
and showy fragrant flowers.

Deciduous, rarely evergreen (S. *semperivires*), shrubs
or small trees: lvs. opposite, entire or rarely pinnate,
exipulate: fls. in panicles; calyx small, campanulate,
4-toothed; corolla salverform, with cylindrical tube
and 4-lobed limb; stamens 2: ovary 2-loculed; fr. a leathery
oblong or oval caps., loculicidally dehiscent, with 2
winged seeds each in locule. (Fig. 3758.) In S. *sem-
perivires* the caps. is fleshy, one-seeded, and drupe-
like, though dehiscent.—About 30 species from S. E. Eu.,
to the Himalayas, N. E. Asia, and Japan.

The lilacs are mostly large shrubs with bright green
medium-sized foliage and with large showy panicles
of lilac, purple, or white flowers followed by brown insig-
nificant capsules. They are among the most popular
and ornamental flowering shrubs, and
hardly any garden or park is found
without them. The fragrance of the
common lilac is very agreeable and short;
S. *obtata* and S. *pubescens*. The strong
odor of S. *chinesis* is not agreeable
to everyone. S. *villosa* and S. *Jostkea*
are almost scentless. S. *amurensis* and
its allies have only a slight odor similar
to that of the privet. Almost all species
are hardy North, but S. *emodi* is some-
what tender; also, S. *pekinensis* is not
quite so hardy as S. *amurensis* and S.
*Japonica*. The lilacs are very showy
in bloom, especially when massed in
groups, and groups as a rule are the more
effective the fewer different varieties they
contain. The mixing of species and
varieties differing in habit and
blooming season only spoils the effect,
and so does too great a variety of
colors. S. *Japonica* is the only real
tree of the genus; it attains a height of
30 ft. S. *vulgaris*, S. *amurensis*, and S. *pekinensis*
sometimes grow into small trees or at least large shrubs 10 to 20
feet high. S. *persica* is one of the smallest species and
seldom exceeds a few feet. The first in bloom are S.
*affinis* and S. *obtata*, followed closely by S. *vulgaris*,
S. *chinesis*, S. *pubescens*, S. *Juliana*, S. *persica*, S. *vil-

3757. Capsule of Syringa vulgaris. (**×3**)

3758. Synthesis spathodes. (**×1/2**)

3757. Synthesis Schott. (×3/5)

SYNGONIUM 3297

SYNTHYRIS

SYRINGA

3297

SYRINGA

3297

SYRINGA

3297

SYRINGA

3297
SYRINGA

Syringa, S. emodi, and S. Josikae; after the middle of June S. amurensis and S. pekinensis come into bloom, followed by S. japonica as the last, blooming in the North in the beginning of July. S. amurensis and S. pekinensis sometimes bloom sparingly a second time in fall. The foliage is bright green and handsome, but it drops comparatively early in fall, especially in S. japonica, without assuming any fall coloring as a rule. In S. oblata the foliage turns to a deep vinous red and remains until November. In S. pekinensis it is retained until late in fall and finally assumes a purplish hue or turns pale yellow.

The foliage is not much attacked by insects, but a fungus, Microsphaera alni, late in summer often covers the whole foliage of S. vulgaris and also of S. chinensis and S. pericica 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, Trochitium 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 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 on account of their early 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 lilacs 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 sucker ing 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 Legrave, one of the very best, B.H. 29: 153; Princess Marie; Princess Alexandra is a favorite variety of this class in America. —Blue, Lilac, pink: Ambrose Verschaffelt, pale pink; Dr. Lindley, pinkish lilac, F.S. 14: 1481; Géant des bataillons, bluish lilac; Geheimrath Heyder, light lilac; Gigantes, bluisa red; Gloire des Moulins, pale pink, G.M. 44: 499; Goliath, purplish lilac; Lovanianna, light pink; Macrostachya, light pink; Sibirica, purplish lilac; Triannoniana, bluish lilac. —Red: Aline Moyqueris, dark red; Charles X (Caroli), dark lilac-red, A.F. 12: 1078, P. 1873, p. 76; Marlyensis, sometimes called Rubra de Marley, lilac-red; Rubra insignis, purplish red. —Dark purple: Philemon; Ludwig Spaeth (Andeken 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 Château, compact panicles; Madame Casimir-Perier, large graceful panicles, one of the best; Madame Lemoine, large fls. in dense panicles; Obélisque; Virginité, white and pink. —Blue, Lilac, or Pink: Alphonse Lavallée, bluish lilac, A.F. 12: 1077; Belle de Nancy, fls. pink with white center; Charles Baltet, lilac-pink; Condorcet, blue, A.F. 12: 1074; Doyen Keteleer, lilac-blue; Jean Bart, pinkish violet; Lamarek, pale lilac, large, rather loose panicles; Lemoineii, 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 flowers; Pauline; Paul Poulsen; Carnot, pale blue. —Purple: Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d’Auvergne, 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 Legrave, Alba virginalis, Ludwig 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 cuttings or by layering. Special attention must be given to pruning in order to have well-branched plants of good compact habit (see Fig. 1555, Vol. III, p. 1205). 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 wilting. 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 stored 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.
Syringa

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 55° to 60° may be given, gradually rising to 78° to 88° 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 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 plants are subjected to the influence of ether during forty-eight hours shortly before forcing. An account of these experiments by W. Johannsen is entitled "Das Æthereverfahren beim Frühtreiben mit besonderer Berückerichtigung des Flieders." That the ether has a particular effect on the metamorphosis and regeneration of the albuminoids in the plant has been stated recently by other botanists also.

Lilacs may be propagated by seed, which is sown in spring. This method is usually practised only with the more common typical species. The many varieties and rarer kinds are usually propagated by hardwood cuttings under glass in June (or in early spring from forced plants), by hardwood cuttings, by grafting, and also by suckers and division, especially in the case of S. chinensis, S. persica, and S. vulgaris. As a stock, S. vulgaris is mostly used and sometimes ligustrum. S. japonica will probably prove to be a good stock. S. villosa, though readily growing from seed and of vigorous habit, is not to be recommended. Budding in July and August is the most extensively practised method. Grafting is done either in April or May in the open or in February or March in the greenhouse on potted stock. Almost any kind of grafting may be employed as the lilac unites readily. Crown-grafting is to be preferred in order to avoid the troublesome suckers. Plants intended for forcing but deficient in flower-buds are sometimes grafted in October or early in November with branches well set with flower-buds and forced in January or later.

**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 put 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°F. 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 Legraye is for all purposes the most useful lilac which has been used for forcing. (Wm. Scott.)

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**KEY TO THE SPECIES.**

A. Tube of corolla much longer than calyx; anthers sessile, not exerted.

B. Panicles on leafy branches, usually terminal: !is. whitish beneath.

c. INF. upright.

d. Anthers not exerted.

e. Stamens inserted near the middle of the tube; corolla-lobes nearly upright. . . . . . . . . . . . 1. Josiknea
**SYRINGA**

**5.**

**emodi**

Infl. nodding or pendulous: corolla-lobes little spreading.

**reflexa**

Panicles from lateral buds, without lvs. at the base; terminal bud suppressed.

**pubescens**

Branchlets and lvs. above glabrous.

**Juliana**

**pulchra**

Convex 

Base of lvs. truncate or cordate.

**leaves**

Roundish or broadly oval.

**affinis**

Young lvs. more or less pubescent, infl. loose.

**oblata**

Less pubescent.

**vulgaris chinensis**

Shrub, 6 ft. high, with slender, somewhat quadrangular glabrous 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; tube very slender; anthers violet, inserted much below the mouth. May. N. China. G.F. 1:415; 6:239. M. & C. G. C. III. 38:123 (S. vulgaris var. pubescens). — Free-flowering shrub of graceful habit, with handsome dark foliage.

**6.**

**Juliana**, Schneid. Spreading shrub, to 6 ft.: branchlets villous; lvs. elliptic-ovate, acute, more or less acuminate cuneate at the base, short-pubescent above, pale and more villous-pubescent beneath, particularly on the veins, 1-2 in. long: fls. 2-4 in. long, rather loose; rachis and pedicels slightly hairy and like the glabrous distinctly toothed calyx purplish violet; corolla lilac-purple outside, fragrant, emarginate, the spreading lobes white inside; anthers violet, inserted a little below the mouth. May,

**5.**

**emodi**, Wall. (S. emodi var. emodi, Rehd.). Shrub, to 15 ft.: branchlets brownish or dark olive-green, dotted with pale lenticels; lvs. elliptic to oblong, acute at both ends, white and glabrous beneath, 6-8 in. long: infl. narrow, 3-6 in. long, with leafy bracts; rachis angular: corolla pale lilac or whitish, not pleasantly scented, tube 3/4 in. long; anthers partially exserted; calyx obscurely lobed. Himalayas. B.R. 31:6. R.H. 1876, p. 368. Gn. 39, p. 106. R.B. 28:193.—Not quite hardy in Mass. There are varieties with yellow lvs., var. aurea, Simon-Louis, and with yellow-variegated lvs., var. aureo-variegata, Hort.

**4.**

**reflexa**, Schneid. Shrub, to 12 ft.: branches gray or purplish gray, dotted with lenticels; lvs. ovate-oblong to lance-oblong, sometimes elliptic-ovoborate, acuminate, cuneate at the base, glabrous above, villose beneath chiefly along the veins, 5-6 in. long: infl. nearly cylindric, nodding or pendulous, 5-7 in. long and 1-2 in. across; rachis, pedicels, and calyx sparingly villose or calyx nearly glabrous: corolla pinkish, 1/2-3/4 in. long, with nearly upright lobes: fruiting panicles pendulous with 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 VULGARIS**

**5.**


**6.**

**Juliana**, Schneid. Spreading shrub, to 6 ft.: branchlets villous; lvs. elliptic-ovate, acute, more or less acuminate cuneate at the base, short-pubescent above, pale and more villous-pubescent beneath, particularly on the veins, 1-2 in. long: fls. 2-4 in. long, rather loose; rachis and pedicels slightly hairy and like the glabrous distinctly toothed calyx purplish violet; corolla lilac-purple outside, fragrant, emarginate, the spreading lobes white inside; anthers violet, 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 infl.

7. *affinis*, L. Henry (S. *obliqua* var. *dilata*, Hort.). Slender, loosely branched shrub; lvs. broadly ovate, acuminate, truncate at the base, finely pubescent while young, particularly on vigorous shoots, on flowering branchlets sometimes glabrous or nearly so, 1½-2½ in. long and 1½-2⅔ in. broad; infl. slender and rather loose, 4-5½ in. long; calyx distinctly 4-toothed; corolla white, tube ¾ in. long. May. N. China. Var. *Giraldìi*, Schneider. (S. *Giraldìi*, Lemoine, not S. *Giraldìa*, Schneider.). Lvs. usually more densely pubescent while young: infl. 5-6 in. long, fls. purplish lillac; racis, pedicels, and calyx purple-violet. N. W. China. R.H. 1909, p. 335.—The earliest of the lilacs to bloom and the fls. do not suffer from frost as do those of *S. obliqua*. Hybrid of var. *Giraldìi* with *S. vulgaris* have been raised recently by Lemoine, which flower nearly two weeks before the earliest varieties of *S. vulgaris*; such are "Lamarthe" with rose-mauve fls. and "Mirabée" with rosy lilac fls.

8. *obliqua*, 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, 2½-4½ in. across: fls. pale lilac to purple-lilac, in dense subglobose or pyramidical panicles, 3-6 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. 7806. G. 36:335.—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 lilacs have originated by recrossing this form with varieties of *S. vulgaris*.


Section *Ligústrina*.


14. *japónica*, Decne. (*Ligústrina amurénis* var. *japónica*, Maxim.). Fig. 3764. Pyramidal tree, attain-

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*SYRINGA* 3301

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3763. *Syringa persica*, one of the common lilacs. (×½)
SYRINGA


—SYZYGIUM (from the Greek, united, referring to the calyptrate 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 terminal 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. 1168, Vol. II.

operculatum, Niedz. (S. nervosum, DC. Eugenia operculata, Roxbg.). A large evergreen tree with 4-angled or nearly terete branches; lvs. opposite, broad-ovate or elliptic, rounded or somewhat acuminate at apex and narrowed at base, 3-8 in. long, dark green and glossy, the primary lateral nerves few and separated; fls. in 3's and collected into a more or less thyrsoid infl. greenish; berry ½ 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.
TABEBÜIA (Brazilian name). Bignoniáceae. 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 irregularly splitting or unequally 3-5-lobed; corolla funnelform-campanulate; stamens included; disk annular or cupulate; ovary with the ovules in many series: caps. more or less compressed, usually elongated, glabrous or scaly.—About 90 species in Trop. and Sub-trop. Cent. and S. 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-maured soil and are easily propagated by cuttings and also by air-layering.

A. Lvs. simple.

leucóxyla, DC. (Bignónia leucóxyla, Vell. B. páldida, Lindl.). Fig. 3765. Evergreen tree or shrub: lvs. elliptic-oblong to obovate-oblong, obtuse or sometimes margined 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.

Aa. Lvs. digitate.

b. Fls. pink.

tríphylla, DC. (Bignónia tríphylla, Linn. Técoma leucóxylon, 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, rosy pink or nearly white, suffused with pink, 2 in. long; calyx 2-lipped: caps. linear, 6-8 in. long. W. Indies, Guiana.

rósea, DC. (Técoma rósea, Bertol.). Evergreen tree: lvs. digitate; lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, entire: fls. in many-fl. terminal panicles; corolla funnelform-campanulate, with short tube and large spreading lobes, rosy pink; calyx campanulate, obscurely 2-lobed, almost truncate. Guatemala.

bb. Fls. yellow.

chrysántha, Nichols. (Técoma chrysántha, DC.). Evergreen tree: lvs. digitate; lfts. 5, ovate, acuminate, entire, 2-4 in. long; long-stalked: fls. in terminal dense racemes, yellow, funnelform, 2 in. long. Caracas.

T. gaculiólia. Hemal. (Técoma gaculiólia, DC. Bignónia gaculiólia, 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 3 lower lobes. Mex.—T. Donnel-Smithii, Rose. Known in Mex. as “Primavera” and said 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 appearing before the palmetto compound lvs.: lfts. 7, oblong to ovate, acuminate, rounded or truncate at base, serrate.—T. Póliner, Rose. Tree, 18-25 ft., bearing pauowlnia-like fls.; lvs. opposite; lfts. 4, about 2-3 in. long, oblong, somewhat acuminate, obtuse at base: fls. white and purplish, with yellow spots, in close clusters at ends of naked branches; corolla 1½-2 in. long. Mex.—T. pínia, Hemsl. (Técoma pínia, Linn.). Closely related to T. tríphylla. Tree, to 60 ft.; lfts. usually 5, elliptic to 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. 304719 is said to have orange-colored fls. and belongs probably to some other species.—T. serráfo, Nichols. (Técoma serráfo, Don.). Evergreen tree: lvs. digitate, with 5-7 oblong-obovate acuminate lfts. serrate at the apex, 3-4 in. long: fls. in terminal panicles, tubular-funnelform, yellow. W. Indies.—T. spectáculo, Nichols. (Técoma spectáculo, Flanch. & Lindl.). Evergreen tree: lvs. digitate, with 5 stalked ovate to oblong-ovate, crenate serrate lfts.: fls. in terminal panicles, orange-yellow, funnelform-campanulate. Colombia. F.S. 9:948.

ALFRED REHDER.

TABERNÆMONTÁNA (named for J. T. Tabernæmontanus of Heidelberg, physician and botanist; died 1590). Apecynáceae. 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, deeply or to the middle 5-lobed or -parted; corolla salver-shaped, tube cylindrical, lobes twisted; disk various; ovary with 2 distinct carpels; berries usually follicles 2, globose, oblong, ovoid or recurved-reniform, smooth or 3-ribbed.—About 160 species, widely distributed throughout the tropics. See Genioma 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. Camassii*, referred in this work to Gone-
oma, flourish everywhere in Florida from Jacksonville southward, and deserve attention. Tiny cuttings soon develop into dense, bushy plants 3 to 5 feet high, covered with deliciously 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 propagat-
ion. *T. coronaria* has larger leaves than *T. Camassii* and the flowers are much like those of the double white oleander, while *T. Camassii* has solidier and smaller blossoms. 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 suc-
cessfully set out. The plants at this season have not time to become established before the first frost comes, and a weakened tabernamontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bannahias, cestrum, *Poinciana regia*, *Tristania conferta*, grevilleas, eucalypti, and so on) are banked about 18 inches to 2 feet high with dry sand and kept quite dry till the time they have made their first growth without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The tabernanetanas look best in groups by themselves or in front of other glossy leaved evergreens. (H. Nehrling.)

**AA. Fls. white.**

**coronaria**, Willd. *Crape* *Jasmine*. Nero's Crown. A tender shrub, 6-8 ft. high; lvs. glossy green, oblong to obovate; fls. white, fragrant, 1-2 in. across, in 1-5-fl. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. *floré-plano*, 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-
ately ovate, sharply acuminate, 2-3 in. long, thick: fls. single, yellow, 1-2 in. long, in few-fl. clusters; corolla-
white, ovate. Early fall. Grown as an annual. Guiana. B.M. 6226.—Rarely cult. in the more southern parts of the U. S.


F. W. BARCLAY. F. TRACY HUBBARD.†

**TACAMAHAC: Populus balsamifera.**

**TÁCCA** (Malayan name). Syn., *Atécia*. *Taccoce*, a family allied to the Dioscorea tribe. Perennial herbs from a tuberous or creeping rhizome, adapted to the warmhouse.

The flowers radical, large, petioled, sometimes undivided and entire, sometimes variously lobed or dissected: fls. at the top of erect leafless scapes in dense umbels, lurid brown or greenish; perianth 6-lobed in 2 rows; stamens 6; ovary inferior, 1-ovuled: fr. globose, ovoid, turbinate or elongated, usually 3-cornered or 6-ribbed, berry-like and indehiscent, rarely finally 3-valved.—About 12 species. One of the most conspicuous of the edible horticultural species. The flower cluster is subtended by a few, usually 4, leaf-like or colored bracts, and intermixed with the fls. are more or less numerous, long and conspicuous, sterile, filiform pedicels, which usually droop below the fl.-cluster. *Taccaceae* contains only one other genus, *Schizocapsa*.

**AA. Lvs. much lobed.**

**pinnafida**, 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. 7290, 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.

**AA. Lvs. not lobed.**

long, oblong, acuminate, dark purplish green: scape longer then the lvs.: fls. dark purple, 1½ 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, the lowermost a little more than half free. Malayia. B.M. 4589. F.S. 9:296-861. Gm. 45, p. 415; 49, p. 423.—According to Gm. 45, p. 415, it requires good, rich, 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.

**Chantiéri, André.** Plant stemless, on a fibrous, red-
bruised caudex: lvs. on petioles attaining proper attention, all the first frost comes, and a weakened tabernamontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bannahias, cestrum, *Poinciana regia*, *Tristania conferta*, grevilleas, eucalypti, and so on) are banked about 18 inches to 2 feet high with dry sand and kept quite dry till the time they have made their first growth without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The tabernametanas look best in groups by themselves or in front of other glossy leaved evergreens. (H. Nehrling.)

**AA. Fls. yellow.**

**grandiflora**, Jacq. A small, tender shrub: lvs. oblong-
ately ovate, sharply acuminate, 2-3 in. long, thick: fls. single, yellow, 1-2 in. long, in few-fl. clusters; corolla-
white, ovate. Early fall. Grown as an annual. Guiana. B.M. 6226.—Rarely cult. in the more southern parts of the U. S.


F. W. BARCLAY. F. TRACY HUBBARD.†

**TACSONIA** (from the Peruvian name of one of the species). *Passifloraceae*. From Passiflora, *Tacsonia* differs in having a long-tubular calyx, stamens and petals usually 5, the latter never wanting, corona of tubercles or very short threads, and in a short reflexed corolla near the base and with a length of demarcation between the two genera is often not well marked and Harns (Engler & Prantl's Pflänzen-
familien) unites *Tacsonia* with *Passiflora* Masters (Trans. Linn. Soc. 27) accepts 25 species of true *Tac-
sonia, relegating the intermediate forms largely to *Passiflora*. Other species have been discovered subse-
quently. The *Tacsonia* are all S. American, inhabiting the Andes. They are tendril-climbing shrubs or herbs, requiring the treatment given passifloras. *Tacsonia* are cult. freely in the open in Cent. and N. Calif. *T. manicata* (*Passiflora manicata*) is a common and strik-
ing-red-fl. tall climber in S. Calif.

In this work, following Engler & Prantl and also Hooker, the *Tacsonia* are described under *Passiflora*.

**TÆNEDIA** (Greek, making reference to the very small ribs of the fr.). *Umbeliferæ*. One species, a slender smooth glaucous perennial of E. Canada and the northern U. S., generally known as *Portulaca integerrima*, Gray, and *Zizia integerrima*, DC. It has little value to the horticulst, 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 lfts. oval to lanceolate, entire, nearly or quite obtuse.

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 cap 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 1568 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 foot 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 finely colored. 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.

patula, 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 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 cap 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.—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. 63, p. 24; 73, p. 127.

erecta, 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 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.

lucida, 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 see.

Theodore W. Barclay.
TAINDIA

sized; sepals about the same length, narrow, acutish to acuminate; petals similar to the rear sepal or narrower; labelium affixed to the foot of the column, erect, glabrous, oblong-ligulate, laterally joined above clasping the column, the middle lobe spreading, short, broad; pollinia 8.—About 14 species, India, S. China, and Malaya.

Fuerstenbergiana, Schlecht. Tall: pseudobulbs ovoid, about 2 in. long, 1-IVd. If erect, petioled, lanceolate, about 2 ft. long: scape slender, erect, 2½-3 ft. tall, bearing fibrously clasping 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.; infl. simple or slightly branched, laxly several- or many-flled; sepals reflexed, ligulate, rather obtuse, minutely puberulent outside; glabrous inside, lateral recurved, falcate, base broadened; petals obliquely linear, obtuse, recurved, glabrous, as long as the sepals; labelum curved, mobile, lanceolate-tongue-shaped, apex hastately dilate with the margins incurved; column medium-sized, broadened toward the apex; pollinia 8. One species, Khasia Mts. and Burma, T. barbata, Schlecht. O. 1915-11.

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-lvd. If erect, petioled, narrowly oblong, with 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.: infl. simple or slightly branched, laxly several- or many-flled: sepals reflexed, ligulate, rather obtuse, minutely puberulent outside; glabrous inside, lateral recurved, falcate, base broadened; petals obliquely linear, obtuse, recurved, glabrous, as long as the sepals; labelum curved, mobile, lanceolate-tongue-shaped, apex hastately dilate with the margins incurved; column medium-sized, broadened toward the apex; pollinia 8. One species, Khasia Mts. and Burma, T. barbata, Schlecht. O. 1915-11.

F. TRACY HUBBARD.

TALÂUMA (S. American name). Magnolidaceae. Evergreen trees, grown occasionally in the greenhouse, Lvs., inll., and seeds as in Magnolia: sepals 3; petals 6 to many, imbricate in 2 rows; stamens numerous; carpels numerous, capitate or spicate, 2-ovuled.—About 30 species in the tropics of E. Asia, S. Amer., and Japan. Talauuma is closely allied to Magnolia, but the carpels are indehiscent and deciduous, while those of Magnolia delinated and are persistent.

Hodgsonii, Hook. & Thom. Tender evergreen tree, 50-60 ft. high, producing lvs. and fls. at the same time: lvs. 8-20 x 4-9 in., obvolute-oblong, cuspidate or obtuse, leathery, glabrous: fls. cup-shaped, fully 6 in. across and 4 in. deep, solitary, terminal; sepals 3-5, purple outside; petals about 6. fr. 4-6 in. long. Himalayas. B. 722.—The leaves have a spicy odor, hard thick fleshy texture, and the glaucous purplish blue of the sepals contrasts well with the ivory-white of the petals. Hooker ranks this species second in beauty only to Magnolia Campbellii (p. 1969, Vol. IV). T. Hodgsonii grows at an elevation of 5,000-6,000 ft. This fine tree has been flowered at Kew and perhaps elsewhere in Eu., but never in Amer., so far as is known. Many times seeds were received at Kew from India, but they never germinated, the reason being the rapid decay of the albumen, involving that of the embryo. The trees now cult. in Eu. have been derived from young plants sent from India in Wardian cases at considerable expense and risk.

WILHELM MILLER.

TALÎNÎM (possibly a native name in Senegal). Portulacaeeæ. Fleshy herbs, sometimes becoming woody at the base with age, occasionally cult. in the greenhouse. Lvs. alternate or rather opposite, flat: fls. small, in terminal cymes, racemes, or panicles, rarely solitary, axillary, or lateral; sepals 2; petals 5, hypogynous, ephemeral; stamens 5 to many; ovary many-ovuled: caps. globose or ovoid, chartaceous, 3-valved.—About 15 species, widely scattered in the warmer regions of Europe and Japan.

The variety of T. patens is a handsome greenhouse shrub, with foliage marked white and sometimes also pink. The young stems are pink and succulent, but they become woody with age. The plant is allied to portulaca and will endure much heat and drought, but is very impatient of overwatering and lack of drainage. The plants bloom freely, the flowers being small, light pink, and followed by small yellow capsules filled with an indefinite number of little brown seeds. Some prefer to retain the sprays of blossom, but to make the best show of foliage the flower-shoots should be cut off as soon as they appear. Talinum is a satisfactory house-plant. It should be placed in a window with a northern exposure or in some other shady position. Talinum may also be planted out during the summer. (W. C. Steele.)


Triangularâ, Willd. Lvs. alternate, obovate-lanceolate: cymes corymbose-pedicellate 3-cornered (in T. patens they are filiform): fls. red or white. W. Indies, Brazil, Peru. Var. crassifolium, Hort. (T. crassifolium, Hort.), is said to be taller and more branched: lvs. larger, often emarginate and mucronate.

F. TRACY HUBBARD.

TAMÂRAKÊ: Lariâ.

TAMÂRÎNDSUS (from the Arabic tama-Indí, meaning “Indian date”). Leguminoseæ. 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 tree and as a fruit tree. It is said to be from India and Peru. It is one of the most valuable leguminous trees of the tropical regions, its fruit and seeds being used in many ways. The genus never entirely perished in the wild state, but was cultivated as a fruit tree in the East Indies and in the West Indies. It is said to have been cultivated in the East Indies during the Middle Ages, doubtless through the Egyptians. Until correctly described by Garcia d’Orta (1563) it was supposed by Europeans to be produced by an Indian palm (Dymock).

Leaves alternate, equally pinnate, the lfts. small, indefinite in number; stipules minute, caducous; fls. irregular, produced in racemes at the ends of the branches: bracts and bracteoles ovate-oblong, colored, caducous; calyx-tube turbinate, narrow, the segms. 4, imbricate, membraneous, 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 stalk adnate to the calyx-tube, the style filiform, stigma terminal, subcapitata: fr. an oblong or linear, compressed, indehiscent pod, with a thin, crustaceous epicarp, pulpy mesocarp, and coriaceous endocarp separate from the obovate-ornicular, compressed seeds; embryo exalbuminous. The genus is distinguished from Schotia, the only ally which seems to be cult. in Amer., by its floral characters.

Indica, Linn. TAMÂRÎNDSUS, TAMÂRÎNDSUS. Fig. 3768. A large tree, attaining to 80 ft. in height when grown on deep soils, with a trunk 25 ft. in circuit; bark brownish gray, somewhat shaggy: lvs. abruptly pin-
TAMARIX 3307

described the lax as nearly hemisphere, has B.M. per pickling great rounded seeds, a potash.

West connate: few a shallow rainfall, India size. In grown all by acids 20-40, pod 3-5 in.

It Flowers a ripening tartaric. As a ingredient delicacies in medicine, Hindus by

It is not sufficiently hardy to be grown in Calif., failure having attended all past efforts to cult. it in that state, so far as known. It delights in a deep alluvial soil and abundant rainfall, the largest specimens being found in tropical regions where the soil is rich and deep. On the shallow soils of S. E. Fla. it does not attain to great size. When small it is very susceptible to frost, but when mature it will probably withstand temperatures as low as 28-30° F. without injury.

The plum slightly curved pod has a thin brittle shell. It contains a soft brownish pulp transversely by a few strong branched fibers; the large flattened glossy seeds, varying from one to twelve in number, are surrounded by a thin tough membrane. The pulp contains sugar together with acetic, tartaric and citric acids, the acids being combined, for the most part, with tartaric (Pharm. Ind. pt. II, 532-36) citric acid is present in a small quantity, about 4 per cent, while there is about 9 per cent of tartaric. The pulp is widely used in the Orient as an ingredient in chutneys and curries, and for picking fish. In medicine, it is valued by the Hindus as 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 S. America, and in addition 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 casks, with alternate layers of coarse sugar. When the cask is nearly full, boiling sugar is poured over it, 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. Gumble writes that the leaves corrode 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 ½ 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, Caryaoborus 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 gotee, 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. POPENOE.

TAMARISK: Tamarix.

TAMARIX (ancient Latin name Tamaricaceae). TAMARISK. Ornamental woody plants, grown chiefly for their showy panicles or racemes of pink or white 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, andr. in 2's, ovary 1-celled, surrounded by 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
E. India and Japan. Several species have medicinal properties and yield dye-stuffs. The punctures of an insect, Coccus mannifera, cause T. mannifera to produce "manna."

The tamarisks are very graceful shrubs or small trees with slender branches clothed with minute scale-like appressed leaves, and with usually light pink small flowers in large and loose terminal panicles or in numerous lateral racemes, followed by small capsular fruits. None of the species is quite hardy North, but T. pentandra, T. odessana, T. gallica, and T. parviflora are fairly hardy as far north as Massachusetts. Several of the species bloom late in summer and are a welcome addition to the autumn-flowering shrubs. As they are inhabitants of warmer arid regions, they are adapted for dry-land conditions, and they also grow well in saline 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 greenhouse 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.

BB. Petals erect, deciduous; styles usually 4.

1. parviflora

2. tetrandra

AA. Fls. 5-merous.

B. Racemes lateral on last year's branches.

BB. Racemes forming large terminal panicles, rarely lateral on the current year's branches.

C. Lvs. glabrous.

D. Petals persistent.

E. Bracts ovate-lanceolate.

F. Infl. nodding; tree with spreading branches.

2. tetrandra

GG. Petals deciduous.

H. Bracts subulate.

I. Infl. upright; erect shrub.

3. juniperina

CC. Lvs. finely pubescent.

4. odessana

3. juniperina, Bunge (T. japonica and T. plumosa, 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; pedicels slender, short, annular; sepals ovate-lanceolate, little shorter than the persistent petals; disk 5-lobed, with maragine lobes. Japan, N. China. S.Z. 1:71 (as T. chinensis.)

4. pentandra, Pall. (T. Pallasi, Desv. T. hispida zvetiula, Hort.). Shrub or small tree with usually purple branches: lvs. lanceolate to ovate, acute, glaucous or pale green; lvs. pink, in large panicles, the racemes dense, 1-2 in. long; branches ovate-lanceolate, acute or acuminate, as long or slightly longer than pedicels; petals broadly elliptic-oblong, connivent; disk 5-lobed, with maragine lobes; styles 3, with obovate, connivent stigmas. Aug., Sept. S. E. Eu. 8138. Gn. 77, p. 494. Gn. W. 25:121.—T. amurenensis, Hort., is a form of this variable species. F.E. 20:344, p. 105. Also T. orepica probably belongs here.

5. chinensis, Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches: lvs. bluish green, lanceolate, acuminate, keeled; lvs. pink, in large and loose usually nodding panicles, pedicels as long as calyx; petals ovate, much shorter than the persistent petals; disk deep 10-lobed. July-Sept. China.

6. odessana, Stev. Shrub, 4-6 ft. high, with upright, slender branches: lvs. lanceolate, subulate, decurrent; fls. pink; racemes slender, about 1 ft. long, on short, naked peduncles, spreading and disposed in simple loose panicles, pedicels about as long as calyx; petals slightly spreading; disk 5-lobed, with brown disk. July-Sept. Caspian region.


8. hispida, Willd. (T. kashgarica, 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 2-3 in. long, disposed in terminal panicles;
TAMARIX

TANACETUM vulgare. (× ¼)

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 skin and liability to dry out before fully ripe probably will preclude its culture except by experts 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 Sampson 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 tangosels produced by artificial hybridization has led to the creation of hun-

TANAKÈA (named in honor of M. Tanaka). Sarsi-fragrææ. Herb probably hardy and perennial; plant dizeous, perhaps sometimes monoeous, 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 cordate at base, acute, doubly serrate; shapes very slender, branched, pyramidal, 6–8 in. high: lvs. very small, greenish white, shortly pedicelled, solitary in the axis of the bracts; sepals 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. 35:373; 36:515.

TANGELO (from tangerine and pummelo; by syn- copation: tange[rine] [pummello]). A new group of citrus fruits originated in 1897 by the writer by crossing the Dancy tangerine with the Bowen grapefruit.

3770. Tansy.—Tanacetum vulgare. (× ¼)
TANGELO said probably other recognized, stimulant cal...
TARO

*Stachyfoidea*.

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-obovate, 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, serrulate, glaucous and nearly glabrous beneath, 3-5 in. long: panicles broad, 2-3 in. long: fls. \( \frac{5}{2} \) in. long, yellow, fragrant: fr. ovoid, black, \( \frac{3}{2} \) in. long. June, July. Cent. and W. China. H.I. 20:1928. 

ALFRED REEDER.

TARÁXACUM (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 large many-fld. ligate yellow heads solitary on naked and hollow scapes; involucre with one inner series of erect narrow bracts and outer calyx-like spreading sometimes reflexed bracts; pappus simple and capillary, borne on a slender beak terminating a fusiform elongated angled achene; fls. opening in sunshine. The plants are exceedingly variable and there are consequently great differences of opinion as to the number of species. Bentham & Hooker would reduce them to about 6, and others would retain 25 or more.

The common dandelion is *T. officinale*, Weber, known also as *T. dens-leonis*, Desf. It varies immensely in stature and form of lvs., as shown in Figs. 3771-3774. For history, see Sturtevant, Proc. 6th Meeting Soc. Prom. Agr. Sci., and Amer. Nat., Jan., 1886. For an account of the red-seeded dandelion, *Taraxacum*, Andr., see Fernald, Bot. Gaz., July, 1895:323. From the common dandelion it differs in having smaller sulfur-yellow heads, smaller and very deeply cut lvs., outer involucral scales not reflexed and somewhat glaucescent; achenes red or red-brown and shorter beaked: pappus dirty white. It is known to occur in New England, N. Y., Pa. and W.; probably naturalized from Eu. For the cultural directions, see Dandelion, Vol. II.

L. H. B.

TARE, TARES. To the modern English farmer the word "tare" means the common vetch, *Vicia sativa*, although tare is also applied loosely to other species of *Vicia* and *Lathyrus*, particularly *Vicia hirsuta*. The celebrated passage in Matthew xiii, 25, "His enemy came and sowed tares among the wheat," refers probably to the darnel, *Lolium temulentum*. The original Greek word in Matthew is Zizania, a name which in botany refers to the wild rice. Darnel belongs to the grass family and its seeds were long thought to stupefy those who ate them unwittingly. The supposed narcotic property in the fruit is said to be due to the presence of a fungus.

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 latterly 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 *colquas*, 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 *colquas* 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. 3770.

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 set seed, testifies to the antiquity of the culture of this type of taro. MacCaughey and Emerson, in the Hawaiian Forester and Agriculturist.
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 acrid. 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 acrid 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 "luau." 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 slowly decreasing, although in 1913 it was estimated that the total planting was somewhat 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 corm or cornel with 7 or 8 inches of the inner petioles still attached. Planting is undertaken at the 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 puddled 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 corms are then removed from the corns, 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, it 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 in such soils, is 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 cornels 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 preserved. 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
TARO

TASMANNIA

3313

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. Cornels, 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

former is obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather the crop for distillation or infusion is when the first flowers begin to open, since the plants have then a larger percentage of oil than before or after. From 300 to 500 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for the division is when the plants have just begun to grow in the spring. Tenacious and wet soils should be avoided and only loams of medium texture and of poor quality in sunny situations chosen. The plants may be set, either in the spring or in the autumn, 1 foot apart and cultivated like sage or mint. The flower-stems should be removed as soon as seen, as this will force greater growth of leaves. The green parts may be gathered at any time, after the plants have become established, and used fresh. Dried tarragon is nearly as useful as green, but there is little market for it, less even than for the leaves. At the approach of winter, especially in cold and snowless climates, the stems should be cut down and the plants covered with litter or leaves. The position of the beds should be changed every three or four years. Tarragon is less cultivated in America than it deserves. Most of our tarragon vinegar comes from France.

A wholly different plant, Tagetes lucida, is much like tarragon in flavor and has been used as a substitute for it.

M. G. KAINS.

TASMANNIA (named after Abel Jansen Tasman, navigator, for whom the island Tasmania is named). Now considered a synonym of Drimys. One species, Drimys aromatica, Muell. (Tasmannia aromatica, R. Br.), is sometimes mentioned in horticultural literature: small tree or a bushy shrub with pinkish fls., elliptic-oblong or oblong-lanceolate lvs. and aromatic pea-size berries. Victoria, Tasmania. B.R. 31: 43.

3777. A hill of dasheen. The large central corm, with part of leaf-stems still attached, is surrounded by the cornels, or tubers, just as they grow.

3778. A full-grown plant of dasheen, the variety of taro grown in the United States.
**TAVARESIA** (derivation unexplained). Asclepiadaceae. Succulent stapelias-like perennials, branching at the base: sts. 6-12-angled, angles tuberculate, toothed, each tubercle with 3 bristles: fls. large and showy, in sessile cymes at base of young sts.; calyx 5-parted; corolla large, tubular-funnel-shaped, 5-lobed; corolla dou-

**TAXODIUM** (alluding to the similarity of the foliage to that of Taxus). Syn., Glyptostrobus, Schubertia, Pinaceae. Ornamental woody plants, grown chiefly for their graceful feathery foliage.

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. monoeccious, small; stamine 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 pyramidal disk with a mucro in the middle and toward the base narrowed into a slender stalk; 2 triangular, winged seeds under each scale; cotyledons 4-9.—Two species in N. Amer. 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 and width that 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 found equally prominent 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, 57). 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 nursery. The seeds, once sown, are quickly saturated with water or grown in water alone, under glass.

**3779. Taxodium distichum.—** Bald cypress.

**3870. Old English yews that have reached maturity.**—Taxus baccata. Addison's walk, at Glanwein, Ireland.
branchlets with typical foliage, those of the longer branches gradually passing toward the end into small, scale-like, imbricate lvs.


ALFRED RENZER.


Evergreen trees or shrubs: lvs. linear, without resinducts, 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 4–5 stamens each with 3–8 anther-cells attached to the peltate connective; pistillate consisting of a single terminal ovule with several bracts at the base: seed a bony nut surrounded or almost inclosed by a fleshy cup-shaped scarlet disk; cotyledons 2.—Six species are known. They are distributed throughout the northern hemisphere and in Ame.; 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, elastic, and of reddish color. It is highly valued for cabinet-making and turning, and before the invention of gunpowder was in great request in England for the manufacture of bows. The foliage is poisonous to horses and cattle, but the berries are not.

The yews are evergreen, usually slow 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 hardy 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 harder 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., G.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 the 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. 1898:505).


3781. Spray of Taxus canadensis. (×3/4)

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. usua. falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous green or pale green beneath, 1/2-1 in. long; fr. with ovoid seed slightly 3-4-angled and 3/4 in. long. Japan. S.I.F. 1:15. Very similar to T. baccata, but branches stouter and lvs. darker green above and tinged yellowish beneath, somewhat broader, more abruptly mucronate and thicker in texture. Var. nana, Rehd. (var. brevifolia, Hort. Amer.). Var. compacta, Bean). Shrubby form with spreading branches densely clothed with short branch-
dense bush with ascending branches: lvs. like those of the preceding form. Var. chinensis, Rehd. & Wilson (T. baccata var. chinensis, Pilger). Lvs. more falcate, lighter green, 3/4-1 3/4 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. capitata does not differ from typical T. cuspidata.

TAXUS

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). Newfound-
lnd to Man., south to Va. and Iowa. B.B. (ed. 2) 1:67. V. 14:252. Gn.M. 2:22.—In cult. it be-
comes usually a more upright and less straggling shrub.

brevidolia, 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, shrewd, pyramidal head. Lvs.: lvs. distinctly 2-ranked, sharply pointed, dark yellowish green, 1/2-3/4 in. long; seeds ovoid, 2-4 angled. Brit. Col. to Calif. S.S. 10:514.—Probably as hardy as T. baccata.

T. floridana, Champ. Bushy tree, 25 ft. high or sometimes shrub: lvs. slender, 1-1 1/2 in. long, dark green. Fls. reddish purple; calyx tubes
tightly crowded, but usually with 2 petals. Calic. 1895, p. 189.-T. koraiensis, Hort.—Ceplhalotus harringtonia var. fastigiata. -T. Walllichiana, Zucc. Tree, to 100 ft.; lvs. gradually long-acumul

ALFRED REHDER.

TCHIHYATCHEWIA (named for Count Paul Tchihatchef). Crucefera. Hardy perennial herb (possibly of shorter duration), suitable for the rockery. Plant very hispid: root thick: st. stout, leafy, pilose: fls: purple; sepals erect, the lateral ones saccate at base; petals clawed, blade minute; stamens without teeth: silique pendulous, obovate, compressed, broadly membrana
ceous-marginate, 1-celled, 2-seeded.—One species, Armenia. Sometimes spelled with another c, Tchi
yatchewia.


TEAK: Tectona.

TEASEL: Species of Dipsacus.

TECOMA (abridged from the Mexican name Teo-
maxochiti). Including Stenolobium, Bignoniaceae. Or-
namental shrubs, grown for their showy flowers.

Upright plants with herbaceous shoots: lvs. opposite, odd-pinnate, rarely simple: fls. serrate, membranous: fls. in terminal panicles or racemes; calyx tubular
-campanulate; corolla funnelform or funnelform-cam-
panulate; stamens included, with diverging anter-
cells and enlarged foliacious connective; disk cupulate, 
crenate: caps. linear, with leathery valves; seeds nar-
row-elliptic, with 2 large wings.—About 3 species from Fl., and Texas to Argentina. The trumpet-vine, commonly referred to Tecoma, will now be found under Campsis.

The tecomas are upright shrubs with pinnate decidu-
ous or subpersistent foliage and large and showy usually yellow flowers in terminal clusters. They are to
due to 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, it is planted on hillsides and roadsides and is used as an ornamental shrub or small tree. It is to be well 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 and buzzing with hummingbirds and insects. Owing to its rapid growth and dense foliage from the ground, the yellow elder is highly valued as screen for
TECOMA

unsightly fences and buildings. This Tecomaria 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 Guatamala is much less hardy than the former. The foliage 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 the fungus. T. stans is said to be a hybrid between T. mollis and Tecomaria 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, funnelform-campanulate, abruptly contracted above the base.

B. Lvs. glabrous or nearly so.

stans, Juss. (Stenolobium stans, Seem.). YELLOW EBON. Upright shrub: lvs. odd-pinnate; lfts. 5-11, almost sessile, oblong-ovate to lanceolate, acuminate, serrate, glabrous, 2-5 in. long and 3½-1½ 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. Amer. B.M. 3191. -Sometimes called yellow bigonia. Fls. fragrant. Var. angustata, Rehd. (Stenolobium incium, Woot. & Standley.). Lfts. 7-11, lanceolate to linear-lanceolate, sharply or incisely serrate with flaring teeth, 1-3 in. long and ½-1½ in. broad. Texas, Ariz., and Mex. This variety is harder than the type, which is sometimes cult. as T. sambucifolia; the true T. sambucifolia, from Peru, which has glabrous anthers, is probably not in cult.

BB. Lvs. villous or tomentose beneath.

mollis, Humb. & Bonpl. (T. velutina, Lindl. T. stans var. velutina, Hort.). Similar to the preceding, but pubescent: lfts. 5-9, oblong-ovate, 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. Mex. to Chile and Peru. -It bursts in bloom much longer and the fls. keep well in water, a rare occurrence in this genus.

AA. Fls. yellow and red, tubular-funnelform, gradually narrowed toward the base.

b. Lfts. oblong or acutish.

Smithii, W. Wats. Fig. 3783 (adapted from The Garden). Upright shrub: lvs. odd-pinnate; lfts. 11-17, oblong, obtuse, acutish, serrate, 1-2 in. long: fls. in large, compound panicles, sometimes 8 in. long and as broad; corolla tubular-funnelform, 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 Tecomaria capensis. G.C. Ill. 14:641. Gt. 48:23. I.H. 43:55. 107. Gt. 44, p. 52. L.H. 46:23. 527. -Brought into the greenhouse in winter and well suited for cult. 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.

BB. Lfts. acuminated.

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:

3783. Tecomaria Smithii. (×1/2)


ALFRED REHDER.

TECOMARIA (name derived from Tecomaria, alluding to its affinity). Big flowered. Warm-country plants, grown for their showy bloom. Evergreen shrubs with slender, often sarmentose branches: lvs. opposite, odd-pinnate; lfts. serrate: fls. in terminal panicles or racemes; calyx campanulate, regularly 5-toothed; corolla funnelform, slightly curved; stamens mostly exerted, with pendulous diverging cells; disk cupulate; caps. bristly. -Cultivated. -Five species in Cent. and S. Amer., and in S. Afr.

The tecomarias are half-climbing or nearly upright
shrubs with handsome pinnate foliage and yellow, orange, or scarlet flowers in rather dense terminal clusters. They can be grown outdoors only in sub-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 on the bases, blade uriantly in Florida gardens and in those all along the Gulf. 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 unshapely. (H. Nehrling.)


ALFRED REINDER.

TECOPHILA (named for Tecophila Billotti, daughter of a botanist). Amaryllidaceae. CHILEAN CRUCUS. Bulbous plants, useful for blooming in pots indoors early in the spring. Lvs. radical, few or 1, included in a long persistent sheath at the base. Heads 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 segms.; stamens 3 perfect and 3 staminodia; ovary 3-celled: caps. conical toward the top, loculedially dehiscent. Two species. Chile. The botanical position of Tecophila 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. violacea, Bert., does not appear to be introduced.

cyanocrocus, Leyb. (sometimes written T. cyanocrocus). Scapes 1–3, erect, 3–6 in. high, 1-fl.: lvs. 2–3, linear-canaliculate and undulate: fls. azure-blue with white throat, about 1½ in. long, with a narrow tube and obovate segms. G. 37:183. R. H. 1900:70. Var. Leichtlinii, Hort., has fls. deep blue with no trace of yellow, said by some to have a white centre. Var. Bakeri, Baker (not known to be in the trade), has longer peduncles, longer and narrower scarcely undulate lvs., and narrow oblance segms. Species hardy 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.

TECTORIA (Latin for cover, the inducis having shield-shaped coverings). Polyodiaceae. A group of ferns, mostly of large and coarse habit, with superior reniform or heart-shaped inducis fixed by the sinus, as in Dryopteris, but with veins uniting freely to form areoles, with free included veins. About 2 species, are known, largely from the E. Indies, a few from Trop. Amer. By some included in Polystichum.

décurrens, Copeland. Lf-stalks narrowly winged from a creeping rootstock: lvs. 2–4 ft. long, 1 ft. or more wide, cut down to a winged raehis and with 4–8 pairs of pinna 6–12 in. long, 1–2 in. wide; sori large, in 2 regular rows between the principal veins. India to Polynesia.

cicutaria, Copeland. Fig. 3784. Caudex stout, erect, sealy above: lvs. 6–8 in. to 1½ ft. long; pinnae horizontal, subsessile from a rather broad truncated base, 2–3 in. long; sori on disk of larger pinnales in 2 rows, oblong, those on terminal narrow segms. solitary, quite marginal. Trop. Amer.

TÉCTONA (derived from Tekka, the Malabar name of T. grandis). Syn., Thêka. Verbenacées. Tall trees, stellately tomentose, including the well-known teakwood, sometimes grown in the greenhouse as a curiosity. Lvs. opposite or ternately verticillate, large and entire: cymes dichotomous, many-fl., arranged in a large terminal panicle, the whole inflorescence erect. Abcissa, calyx campanulate, shortly 5–6-cleft, inflated in fr.; corolla-tube short, limb spreading, 5–6-cleft; stamens 5–6; ovary fleshy, 4-celled, cells 1-ovuled: drupc inclosed in the calyx, 4-celled; endocarp bony. Three species, Asia, Indie, Burma, Malaya, and Philippines.

grandis, Linn. Teak. Tree, 80–150 ft. high: branches 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 pinacles 18 in. diam.; calyx stellately white-tomentose, 1 in. diam. in fr. when it is ovoid or sub-pyramidal; corolla scarcely ¾ in. long. Indie, 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.

TEÉDIA (named for J. G. Teed, German botanist). Scrophulariaceae. Glabrous or pubescent shrubs, grown in the greenhouse. Lvs. opposite, ovate, entire: peduncles in the upper axis, bearing a few-fl. cyme inflo.: fls. rose, rather small; calyx deeply 5-cleft, lobes narrow; corolla-tube cylindrical, limb spreading, 5-lobed, lobes subequal, rotundate; stamens 4; berry subglobose, indehiscent. Two species, S. Afr. The foliage of both species has an objectionable odor.

lúcida, Rud. Glabrous: st. 4-cornered: lvs. oblong-ovate, acuminate, 2 in. long, decussate; petioles winged:
panicles leafy, deccussate: fls. rosy pink; seeds many, small. S. Afr. B.R. 206.—This species was intro. into S. Calif. some years ago, but appears to have lost favor. It is said to act like an annual there, but seeds freely and prefers half shade.

_Telanthera_, Burch., grows about 2 ft. high, rusty-pubescent or villous; lvs. ovate or elliptic, often broader than those of _T. lucida_.

**TELANTHERA** (name refers to the fact that all ten parts of the staminal cup are equally developed). _Amaranthacea_. _Alternanthera_. Small much-used bedding plants, popular in design work because they are compact and stand shearing well.

Apparently all the _Alternantheras_ used by gardeners as bedding plants belong to the genus _Telanthera_, which is distinguished from the true genus _Alternanthera_ by having 5 anther-bearing stamens and 5 elongated antherless staminodia united into a cup or tube. In _Alternanthera_ the tube is short or almost none, the anther-bearing stamens sometimes less than 5, and the staminodia short or none. Of _Telantheras_ there are 40-50 species, mostly herbs, in Trop. Amer. and 1 in W. Afr. The lvs. are entire, ovate to elongated, opposite; fls. small, usually in dense heads in the axis, whitish or sometimes colored, perfect, each subtended by 2 bractlets. In Engler & Prantl, _Die Natürlichen Pflanzenfamilien_, Schinz retains _Telanthera_ under _Alternanthera_, not dividing the group.

The _Alternantheras_ of gardeners are much used in carpet bedding and for ribbon borders, because of their low compact growth, the bright colors of the foliage, which holds its character throughout the season, and the ease with which they withstand shearing. They are usually kept within 6 inches of the ground. The plants are tender to frost, and grow best in warm sunny places. The stock plants for the foundation work in carpet bedding. The flowers are inconspicuous and of no account to the gardener.

The plants are propagated by cuttings or divison. In either case, they must be carried over winter in the greenhouse or in hotbeds, preferably in the houses at the North. The plants should be kept at 60° or 65° during winter, and rather dry to hold them more or less dormant. Place them where they will receive only enough light to keep them healthy. (1) Cuttings are usually made in August from strong plants growing in the open. The cuttings may be struck in shallow flats and then transplanted into these flats without transplanting. The cuttings should be well established before winter sets in, else they will remain weak. In March or April they may be potted off, preparatory to using them in the open. (2) Division is usually preferred by gardeners who have much bedding to do. The plants are lifted after the first frost, cut back to 3 or 4 inches long, and planted in flats. In March or April, the plants are divided and the parts (with the old roots shortened in) potted or transplanted to other flats. However grown, the plants should have four to six weeks in a cool greenhouse before they are placed in the open ground. Even in the warm greenhouse they usually make slow growth in March and April.

The botanical status of the _Alternantheras_ is imperfectly understood, and the group needs careful study from living plants. Various garden names cannot be accounted for at present. The common garden _Alternantheras_ appear to have issued from the first three following Brazilian species.

**a. Lvs. essentially lanceolate or elliptic.**

_Alternanthera amznna_, Regel. Fig. 3785. Very dwarf; lvs. long-lanceolate or oblong-lanceolate, sometimes elliptic, acuminate, very short-petioled, the under color mostly green but veined and blotched with red and orange; fl.-heads sessile, single, in pairs or 3's, and terminal. I.H. 12: 447; 15: 558.—To this apparently belong the garden names _amabilis_, _spectabilis_, _sessilis_, _rosea_, _Reinhardii_.

**Betzickianna**, Regel (originally, in 1862, spelled as here, but changed by the author in 1862 to _Betzickiana_). 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-cut at apex. To this variable species appear to belong the garden names _picta_, _tricolor_, _aurea_, _aurea nana_, _compaedia_, _paronychioides_, _versicolor_, _aurica_, _magnifica_, and others. **Var. typica**, Regel (_Alternanthera paronychioides_, 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-spataculate, 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: 440.

**ficoidea**, Moq. St. herbaceous, repent at base and ascending, angled and striate, glabrous, or puberulent above and in the fl.-axes: lvs. spreading or deflexed, short-stalked, broadly lanceolate, attenuate and somewhat acute, mucronulate, the margin undulate-repand: heads ½-2 in. long, sessile, solitary or in 2's; bracts

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**Fig. 3785. Spray of Telanthera amznna; also leaf-outlines of a, T. amznna; b, T. Betzickianna; c, T. versicolor.** (X1)
acuminate-cuspidate, much longer than outer sepals.

Brasil.—The *T. ficuoides*, Hort., may be a form of one of the other species. L. H. B.

**TELANTHERA**

*TELANTHERA* (*Buphthalmum*).

**TELÈPHIUM** (an old Greek name). *Caryophyllacea*, in Engler & Prantl, Die Natürlichen Pflanzenfamilien; *Ficoides*, in Bentham & Hooker, Genera Plantarum. *Orpine*. 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 stems, with erect or ascending branches, bearing lvs. of chartaceous, linear-lanceolate, acuminate-cuspidate, 1½-2 ft. long in clusters, persistent; pedicels ascending, 2-cleft, purple; flowers, greenish, becoming pink or red; calyx inflated-bell-shaped, nearly ½ in. long; petals laciniate-pinnatifid, sessile. Calif. to Alaska. B. R. 1178. Var. rubra, Hort., grows 1 ft. high, has red foliage and yellow flowers.

**TELFAIRIA**

*TELFAIRIA* (Lvs. pedata, Hook.). *Cucurbitaceae*. Climbing shrubs, occasionally grown as greenhouse species, of economic value in the tropics. Lvs. digitately compound; lfts. 3-5, oblong, auriculate at the base on the outside; tendril lateral and 2-leafed; fls. diocious, medium or large, male pedicels bracteate, pale purple; male racemose, calyx turbinate, lobes lanceolate; corolla rotate, 5-parted, sometimes spurred; sepals long-segmented, filbricate-tendrilled; stems 3; female solitary, cylindric and corolla flat on male, stems rudimentary or none; ovary oblong, 3-celled: fr. elongate, base swollen, many-seeded; seeds edibele.—Two species, Trop. Afr.

**TELFÄRIA** (named after Charles Telfair, 1778-1833). *Cucurbitaceae*. Climbing shrubs, occasionally grown as greenhouse species, of economic value in the tropics. Lvs. digitately compound; lfts. 3-5, oblong, auriculate at the base on the outside; tendril lateral and 2-leafed; fls. diocious, medium or large, male pedicels bracteate, pale purple; male racemose, calyx turbinate, lobes lanceolate; corolla rotate, 5-parted, sometimes spurred; sepals long-segmented, filbricate-tendrilled; stems 3; female solitary, cylindric and corolla flat on male, stems rudimentary or none; ovary oblong, 3-celled: fr. elongate, base swollen, many-seeded; seeds edible.—Two species, Trop. Afr.

**TELÉFRIA**

*TELÉFRIA* (Feuillée pedata, Sims). Root stout, fleshy: st. perennial, 50-100 ft. long; lvs. long-petioled; lfts. 3-5 in. long, acuminate, repand-toothed, glabrous except nerves beneath: lfs. pale purple, fringed, male 2 in. across; petals obvolute-cylindric, female 1 ½ in. across; ovary obtusely 10-ribbed: fr. fleshy, crowned by the calyx, 3 in. across, sometimes weighs 60 lbs., 200-300-seeded; seed 1 in. broad, edibele. Zanzibar. B. M. 2681; 2751, 2752.—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 man330. 441; 442. ed. of the 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 yellow 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.

*TELÉLIMA* (Feuillée pedata, Sims). Root stout, fleshy: st. perennial, 50-100 ft. long; lvs. long-petioled; lfts. 3-5 in. long, acuminate, repand-toothed, glabrous except nerves beneath: lfs. pale purple, fringed, male 2 in. across; petals obvolute-cylindric, female 1 ½ in. across; ovary obtusely 10-ribbed: fr. fleshy, crowned by the calyx, 3 in. across, sometimes weighs 60 lbs., 200-300-seeded; seed 1 in. broad, edibele. Zanzibar. B. M. 2681; 2751, 2752.—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 man.

**TELÉMOPSIS**

*TELÉMOPSIS* (Embothrium speciosissimum, Smith). *WARATAH*. *WARRATAN*. Stout glabrous shrub 6-8 ft. high: lvs. cuneate-oblong, 5-10 in. long, mostly toothed in the upper part, coriaceous: fls. greenish, 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 shrubs of New 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 the involucral bracts. This plant is known as 3 in. in. *Adenomyrmecia*, 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.

**TELÉOPEA** (Greek, seen at a distance, of fanciful application). *Proteaceae*. 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. 3-4 in. long, hermaphrodite, some species are male; flowers, greenish; racemes terminal, subglobose or ovoid; bracts exterior, membraneous, colored; perianth-tube elongated, segms. at length more or less separated; disk fleshy, strongly oblique but almost perfectly annulate; ovary long-stipitate, many-ovuled; follicle stipitate, oblique, leathery, recurved.—Three species, 2 Australian, 1 Tasmanian. An earlier name of the genus is Hylogene, but Telopea is included in the list of "nomina conservanda" by the Vienna Congress.

**SPECOSSISSIMA**, R. Br. (*Embôthrium speciosissimum*, Smith). *WARATAH*. *WARRATAN*. Stout glabrous shrub 6-8 ft. high: lvs. cuneate-oblong, 5-10 in. long, mostly toothed in the upper part, coriaceous: fls. greenish, 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 shrubs of New 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 the involucral bracts. This plant is known as 3 in. in. *Adenomyrmecia*, 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. Shrubs or rarely subshrubs, cult. 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 orbicular or obovate, usually reflexed; wings narrow; keel as long as the standard or shorter; stamens all united in a sheath open on the upper side; ovary sessile or stipitate: pod sessile or stipitate, much flattened, obovate-oblong or linear, completely dehiscent.—About 8 species, Austral. Said to do best in a mixture of sandy loam and peat. Prop. by cuttings.

retusa, R. Br. (T. glauca, Sims). CORAL BUSH. Tall glabrous or glaucous shrub: lvs. broadly obovate to narrow-cuneate-oblong, sometimes all under ⅓ in., sometimes all over 1 in. long, emarginate or mucronate, coriaceous: fls. red (or rarely white); calyx with 4 very short, broad teeth, the lowest longest; pod ⅓–2 in. long. B.M. 2088; 2334. B.R. 383; 859. L.B.C. 6:526; 7:644.—Cult. in S. Calif. where it blooms in the winter.

F. TRACY HUBBARD.†

TEOSINTE: Euchlanda.

TEPHROSIÁ (Greek, tephros, ash-colored, hoary; referring to the foliage). Leguminosae. Hardy or half-hardy perennial herbs, subshrubs, or rarely shrubs, of little 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 axis: fls. in fascicles of 2–6, red, purple, or white; calyx-lobes subequal or the 2 upper longer; petals clawed, standard suborbicular, outside more or less silky-villous; wings oblquely 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.


macrántha, Rob. & Greenm. Fig. 3786. Shrub, 6–10 ft. tall: lvs. odd-pinnate; lfts. about 10–12 pairs, oblong-linear, entire, short-acute or cuspitate: fls. in loose terminal panicles 1 ft. long, shaded purple and white, nearly as large as sweet peas; standard very large, erect, oblong-orbicular. Mex. G.F. 7:175 (reduced from Fig. 3786).—A very showy kind, 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.†

TERMINÁLIA (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 calyx-teeth, the 5 superior longer, alternating with the teeth: filaments exserted, subulate or filiform; anthers oblong, the lobes scarcely connected; ovary unicocular, style subulate, often villous at base, stigma simple; ovules 2, rarely 3: fr. a drupe, ovoid, angular, compressed or 2–5-winged, 1-seeded, the cotyledons convolute.—A genus of about 100 species distributed throughout the tropics, principally in S. Asia, with only a few in Amer.

Catáppa, Linn. TROPICAL ALMOND. INDIAN ALMOND. MYROBALAN. ALMENDRO. AMENDOREIRA. Fig. 3787. A tall, stately tree, up to 80 ft. high, with horizontal branchings 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, obovate, obtuse to subacuminate at the apex, attenuate to the slightly auricled 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: petals subulate, under 1 in. long, flattened oblong, rusty-pubescent: fls. whitish, upper ones stamine 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 cordate: fr. broadly oval in outline, elliptical and 2-valved or pointed at the apex; seed 2, oblong, smooth, brownish, very hard; fr. lasts through winter.—Tropical American. Fig. 3787.
winged in transverse section, 11½-2 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 whitish, infolded spirally. B.M. 3004,—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 birds or bats, the 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 leaves in March, according to M. Watt). The husk is thick, but the rich reddish hues assumed by the foliage before falling make it very attractive. There are many fine avenues planted to it throughout the tropics. The tree seems to be much less esteemed in Amer. than in the Orient. Firminger describes it as “of a fine filbert-like flavor, with a crispness like that of a fresh walnut; leaves of the most delicious of any kind of nut the country (India) affords.” He also states that the kernels, when removed from the husk, are generally served on the table in a plate of water. They yield a valuable oil, resembling almond oil, which is used in India. The tasar silkworm is fed on the lvs., according to M. Watt. It is said that the tree is the most popular ornamental trees for street and avenue planting. It is not grown in Calif., and 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 cult. in other 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 dyeing and tanning, according to Watt, and also in native medicine.——T. indicum, T. Caesalpinia, T. amatoca, hypatia, the anglo-habana, T. Roylei, Hass., and T. Caesalpinia, Hass., from S. Calif.: described as a medium-sized and very rapid-growing tree of symmetrical shape, suitable for street planting; lvs. small for the size of the tree. The shining orange-yellow fls. have roundish congested long-peduncled heads; drupe glabrous, ovate-lanceolate, beaked, with pilate margin.—T. Béletrica, Roxbg., the belerico myrobolan, a large tree found throughout the forests of India, Burma, and other parts of S. Asia, yields a fr. which is exported from India for use in tanning. The kernels are eaten in India, but are said by Watt to cause intoxication if taken in excess.

—T. Bénetro, Pers., properly T. angustifolia, Jacq., has recently been intro. to S. Fro., and promises well. It is similar to the tree with narrow lvs., indigenous to Malaya.—Under the name of T. canacra, Blanco, a plant has been recently intro. to the U. S. from the Philippines, and is probably T. Bélerrhiza. It is doing well in S. Fla. and promises to be a unusually handsome ornamental. Ind. says of it, “It so resembles T. indicum that it may be intro. to the U. S. The tree is small and not very common, in the provinces of Bataan and Cavite (Philippines). In the rainy season abundant crops of cherry-like lvs. and flowers are produced. Each fr. consists of 2-3-celled, report, having been surrounded by sweet pulp somewhat resembling that of the duhat (Euca jambolana) in flavor. The pulp with the addition of lemon or some other acid juice makes a beautifully colored jelly.” The tree is known as “alompit” in the Philippines.

F. W. POPE.

TERNSTRÖMIA (named for Christopher Ternström, Swedish naturalist; died 1745). Ternströmi-deae. Evergreen trees or shrubs, adapted to the warmest climates. Lvs. leathery, entire, ovate, oblanceolate, or oblong, glabrous, feather-veined: lvs. clustered; berries about the size of peas. Japan. S.Z. 1:81.

TESTUDINARIA (from testudo a tortoise, alluding to the supposed resemblance to a test of the oblong-ovate groundsels). Diastax. The name of a Genus of shrubs, the 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.

Stems twining, slender, herbaceous; lvs. alternate, caudate or somewhat deltoid; lvs. dioecious, small, racemose at the axils; perianth of male fls. broad-campanulate, 5-6-celled, greenish, or的朋友, perianth-segments of female fls. small, staminodia small; ovary ovoid or oblong, 3-celled: caps. 3-angled, angles prominent, cuneate-winged.—Three species from S. Afr.; a fourth has been described from Mex.

elephantipes, Salisb. Rootstock studded with angular woody protuberances, sometimes 1-3 ft. diam.: sts. slender, glabrous, much branched, twining, 8-10 ft. high. The inner part of this “bulb” has been compared to a turf for texture and color. The root of this plant is a good source of starch; the stalks, leaves and eat it. Old and grotesque bulbs have been brought from time to time from the Cape as curiosities. The plant is of easy cult. in a cool greenhouse. No method of prop. by the bulb is known.

paniculata, Deuem. Rootstock above ground about 3 in. high, irregularly oblong, woody, flattened above, tesselated lobed, fuscous, wrinkled, and wrinkled above: fr. glabrous, greenish, ovate, serrate, rounded, or reniform or shortly deltoid-subcordate, obsoletely 3-lobed, mucronate, petiolate; panicles axillary, many-fl., sparsely or much branched: lvs. pedicelled, odorous, rather greenish or pale yellowish. S. Afr.

F. TRACY HUBBARD.

TETRACÉTRON (Greek, four and spur, referring to the 4 spur-like appendages of the fr.). Magnoliódeae. A deciduous tree from China and Japan, petiolate, ovate lvs. palmately 5-7-veined, serrate, exstipulate: lvs. sessile, small, perfect, in slender pendulous racemes, apetalous; sepals 4, ovate, imbricate; stamens 4, inserted before the sepals, exserted; carpels 4, connate along the ventral suture; styles 4, recurved; ovules pendulous, several in each cell: fr. a 4-celled deeply lobed caps., 1½-2½ in. long: seeds 4, in 4 pieces, hard, dark, the pupils, more or less, with a hooked keel; the fruit is the Ceridiphylum this is the tallest deciduous tree of China, attaining occasionally to 100 ft., and 20 ft. in girth. In its foliage it bears a strong resemblance to Ceridiphylum, though not closely related, but it is easily distinguished by the alternate lvs., solitary, not in 2s. on the spurs. It has proved hardy at the Arnold Arboretum, at least in sheltered positions, but does not seem to grow so well as Ceridiphylum, with which it probably partly shares the same exigencies as to cult. and prop.

T. sinense, Oliver. Tall tree with smooth pale or rufous gray bark: lvs. slender-petiolate, ovate or elliptic-ovate, acuminate, cordate at the base, bluntly serrate, 3-5 in. long: racemes 2½-3½ ft. long, short-stalked, slender; lvs. yellowish, minute; the exserted stamens about 1 line long: caps. brown, ½ in. long. June, July. Cent. and W. China. H. I. 19:1892.—The tree needs to be further tested in this country.

ALFRED REHDER.

TETRADYMY (four together, from Greek words, referring to the 4-fl. heads of one species). Compositae. A genus of low plants, cut in pieces, native to the arid regions of W. N. Amer. Herbage covered with dense matted wool; lvs. alternate, often modified into spines. The original species, T. canescens, is the best known. Its heads have only 4 fls. They are yellow and about ½-⅓ in. long. This plant was observed in the early 1881 by western collectors but has not been widely cultivated in Amer. There are about a half-dozen species, but not known horticulturally.
TETRAPANAX

TETRAPANAX (four and panax, referring to the four-merous flower structure). By Dr. A. C. Gunther & Hooker (Genera Plantarum) 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 papyrifera 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;

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 reduce their extent 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 inches 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 grapey 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.

H. C. IRISH.

TETRAGONÓLOBUS: Lotus. The following species now in cult. was not treated in Vol. IV, p. 1917. Lotus silíquósus, Linn. (Tetragonólobus sílíquósus, Roth). Perennial, trailing, hirsute: rhizome slender, branched: sts. ascending: lvs. oblong or obovate; petals white; stipules shortly adnate: peduncles 1-fid, much longer than the fl.: fls. pale yellow; calyx-segms. lanceolate; pod with straight wings much narrower than the body. Mediterr. region.

TETRAMÍCRA: Lepíotes.

TETRÁNÉMA (Greek, four and filamen; the genus is characterized by having 4 stamens). Scrophulariáceae. Perennial herbs, grown in the greenhouse. St. very short or in cult. slightly elongated, ascending: lvs. nearly radical, opposite, obvate or oblone, 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 5-parted; corolla declinate, posterior lip shortly 2-lobed, anterior larger, 3-cleft; stamens 4: caps. rather compressed, loculicidally dehiscent.—Two species, Mex. and Guatamala. T. mexicanum, Benth., is the only species cult., known as the “Mexican foxglove” and formerly as Pentstemon mexicanus. The pretty fls. are borne in profusion on the summits of slender purple scapes 6-8 in. high. Although essential to summer blooming, if given good care it may be made to flower most of the year. It is usually regarded as a warmhouse subject, but it makes a good window-plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds.


F. TRACY HUBBARD.
the preference probably lies with placing it in Tetrapanax. This genus, if accepted, differs from Fatsia in its four-merous rather than mostly five-merous flowers, with two-merous ovary, the tomentose-lanate character, and other features. *T. papryiferum* is an excellent subtropical subject.

*Fatsia japonica*, Decne. & Planch., remains in that genus, as treated on page 1204.

**TETRAPANAX** (Greek, four and stigma, in reference to the 4-lobed or 4-parted stigma. *Vitaceae*. About 40 species in Trop. and Subtrop. Asia of shrubs climbing by tendrils: lvs. alternate, digitate or pedate; lfts. 3-5, sometimes reduced to 1; tendrils with adhesive disks or twining: fls. polygamio-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 2-4-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. obectum* 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. Harmandii* is a climbing shrub with larger lvs. and edible berries, suited only for tropical or subtropical countries. For cult. and prop., see *Cissus* and *Parthenocissus*. *T. obtectum*, Planch. (*Cissus obtecta*, Wall.). Climbing with disciferous tendrils: branchlets hirsute: lvs. long-stalked, persistent or persistent; petioles pubescent; lfts. 4-parted, sessile, cuneate-ovate to elliptic, acute, remotely crenate-serrate with mucronate teeth, glabrous, or in var. *pilosum*, Gagnep., pubescent beneath, 3½-1½ in. long: fls. greenish, in slender-stalked umbels; pedicels slender: berries ovoid, ½ in. long. Himalayas, Cent. and W. China. *T. serrulatum*, Planch. (*Cissus serrulatif*, Roxbg. *Vitis capreolata*, Don). Climbing with twining tendrils: glabrous: lfts. 5, pedate, sometimes 3, short-stalked, ovate or elliptic to elliptic-lanceolate, acute or acuminate, serrate, ½-2½ in. long: fls. in compound cymes: fr. globose, black, ½ in. thick or slightly larger. Himalayas, W. China. *T. Harmandii*, Planch. High climbing with twining tendrils: lfts. 3-5, short-stalked, narrowly lanceolate, serrate, glabrous, about 2-3 in. long: fls. in axillary short-stalked cymes; fr. globose, 2-3-seeded. Philippine Isls. Recently intro. by the Dept. of Agric.; said to have edible berries similar to those of the Scuppernong grape.

**TETRAETHCA** (Greek, four and cell; the anthers are sometimes four-celled). *Tremandraceae*. Slender glabrous or stellate-pubescent, heath-like little shrubs, grown in the greenhouse and out-of-doors in the far South.

Leaves alternate, verticillate or scattered, heath-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.—About 20 species, all from Australia. In European greenhouses all the plants of this family are considered difficult of cult. They are treated like many other Australian heath-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.

**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 reduced; ovary glabrous or more frequently pubescent, with 2 or more superposed ovules. B.M. 8028.

**TEUCRIUM** (Teucer was the first king of Troy). *Labiate*. *Germander*. Herbs, subshrubs, or shrubs, some of which are greenhouse plants or outdoors in the extreme South, others of them hardy in the North and suitable for the wild-garden or rockwork.

Leaves entire, dentate or incised, sometimes many-cleft; floral lvs. similar or reduced to bracts: floral heads 2-fld., rarely many-fld., arranged in racemose spikes or terminal heads, rarely with the fls. in a terminal spike or irregularly whorled; calyx tubular or campanulate, rarely campanulate, 10-nerved, 5-toothed; corolla-tube included or rarely exserted, limb as if 1-lipped, lower lip larger, upper very small or split or as to appear to be wanting; stamens 4, in 2 pairs, exserted through the split notch in the short upper lip: nutlets obovoid, reticulate, rugose.—About 160 species, widely distributed through the warmer and temperate regions of the world. Monographed by Bentham in De Candolle’s *Prodrumus Systematis Naturalis*, Vol. 12 (1848). The specific descriptions in the present article are largely based on this work but the sequence of sections and species is according to Briquet in *Engler* and Prantl, *Pflanzenfamilien* VI. 5a.

The teuciuriums are little known in cultivation. They probably present no special difficulties to the gardener.

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**KEY TO THE SPECIES.**

**A.** Floral whorls condensed into a terminal subglobose head.

**b.** Lvs. entire

**c.** Blades oblong or oblong-linear

**2.** Polium

**cc.** Blades rotundate

**3.** pyrenaeicum

**AA.** Floral whorls not condensed into a terminal head.

**b.** Calyx erect.

**c.** Lvs. entire or the lower somewhat dentate

**11.** fruticans

**cc.** Lvs. incise-dentate or dissected.

**d.** Pedicels shorter than the floral lvs.

**9.** bicolor

**db.** Pedicels much longer than the floral lvs.

**10.** orientale

**bb.** Calyx dentate.
CXI. Syringa (lilac), Madame Lemoine.
Section I. Polium.

1. montanum, Linn. Low subshrub, prostrate, hoary or pubescent: sta. much branched at base, summit shortly ascending or rarely suberect and 2-4 in. long; white or yellow, or rarely purplish; corolla 1-2-fld. (T. aureum, Schreb.), has broader lvs., very hairy heads and yellow tips to the branches.

3. pyrenacium, Linn. Perennial, repent or diffusely much branched, villous, sterile branches whip-like, fertile short-ascending, Lvs. ovate, obtuse, base truncate, ovate-lanceolate, teeth incised, both surfaces green and hisurate, especially near the margins and nerves; floral lvs. petioled, oblong-linear, entire, acute: floral whorls few, condensed in a small terminal head: fls. yellow (or white); calyx campanulate, teeth acuminate-acute; corolla-lobes often purplish at base. Mountains of S. W. Eu.

Section II. Chamædris.

4. Chamædris, Linn. Perennial or shrubby, 1-2 ft. high, base decumbent, branching, pubescent or villous: lvs. short-petioled, ovate or oblong, incised-crenate, base cuneate, both surfaces green or crenate beneath; floral lvs. short-petioled, entire, ovate, base truncate, ovate or oblong-linear, crenate, base truncate, round or cuneate, both surfaces green and hisurate, especially near the margins and nerves; floral lvs. petioled, obtuse, base truncate, ovate-lanceolate, teeth incised, both surfaces green and hisurate, especially near the margins and nerves; floral lvs. petioled, ovate, base truncate, ovate or oblong-linear, entire, acute: floral whorls few, condensed in a small terminal head: fls. yellow (or white); calyx campanulate, teeth acuminate-acute; corolla-lobes often purplish at base. Mountains of S. W. 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, broadly campanulate; corolla-tube exserted, pubescent outside, the tube twice as long as the calyx. Eu. and adventitious in E. N. Amer.

Section IV. Stachybotrys.

7. canadensæ, Linn. Erect, perennial herb, 1-3 ft. high, soft-pubescent or crenate; lvs. ovate-lanceolate to oblong-ovate, 2-3 in. long, serratate, base rounded, somewhat crenate beneath, whitish; floral lvs. bract-like, sessile, lanceolate: spikes 2-6 in. long, rather lax, simple: fls. purple to cream-color; calyx short-peduncled, campanulate, hoary and somewhat villous; corolla-lip elongated. Low ground, Maine to Brit. Col., southward to Pa., Ohio, Mo., New Mex., and Calif.—Useful for low grounds and moist borders.

8. hiraciniæ, Linn., etc. Spelled hircanicum. 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 crenate beneath; fls. as subulate bracts: spike simple, 3-5 in. long, dense: fls. purple or red; calyx 2-lipped; corolla villous outside. Caucasus and Persia.

Section V. Teucrius.

9. bicolor, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, oblong or lanceolate, about 1 in. long, obtuse, entire or incised, both surfaces green; floral lvs. usually exceeding the fls.: peduncles axillary, 1-flld., short, underbracteate: lvs. blue; calyx narrowly campanulate, 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, crenate; lvs. 1-2-pinnatisect, lower 1½-2 in. long, segments, linear or incised, both surfaces pale or green; upper lvs. smaller; floral lvs. minute: peduncles laxy racemose, irregularly 1-3-flld.; pedicels 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, petiolate; fls. asovate, irregularly 1-3-flld.; pedicels much longer 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. Teucrropis.

12. betonicum, L'Hér. Shrub 2-3 ft. high: branches hoary-tomentose: lvs. ovate-oblong, 1-1½ in. long, rather long-petioled, hoary beneath or on both sides; floral lvs. usually lanceolate; floral whorls 2-4-flld., second, laxy racemose, raceme 3-6 in. long: fls. purple; calyx campanulate; corolla-tube somewhat exserted, pubescent outside, upper lobes of limb forming an obsolete upper lip, lateral lobes small, oblong, lowest oblong, concave. Madeira. R.H. 1912, p. 465.

T. fruiticosa, Hort., is offered in the trade as a shrub for the rocks, with downy foliage and bentana blue fls.; not known botanically; possibly it is an error for T. fruiticosa.

F. TRACY HUBBARD.

TEYSMANNIA (named for J. E. Teysmann). Polypecæ. Low unarmed palm, grown in the greenhouse: caudex underground: lvs. erect, elongate-rhomboid oblong, base acute, margin incised, divisions 2-cell, or spadix rather short, branches divided at base, reflexed above; spathes papery-leathery: fls. hermaphrodite,
THALIA (named after Johann Thalius, a German naturalist; died 1588). *Marantaceae*. Perennial marsh or aquatic herbs, some of them hardy, suitable for the warm- or greenhouse.

Leaves few, large, long-petioled, often canna-like: panicles terminal; in 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, crest within; anthers 1-celled; ovary 1-celled, 1-ovuled, stigma 2-lobed: caps. oblong-ovoid or globose.—Schumanni (Das Pflanzenreich, hft. 11) accepts 7 species, in Trop. and warm Temp. America.

### A. Plant covered with a white powder.


#### AA. Plant not powdery.


*T. sanguinea*, Lem.=Stromanthe sanguinea.

F. Tracy Hubbard.

### THALICTRUM (ancient name of doubtful origin; perhaps ultimately from Greek thallo, to grow green). *Ranunculaceae*. MUGH RUE. Interesting plants for the herbaceous border and wild-garden, with fern-like foliage and small flowers in panicles or terminal clusters.

Erect perennial herbs: lvs. ternately compound and decompound; st.-lvs. alternate: fls. diosaceous, polygamous, or perfect in some species, rather small, generally greenish white or sometimes purple or yellow, borne in a panicle or loose raceme; sepals 4 or 5, deciduous; petals wanting; stamens many, showy: carpels usually few, 1-seeded. A monograph of the entire genus was published in 1885, by Lecoyer, in Bull. Soc. Roy. de Bot. de Belgé, where he describes 60 species. In 1886 Trelease published a treatment of "North American Species of Thalictrum" in Proc. Soc. Bost. Nat. Hist. 25:293–304, in which he recognized 11 species and 4 varieties north of Mex. His treatment is rather closely followed by Robinson in Gray's Syn. Flora, 1895. All N. American forms were illustrated by K. Schum. in Stud., Aug., 1900. See also recent studies by E. L. Greene. About 80–90 species are now known, widely distributed in temperate regions, a few in the tropics.

Many thalictrums are very hardy, and only the more southern forms of those given below are at all tender. These plants are very attractive for the flower gardens, contrasting with their handsome stems and leaves, which are often of a purple cast. They are neat and attractive subjects, often conspicuous in the wild but not so much planted as they deserve. The spring-flowering species are mostly inhabitants of woods and groves, and the summer-flowering of low open grounds and swales, but they do well under garden conditions. The early ones are small and delicate plants, and the late ones are tall and often commanding. The tassel-like staminate inflorescence of some species is very attractive. Thalictrums may be propagated by seed, or by division of roots in early spring just as growth begins. The division of the roots is more popular than the seed method, as it produces strong plants much earlier. Seed is scarce in some species. Any good loamy soil will suit them, if well drained.

#### AA. Fr. strongly angled and 2-3-winged, usually stiptate.

*1. aquilegifolium*, Linn. FEATHERED COLUMBINE. Fig. 3789. Sts. large, hollow, 1-3 ft. high, glaucous: lvs. once or twice 5-parted; lfts. stalked or the lateral ones nearly sessile, slightly lobed or obtusely toothed, smooth, suborbicular: fls. in a corymbose panicle, diosaceous; sepals white; stamens purple or white: fr. 3-angled, winged at the angles. May–July. Eu. N. Asia. B.M. 1818; 2025 (as var. formosum). Gn. 47, p. 357; 50, p. 117. A.F. 16:1234. J.H. III. 50:203. G.n. 34:276 (var. atropurpureum). G.L. 23:249 (var. atropurpureum). G. 32:632 (var. album). G.C. 3:47121 (var. albiflorum). A.G. 21:12 (var. album).—Also planted and frequently planted; fls. in early summer. The old name *T. Cornu*, Linn., may be a synonym of this, and if so it is the older name, being published on a preceding page, but *T. Cornuti* was described as an American plant, while *T. aquilegifolium* is not. As the description and old figure of *T. Cornuti* do not agree with any American plant, the name may well be dropped. Plants advertised as *T. Cornut* are probably *T. aquilegifolium* or *T. polygonum*.

#### 2. dipetrocarpum, Franch. Very smooth, rhizome short: st. simple, 2 ft. or more high, angled above: lower and middle lvs. broadly triangular, 4-6 in. broad, three-tornately cut; lfts. subrotund, base slightly cordate, pale greenish; fls. in a corymbose panicle or raceme, with 3-4 lfts.; lvs. much smaller: panicle narrowly pyramidal: fls. rose, rather large; sepals ovate-lanceolate, long-acuminata: achenes subsebessile, compressed, obovate, perceptibly inequilateral, marked on the faces with 3 fuscous nerves, each side rather broadly winged; wings membranaceous, white. Yunn. 4:24; 4:26; 44:2; 45:2; 53:111; 36:277. G.M. 51:661. Gn. 72, p. 435. J.H. III. 64:95.—An excellent plant, much noticed abroad.

*3. Chelidoni, DC. Dwarf and much branched: lvs. binate, glaucous beneath and pale green above; lfts. about 1 in. across, orbicular-cordate, crenate or lobed; fls. 1 in. across, lilac or purple, in a rigid-branched panicle, the pedicels deflecting in fr.; sepals elliptico
THALICTRUM

obtuse: achenes many, long-stalked, reticulate, with an incurred style. Himalayas, 8,000-12,000 ft. G.C. III. 28:167.—A handsome plant.

4. Delaváyi, 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. pendant, dioecious; filaments purple or lilac, ½ in. 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; 38:450. 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.


DD. Achenes somewhat stalked, widely spreading, straight on the dorsal margin.

6. sparsífoërum, Turez. 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 pedicels, perfect; sepals obovate, whitish, 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.

cc. Filaments filiform or at least very slender; anthers linear, acute or mucronate.

d. Stigma not hasteate or spurred.

7. alpinum, Linn. Sts. smooth, naked or 1-lvd., only 4-8 in. high, from a scaly 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 obovate, Northern and Arctic, and alpine regions of both Old and New Worlds. B.M. 2237.

dd. Stigma not hasteate or spurred.

8. minus, Linn. (T. purpurascens, Schang. T. azedite, Vill.). Sts. round, sulcate, 1-2 ft. high; lfts. 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 polymorphous species in the variation of the lfts.


9. Pérdomi, J. J. Clark. Much like T. minus, but fls. larger, sepals acute or acuminated; the pedicels longer and somewhat capillary: glabrous, the branches redish green: lvs. 2- or 3-pinnate, about 8 in. long, the pinnae 3-5 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. flárum, Linn. Stout, 2-4 ft., with furrowed st. and creeping stoloniferous rootstock: lvs. large, 2-3-compound; lfts. to 1½ in. long, 3-lobed, obovate or obuncinate: infl. compound and compact, the fls. erect and pale yellow (the anthers bright yellow); sepals small: achene 6-10, small, 8-ribbed. Eu.

11. glauçum, Desf. (T. speciósum, Hort.). Sts. erect, round, glaucous, 2-5 ft. high; lfts. ovate-oblanceolate, 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.

bb. Fls. diascic or polygamo-diausic.

c. Achenes somewhat inflated, obovate, and short-stalked.

12. polycárpmum, Wals. 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 16-25, with yellowish anthers: achenes larger, in a dense globose head, short-stalked, obovate, turgid, tapering into reflexed styles. Sandy streams, coast ranges of Calif. to Columbia River.

c. Achenes flattened and 2-edged, nearly or quite sessile.

13. occidentál, Gray. St. to 3½ ft. high, bearing 2 or 3 lvs. which are 2-4-ternate and glandulopubescent: lfts. thin and glaucous, with rounded lobes: achenes long, slender, thin-walled, 2-edged, not furrowed. Colo., northward and westward.

14. Fédénderi, Engelm. Fig. 3790. Plant 1-3½ ft. high, rather stout and leafy: lvs. 4-5 times pinnate or palmate, 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 1 edge gibbous, 3-4 ribs on each face. July, Aug. S. Colo., westward and southward.

3790. Thalictrum Fédénderi. (X½)

ccc. Achene obovate, sessile or nearly so, striate or ribbed.

d. Filaments club-shaped or dilated to nearly or quite the width of the anthers.

15. polygánum, Muhl. (T. Cornútt, Auth., not Linn.). TALL MEADOW RUE. Erect, 3-8 ft. (or more) high, branching and leafy, smooth or puberulous, 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-diausic; sepals white; filaments broadened when young; anthers short: achenes obovate, stipitate, 6-8-winged or ribbed, 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. dasycármum, Fisch. & Lall. (T. purpuráscens, Auth., not Linn.). Stout and erect with purplish st., 3-7 ft. tall, leafy and branching: lvs. 3-4-ternate; lfts. short-oblong and mostly 3-toothed, pubescent beneath but not waxy or glandular: fls. mostly dioecious but perhaps in some cases polygamous, with purplish
sepal and filament: achene ovoid, with 6–8 prominent ribs. N. J. to N. D. and Sask. and far southward.—An attractive plant.

17. *Thalictrum*, Trel. (*T. confine*, Fern.). St. simple, erect, 10–20 in. high, glabrous, glaucous, bearing 2–3 long-petaled lvs. above the base: lvs. 3–4 times 3-parted; fls. and fr. short-stalked, erect, round and lobed at the apex, veiny beneath: fls. in a simple panicle, diosceous, small; sepals ovate; stamens 10–20, on slender filaments; anthers oblong, slender-pointed: achenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. D. westward and southward in the mountains.

For *Thalictrum* Linn. Rather slender, 1–2 ft. high, glabrous: lvs. 3–4 times 3-parted; fls. thin, orbicular, several-lobed or revolute, bases variable: fls. in a loose, leafy panicle with slender pedicels, diosceous; stamens much longer than the greenish sepals; anthers linear, obtuse, exceeding their filaments in length; achenes ovoid, nearly or quite sessile, longer than their style, with about 10 longitudinal grooves. Early spring. Woods. Lab. to Ala., west to Mo.

For *T. anemonoides*, see Syneonemon.—*T. orientale*, Boiss. Low perennial, st. 1½ ft. high, flexuose, plant surculose (emitting runners), lvs. trinate, segments round, very obtuse, somewhat 3-lobed: panicle few-fl.; sepals petal-like and persistent, obovate, white, surpassing the stamens; filaments linear: carpels 3–9, linear-oblong, deeply strigate, ½ in. long. A. Minor. Fls. like those of *Syneonemon*. The plant listed under this name is said to grow to 3 ft. high and to have much more slender fern-like glaucous-green lvs. with slender ovate white fls.—*T. paniculatum*, Hert., is described as a dwarf (1 ft.) with yellow fls. It probably is not *T. paniculatum*. Bees.—*T. patens*, Hert., differs from *T. minus* in having the fls. being trifid from the ovate base, in the very open panicle and the reddish fl.-segments: habitat doubtful.—*T. præstanum*, Hert., listed, does not seem to be a graceful plant 4–5 ft. high, with yellow and mauve fls.—*T. sulfureum*, Hert., is a hybrid.

K. C. Davis.
L. H. B.†

**THAMNOPTERIS** (Greek, *busky fern*). *Polyphyllaceæ*. 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 in common cultivation, viz., *A. Nidus*, the bird's-nest fern. Some authors name it under Neopteris (which see).


**Thèa** (the latinized Chinese name of the tea plant). *Ternatramiœdaæ*. Tea. Woody plants; one species grown for its leaves which yield the tea, for their handsome flowers and foliage. Theophrastus speaks of small trees: lvs. alternate, short-petioled, serrate: fls. axillary, sometimes terminal, usually solitary, stalked, nodding; sepals 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: fr. a dehiscent cap with 1 large globose or ovoid seed in each cell.—About 14 species in Tripodiaceæ. Camellia, the attractive evergreen foliage. *T. x forestii*, Ram. & B. A. is planted in some of our gardens and is a handsome ornamental shrub. It is sometimes grown for its handsome white or pink flowers and the attractive evergreen foliage. It is but little

known in this country and require about the same treatment as camellia, which see for culture and propagation.

sinensis, Linn. (Camellia Thèa. Link. Camellia theæâgra, Griff.). Tea. Fig. 3791. Shrub, sometimes tree, to 30 ft.: lvs. elliptic-lanceolate or obovate-lanceolate, acuminate; serrate, glabrous, sometimes pubescent beneath, 2–5 in. long; fl. white, fragrant, 1½ in. broad; petals usually 5. China, India.—Several varie-

ties have been distinguished, of which the following are the most important: Var. *Böheâ*, Pierre (T. Böheâ, Linn.). Lvs. elliptic-oblong, obtuse, flat, dark green, to 3 in. long; fls. usually solitary; sepals pubescent inside or glabrous, ciliate; petals 5–6; styles connate below: branches erect. B. M. 998. L.B.C. 3:226; 19:1828. Var. *viridis*, Pierre (T. viridis, Linn.). Lvs. obovate-lanceolate, acutish, often concave, light green, to 5 in. long: fls. 1–4; sepals pubescent, ciliate; petals 5–9; styles free: branches spreading. B. M. 3145. L.B.C. 3:227; 19:1828. Var. *cantonensis*, Pierre (T. cantonensis, Lour.). Lvs. oblong-lanceolate; fls. usually terminal, solitary; sepals pubescent inside; petals 7–9; styles free only near the apex. Var. *assâmica*, Pierre (T. assâmica, Mast.). Lvs. oblong-lanceolate, acuminate: fls. 1–4; sepals 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.

THEOBROMA

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 nerved entire lvs., 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 a
THEOBROMA

very different plant: see Erythroxylon.) The beans are washed or fermented, or both, to remove the mucilaginous substance with which they are surrounded or coated with clay to make them moisture-proof, to prevent decay, and preserve the aroma.

The common cacao is T. 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-oval 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 fascicles directly on the bark of the trunk and main branches, about 3/4 in. across when expanded, on slender pedicels ½ in. or more long; calyx rose-colored, with acuminate segms.; 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 called "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 Tribroma 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 "Aliagtero," or 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 grown 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, warted, 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 Hart's "Cacao," 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 Arragonez Capuchin Fathers about 1757. (De Verteuil, "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 intercrossing of cross-fertilized "Aliagtero" cacao, as the hybridization 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, no strain being produced by any process of propagation which is similar to that in which they are grown. A fine set of illustrations of varieties common to different countries has been published in a work by Paul Preuss, who traveled in cacao-producing countries on behalf of the German government.

These different strains are bought by manufacturers and blended in the 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 choice 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 a recent account of budding, 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 and hardened preparations of the roasted and ground cacao bean, with the larger proportion of the original fat retained, while in the so-called "cocoa" preparations the same material in fine powder, sweetened or unsweetened, but with the greater proportion of the cacao fat extracted. The fat, Beeswax, 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. pentagena, and differ only in the method of preparation.

The word "cocoa" is a market corruption of the Spanish "Cacao," which was adopted by Tournefort as a generic name but has since been displaced by the Linnean Theobroma. The plant known as Theobroma bicolor has recently been made the type of a new genus (Tribrum bicolor, Cook) on account of distinctly different habits of fruiting and flowering and structural differences from the flowered (O. F. Cook, Journ. Woman. 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's growth. The pods are oval, ribbed and netted, hard and woody, with an outer shell 3/8 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 some what 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. bicolor is known in some parts of Central America by the names of "Wariba," "Tiger," and "Pastashe" cacao. See also Cont. Nat. Herb., vol. 17, pt. 8, for branching and flowering habits of cacao and pastashe.

THEODÓREA (probably a personal name). Orbíoid. One Brazilian orchid, T. gomezoides, Rodri., of botanical interest but very little known in cult. By some it is referred to Gomeza. 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 subconvenient, lanceolate, acute, 4-5 lines long, and light green in color, with a broad dark brown line towards the base. The lip is oblong-ovate, acute, somewhat reflexed at the base, and with a small buff blotch in the center. It appears to be a free-growing little plant, and its appearance in cult. is interesting."


Stem stout, erect, rather simple: lvs. somewhat terminally clustered, spreading, very short-petioled, linear-oblong, spinose-dentate, netted-veined: fls. hermaphroditic, rather large, in short many-fl. racemes, white; calyx 5-parted, sagitt. ovate; corolla cylindric-campanulate, 5-lobed at the top, lobes rotundate; stamens 5, staminodes 5; ovary ovoid: fr. globar., apple-shaped, fleshy, many-seeded.—Two species according to Mez, Pflanzenreich, hft. 15 (IV. 2362), W. Indies. The chief technical differences between Theophrasta and Clavija are in the lfs. and frs. In Theophrasta the corolla is cylindrical and hollow, and the staminal column is attached on the base of the corolla: fr. large and many-seeded. In Clavija the corolla is subrotate and deeply 5-leaflet; staminalia attached on the tube of the corolla: fr. 1- to many-seeded. See Clavija.

Jussièi, Lindl. (T. densiflora, Decne.). Small slender tree, 4-8 ft. high, trunk spiny, 1 in. thick: lvs. large, elongate, linear-lanceolate, gradually narrowed toward the base, about 1/8 ft. long, margin dentate, serrulate, serrations spinulose, both surfaces lepidote: infl. many-fl., tomentose with chestnut-brown hairs: fls. white; sepals narrowly rotundate or acutate at apex; corolla fleshy; stamens dark brown, papillose. Haiti and Santo Domingo. B.M. 4239.

americanâ, Linn. (T.isæca, Decne.). Subshrub 1-3 ft. high: st. simple, with ash-gray bark: lvs. elongate, linear-lanceolate, gradually narrowed toward the base: 18-20 in. long, about 2 in. wide, margin with small teeth: infl. many-fl., very densely cylindrical raceme, fuscous-tomentose: fls. dull brown, becoming black; sepals rotundate at apex; corolla urceolate; stamens slightly emarginate, pulvinate-fleshy. Haiti and Santo Domingo.—Probably rare in cult.

Schoenoplectus imperialis. Lindl.<br>lindl. imperialis.—T. latifolia, Willd.=Clavija latifolia.—T. longifolia, Jacq.=Clavija longifolia.—T. macrophylla, Lind., not Link=Clavija grandis.—T. minor, Lind., is offered in the trade; it is some form of Clavija.

F. TRACY HUBBARD.

THERMÓPSIS (Greek, lupin and like). Legumínose. Hardy perennial herbs.

Rhizome usually repent, sending up annual, erect, simple or branched sts., sheathed at their base: lvs. alternate, digitately 3-leaflet; stipules free, leaf-like: lvs. rather large, yellow, rarely purple, in terminal racemes or disposed opposite the lvs.: pedicels solitary; calyx narrowly campanulate, teeth or lobes subequal: standard suborbicular; wings oblong; keel equaling or scarcely longer than the wings; stamens free: pod subsessile or short-stipitate, linear-oblong or ovate-inflated, straight or curved.—About 18 species, N. Amer. and N. and E. Asia. They are not particularly as to land or position, but do best in a deep light well-drained soil. They are generally deep-rooted plants and endure drought very well. Prop. may be effected by division, especially in T. montana, T. fabacea, and T. rhombifolia, which spread extensively by the root, but in general the better way is by seed. Although the seed is rather slow to germinate and should be sown as soon as ripe or in the spring with some heat.

a. Pod strongly recurved.

rhombifolia, Richards. Plant about 1 ft. high, branched: lfts. usually oval or ovobate, ½-1 in. long:

**lanceolata**, R. Br. (Polidshire lupinoides, Wild.). Sts. 6–12 in. high: Ivs. nearly sessile, the lower and uppermost ones often simple; lfts. oblong-lanceolate, silky-puberulent on both surfaces; stipules lanceolate, half as long as lfts.: fls. gynoecium; oromorph verticillate, bright yellow. Siberia and Alaska. B.M. 1389.

a. **Pod straight or only slightly curved at the apex.**

b. **Plant 3–5 ft. high.**

c. **Stipules longer than the petiole.**


d. **Stipules shorter than the petiole.**

e. **Racemes axillary.**

**fabaceae**, DC. Resembles *T. montana* and has possibly been confounded with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

dd. **Racemes terminal.**


**fraxinifolia**, Curtis. Sts. 1–3 ft. high: lfts. 3, oblongate to elliptic, oval or lanceolate, glabrous or nearly so; stipules linear to linear-lanceolate: fls. in a loose raceme 4–12 in. long: pod falcate, linear, pubescent, 2–4 in. long. Mountains of N. C. and Ga.

F. W. Barclay. F. TRACY HUBBARD.

**THESPESIA** (Greek, divine; application doubtful). *Malvaceae*. Trees or tall herbs, grown in the warmhouse, and planted in warm regions.

Leaves entire or angulate-lobed: fls. usually yellow, showy; calyx truncate, minutely or bristle-toothed, rarely 5-eared; ovary 5-celled: caps. woody-coriaceous, loculicidally 5-valved.—About 10 species, Trop. Afr., Asia and the islands of the Pacific.—Cult. in S. Calif., where it is said to succeed only in warm and moist locations. The fls. are described as varying from yellow to purple. A common tree on tropical seacoasts, reaching 30–40 or even 50 ft., with dense top, blooming all the year; the inner bark yields a fiber, and the wood is durable and useful. *T. grandiflora*, DC. Tree. 30–45 ft. high: lvs. ovate, subcoriaceous, apex subacuminate: fls. purple or red, 3 in. diam. Florida. The wood is used in Puerto Rico for furniture and other purposes and it is recommended for ornamental purposes.

F. TRACY HUBBARD.

**THEVETIA** (named for André Thevet, a French monk, 1502–1590). *Apocynaceae*. Glabrous small trees or shrubs which are grown in the warmhouse, or out-of-doors in the extreme South.

Leaves alternate, 1-nerved or lightly feather-veined:

**fils**, large, yellow, in terminal, few-fl. cymes; calyx 5-parted, many-glanded inside at the base, segms. acute, spreading; corolla funnel-form; lobes broad, twisted; disk none; ovary shortly or deeply 2-lobed, 2-celled: drupe broader than long, 2-celled.—About 10 species, Trop. Mex. south to Paraguay. *T. nereifolia* is a very ornamental small evergreen shrub, growing luxuriantly in rich sandy soil, not too moist and not too dry, ultimately attaining a height of 6 to 8 feet and almost as much in diameter. The foliage is abundant, light glossy green, and reminds one of the oleander, but the leaves are narrower. The flowers are yellow, fragrant, and abundantly produced. The fruit, which is of the size and somewhat of the form of a hickory-nut, is regarded as poisonous by the negroes. Thevetia can stand a few degrees of frost. If banked with dry sand in fall it does not suffer to any great extent, although the top may be killed. (H. Nehrling.)

a. **Lvs. 8–10 in. long, about 2 in. wide.**

**nifida**, DC. A tender shrub: lvs. oblong-lanceolate, acuminate, margins revolute: fls. rather large: corolla white, with a yellow throat. W. Indies; cult. in S. Calif.

b. **Lvs. 3–6 in. long, less than ½ in. wide.**

**nereifolia**, Juss. Known locally in Fla. as "trumpet-flower" and incorrectly as "yellow oleander." A tender shrub: lvs. linear, shining, about 3 in. long, yellow, fragrant. W. Indies, Mex. B.M. 2309 (as *Cerbera Thevetia*).—Cult. in S. Fla. and S. Calif.

F. TRACY HUBBARD.

**THIBAUDIA** (named for Thibaud de Berneau, a French botanist). *Ericaceae*. Shrubs with the st. sometimes tall-climbing: lvs. alternate, persistent and leathery: fls. in numerous many-fl. axillary racemes, scarlet; calyx 5-lobed or 5-toothed; corolla tubular, contracted at the mouth, 5-toothed; stamens 10; ovary 5-celled: berry small, globose, 5-celled. About 20 species, Trop. Amer. Probably none of the true Thibaudias is common in cult., although the two following species have been grown. *T. floribunda*, HBK., with grayish branches, oblong-lanceolate lvs. and glabrous fls. in solitary raceme. Peru. *T. pemichinchensis*, Benth., growing 6–12 ft. high, with lvs. 3–4 in. long and oval-oblong or sub lanceolate and the calyx seurry-tomentose. Equador. *T. acuminata*, Wall., is correctly *Corallo-bôrya acuminata*, Hook. f. (Epigynium acuminatum, Klotzsch). Shrubs 2–4 ft. high: branches thick: lvs. alternate, petiolated, 5 x ½ in., sometimes 10 x 2½ in., lanceolate, base cuneate, glabrous: fls. red, in axillary corymbs; calyx-tube cincereous pubescent or glabrous, 5-lobed; corolla glabrous or glandular-puberulent outside, small, 5-toothed. India. B.M. 5010.

**T. glorios*, Griff.—Agapetes gloriosa*.—*T. macrantha*, Hook.—Agapetes macrantha*. J.F. 1:95. R.B. 20:181.—*T. pulchra*, Hort., Is offered in the trade as an orange-red-fl. form. This may be the same as *T. pulcherrima*, Wall., which equals Agapetes variegata.—*T. setigera*, Wall.—Agapetes setigera*. F. TRACY HUBBARD.


**THLADIANTHA** (Greek, to crush and flower): use the genus is said to have named it from pressed specimens). *Capparaceae*. Herbaceous softly pubescent vines with tuberculous roots, some of which are hardy, others adapted to the greenhouse.

Leaves ovate-cordate, denticulate, sinuses deep; tendril simple: fls. dicereous, rather large, golden yellow; male fls. solitary or racemose, calyx-tube short-campanulate, 5-lobed, corolla either irregularly campanulate, 5-parted, stamens rudimentary; female fls. solitary, calyx and corolla as in the male, stamens rudimentary or none; ovary oblong, pubescent, with 3 placentae: fr. oblong, fleshy, indehiscent, many-seeded.—About 13 species, China, Java, and Himalayas.
**dóbia, Bunge.** A tall climber; lvs. light green, oval, base cordate, apex acute; fls. numerous, yellow, bell-shaped; male fls. solitary in the axils without bracts; fr. ovoid-oblong, about 2 in. long, red; seeds black, smooth. Summer. N. China. G.C. III. 28:279; 54:54. B.M. 5409 (male fl. only). G.M. 43:537.—According to R. T. Lycnon in Cn. 56, p. 518, the plants are of easy cult. and by planting both sexes and artificial pollination the fr. may be grown. He further states that the root-tubers are without buds but form buds just before growth commences, as does a root-cutting. According to Danse and Dandridge, the plant is hardy in W. Va., increasing rapidly by tubers and becoming a pest when planted with cultivated plants.

**Olíveri, Cogn.** More vigorous than the former: annual stts. attaining a height of 30 ft. or more, glabrescent, tubers absent; lvs. larger, cordate, acute, about 8 in. long; fls. more numerous, golden yellow. Cent. China. R.H. 1903, p. 473.—There is also a hybrid between these two species which is offered in the trade.

**F. TRACY HUBBARD.†**

**THLÁSPI** (Greek, crushed, referring to the strongly flattened pods and seeds). *Cruselifer.* Annual or perennial herbs which are glabrous or glaucescent, rarely pilose, some of which are cultivated now and then.

Leaves basal, rosulate, entire or dentate; cauline oblong, hastate-aureculate: fls. racemose, without bracts, white, rose, or pale purple; sepalz erect, equal at base; petals obvolute; stamens free, without appendages: siliqua short, laterally compressed, oblong, obturate, or oblanceolate.—About 90 species, widely distributed in the temperate, alpine, and arctic regions, mostly in the northern hemisphere, but also in S. Amer., N. Afr., and Austral.

**alpéstre, Linn.** Perennial, 2-12 in. high but usually low, glabrous, somewhat glaucous, habit tufted, forming rather thick mats: basal lvs. in a rosette, petiolated, obovate; cauline lvs. elongated-lanceolate, base cordate, entire or dentate; peduncle unbranched, terete: fls. white, sometimes somewhat reddish; sepalz 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. alpestris* is now considered a distinct species, *T. coloradensis* Ryd. Perennial, basal lvs. narrowly obovate, broadly spatulate, sinuate, crenate or subentire; cauline lvs. oblong or obovate, obtuse; infl. short and dense; fls. white; sepalz with a white margin. Mountains of Wyo. and Colo. The fls. are larger than those of *T. alpestris* and the pod differs. It is uncertain whether the material in cult. in Amer. is this plant or *T. alpestris.*

**arvínse, Linn.** PENNY CRESS. Annual or biennial, 6-18 in. high, glabrous, yellow-green; basal lvs. obovate or spatulate, petiolated; upper lvs. oblanceolate, remotely and irregularly dentate; fl.-st. mostly branched above: fls. small, white; sepalz greenish. Eu.—A weed in most countries, including Amer.


F. TRACY HUBBARD.

**THORN**:

**CRATZUS.** Christ's T.: *Pallurus Spinus-Cristat.* Jeckem in T.: *Cn. 181, 305;* also *Pachyneura succedae.*

**SWALLOW T.:** *Hippophæa rhomnoides.*

**THORN-APPLE:** Datura stramonium; also *Cratusus.

**THRIFT:** Armeria, Statice.

**THRINAX** (Greek, fan). *Palmaceae,* tribe *Córyphæ,* Thatch Palm. Fan palms well adapted for pot culture.

Spineless palms: trunks low or medium, or cespitose, ringed below, clothed above by the fringed leaf-sheaths: lvs. terminal, orbicular or truncate at the base, flabellately plicate, multifid; sepalz induplicate, bifid; rachis short or none; ligule free, erect, concave; petiole slender, bifidcous, smooth on the margins; sheath usually beautifully fringed; spadix long; axis clothed with tubular sheaths, papery-coriaceous, split: fls. perfect, the calyx and corolla united into a lobed or entire cup, on rather long, slender pedicles, the pedicel with a caducous bract at the base; their filaments united below; ovary 1-celled: fr. the size of a pea.—About 17 species, native to W. Indies and Fla., and not much known in cult. For the new Porto Rican species, see Cook, Bull. Torr. Bot. Club, Oct., 1901 (vol. 28). Upon a technical embryo character some of the species below and many other wild species are segregated to constitute the genus Coccothrinax, Sargent. As that genus does not differ horticulturally, these species are here treated with Thrinax. See *Coccothrinax.*

The species are of slow growth, but succeed with indifferent care. They are mostly of elegant form and habit. A good specimen is shown in Fig. 3794.

### 3794. A good specimen of Thrinax.

**A. Under surface of lvs. green.**

**B. Ligule with a blunt appendage at the middle.**

**radiata, Lodd.** (Coccothrinax radiata, Schum. *T. ele-gans,* Hort.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; sepalz united to or beyond one-third; ligule broadly rounded, with a short, blunt appendage at the middle; spadix large, 2-2½ ft. long, paniculate. Cuba to Trinidad.— Said to have been known in cult. as *T. elegans* and *T. gracilis.*

**BB. Ligule bluntly deltoid.**

**parviflora,** Swartz. Caudex 10-20 ft. tall: lvs. 10-25 in. long, minutely pubescent, becoming glabrous, green beneath; sepalz united one-fourth or one-sixth their length; ligule bluntly deltoid, 1½ lines long. Jamaica.—The plant of Fla. herefore known as *parviflora* seems to be *T. floridana,* Sarg., a plant not in the trade. S.S. 10:510.

**BBB. Ligule obsolete, truncate.**

**barbadensis,** Lodd. (Coccothrinax barbadensis, Becc.). Trunk middle-sized: lvs. green, glabrous; sepalz united at the base; ligule obsolete, truncate: spadix paniculate; berry polished, ½ in. thick. Barbados.
THRINAX

argentea, Lodd. (Coccothrinax argentea, Schum.). Caudex 12-15 ft. high, 2-3 in. thick; lvs. shorter than the petiole, silvery gray beneath, making one of the most beautiful effects in all the palms; segms. united at the base; ligule concea, semi-lunar, erose. W. Indies.

BB. Lf.-segms. convivnt for one-third their length.

excelsa, Lodd. Lvs. pale green above, hoary-glau- cious beneath; segms. united one-third; ligule bluntly deltoid; sheath densely buff-lanate. Jamaica, British Guiana.—Held by some to be a form of the preceding.

BBB. Lf.-segms. convivnt for one-half their length.

multiflora, Mart. (T. gramínifólia, Hort.). St. medium, 6-8 ft. high; sheaths ragged, fibrous, irregularly reticulate, tomentose; young lvs. white woolly-tomentose; blade equaling the petiole, incinate; segms. united one-half their length, eniform-acuminate, rather strict, glaucous beneath; ligule transversely oblong, sinuate, 3-lobed. Haiti. I.H. 31: 542.

Other species of Thrinax are in cult. in private collections (see p. 2446), but it is doubtful whether they are in the trade. Some of them reaching 15 ft. high; C. floridanus, Lodd. (C. argentea, C. Thranth.); C. major, Muell. (C. floridanus, C. Thranth.). A modern palm with lvs. about 3 ft. diam., and with a short, stiff ligule. Probably belongs, according to Beccari, somewhere near Coccothrinax argentea. This palm was lost to science for 60 y. or more, and has recently been rediscovered. A specimen growing in the Brooklyn Botanic Garden has the trunk covered with a fibrous hair-bun covered growth, unlike any W. Indian palms known.—T. elegansima, Hort.—Coccothrinax.—T. Chico.—Acancourthria Chapm., H. B. K. & Wendl. Cubán 1/4. A medium sized palm with lvs. about 3 ft. diam., and with a short, stiff ligule. Prob- ably belongs, according to Beccari, somewhere near Coccothrinax argentea. This palm was lost to science for 60 y. or more, and has recently been rediscovered. A specimen growing in the Brooklyn Botanic Garden has the trunk covered with a fibrous hair-bun covered growth, unlike any W. Indian palms known.—T. elegansima, Hort., seems to be unknown to botanists. It may be T. elegans, which was described by Forero & Wendl. as T. forerianum, Sarg. A slender tree, to 30 ft.: if-blades 3 ft. across, yellowish green, shining above; spadix 3-4 ft. long: fls. slender-pedicelled, the sepals and petals united; filaments subulate; fr. small, 1/2 in. diam. or less. Fls. and Keyes.—T. gibberi, Chapm.—Coccothrinax.—T. keyensis, Sarg. Rather stout, 25 ft., the trunk on a banded root; if-blades 3-4 ft. across, yellowish green above; spadix 6 ft. or more; lvs. on short disk-like pedicels, and sepals and petals only partially connivent. The frs. are elongated: the ligule narrowly united; filaments triangular; fr. very small, only 1½ in. or less. thick. Keyes.—T. microcarpa, Sarg. Tree, 30 ft. or more: if-blades 3-4 ft. broad, pale green above and silvery white beneath; spadix 1-2 ft. very long; frs. sessile, pedicelled, the sepals and petals only partially connivent; filaments subulate; frs. oval, or about 1 in. long, united; fr. very small, only 1½ in. or less. thick. Keyes.—T. macroura, Wendl. One to 2½ y. high; lvs. glaucous beneath; st. with two-thirds of the fr. spreading, the fourths their length. G.C. III. 11: 133; 30: 333. Anguilla.—T. Wendlandiana, Becc. Lvs. falcate-oblanceolate, paler beneath; segments oblong: spadix elongated; fls. long-pedicelled, Thailand and Honduras.

N. TAYLOR.*

THRISPÉRUM (Greek, hair, and seed, referring to the hair-shaped seeds). Syn., Sarcococulis. Orchí- daceae. Epiphytic non-pseudobulbous orchids, grown for their bloom in the greenhouse.

Stems short, either covered with prominent persistent truncate bases of the lvs. or leafless: lvs. flat and often narrowing toward the petiole; racemes axillary; bracts small; sepals and petals nearly equal, free, spreading, the lateral sepals often more or less dilated at the base; labellum articulate at the end of the basal projection of the column, 3-lobed; column short, erect, produced at the base; pollen-masses 4: caps. usually linear or narrow-oblong.—Species 30, Old World.

Cecilia, Reichh. f. (Sarcococulis Cecilia, F. Muell.). Sts. short, sometimes elongated to 2-3 in. lvs. linear or narrowly oblong, to 3 in. long, thinly hairy, up to 6-8 in. long, erect, bearing above the middle several small short-pedicelled pink fls.; lateral sepals almost ovate, dorsal sepall narrower; petals still narrower; labellum shorter than the sepals. Austral.


Iliacina, Reichh. f. (Sarcococulis ilicinum, Griff.). Climbing: sts. slender, 2-3 ft. high: lvs. alternate, ovate, pale green, 1½-2 in. long, cordate and amplexicaul at the base; raceme 1-5 in. long; racis very stout, compressed, few to many-fl.; fls. pale rose, white-flushed, very short-pedicelled; sepals and petals broadly ovate; labellum saccate, white, yellowish and pubes- cent within: caps. 4-6 in. long, linear. Malaya. B.M. 7754.

F. TRACY HUBBARD.*

THRYÁLIS (old Greek name, transferred to these plants). Malpighiáceae. Confusion in practice has arisen in the application of this name and Gal- phima. As expressed by J. N. Rose, "the genus Thryallis was published by Linnæus in the second edition of his Species Plantarum, busing it upon a single species, T. brasiliensis. In 1829 Martius described two additional species, T. longifolia and T. latifolia. 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 Galphima." Kuntze gave the name Heliococca, Munz. (G. Hederacea, Benth.). This is restored to its original application, with its legitimate extension, then the plants described under Galphima, page 1312, become T. brasiliensis, Linn. (G. brasiliensis, Juss.); T. hirsuta, Kuntze (G. hirsuta, Cav.); T. glauca, Kuntze (G. glauca, Cav.). There is a native species, T. anguifolia, Kuntze (G. angui- folia, Benth.). In Texas and adjacent Mexico, 1 to 2½ ft. tall, more or less woody at base, with linear to lanceolate leaves and petals yellow turning reddish.

THRYPTOMENE (Greek word said to refer to the low heath-like appearance of the plant). Myrtáceae. Glabrous heath-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 axis or rarely fasci- culate; bracteoles 2; calyx-tube hemispherical, tur- nate or short-campanulate limb with 5 petaloid or scarious, entire, spreading segms.; petals 5, persistent, usually connivent; stamens 5; fr. ellipsoid, 10; ovary inferior, 1-celled: fr. sometimes 2-seeded, inde- hiscent, sometimes 2-seeded and spuriously 2-berried. About 25 species, Austral.

Mitchelliana, F. Muell. A compact, bushy shrub with slender branches: lvs. oblong, flat, ½-3½ in. long; fls. in the upper axis solitary or in clusters of 2 or 3, white. Offered in S. Calif.—Intro. by Mrs. T. B. Shepherd, who says the plant rarely exceeds 4 ft. in height, blooms in midwinter and is good for cut-fla.

F. TRACY HUBBARD.*

THÚJA (Thuya or Thuya, an ancient Greek name for a resinous tree or shrub). Also spelled Thuya or Thutia. Including Biota. Pináceae. Arbor-Vitae. Ornamental woody plants, grown for their handsome evergreen foliage and formal habit.

Resiniferous trees with short horizontal much rami- fied branches; the flattened branchlets arranged in kind- like frs. decussate or spirally arranged, usually muta- gernal on the back: fls. monoecious, globose, small, terminal on short branchlets, stamine yellow and consisting of usually 6 opposite stamens each with 2-4 anther-cells; pistillate consisting of 8-12 scales in opposite pairs, of which only the middle ones, or in the second, Biota the lower one adjacent, each scale with 2 ovules inside at the base: strobiles globose-oval to oval-oblong, with 2 seeds under the fertile scales.—Five species occur in N. Amer., E. and Cent. Asia. The wood is light and soft, brittle and rather coarse-
grained, durable in the soil; it is much used for construction, cabinet-making, and in cooperage. *T. occidentalis* contains a volatile oil, and thuja is sometimes used medicinally.


Lvs. with whitish markings beneath, without or with indistinct gland.


*Stándishii*, Carr. (T. *japónica*, Maxim. *T. gigantea var. japónica*, Franch. & Sav. *Thujaepeis Stándishii*, 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. 21:258 (adapted in Fig. 3801). R.H. 1896:160. C.A.A. 11:311. S.I.F. 1:11.

**AA.** Cones 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.)

*orientális*, Linn. (Biota *orientális*, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches: branchlets thin: lvs. rhomboid-ovate, acute, bright green, with a small gland on the back: cones globose-ovate, ½–1 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. *athro-themis*, Carr. Dwarf, irregularly and not forming branches; branchlets nearly quadrangular, slender, dark green. R.H. 1861, p. 230. Var. *aurea*, Hort. Low,
THUJA


T. dolobrata, Lindl.—Thuja dolobrata. ALFRED REHDER.

THUJOPSIS (Greek, Thuja-like). Also spelled Thujopsis. Pináceae. Ornamental tree or shrub grown chiefly for its handsome evergreen foliage and the formal habit.

A tree closely related to Thuja and chiefly distin- guished by the broader much flattened branchlets and by its conelets having 3–5 winged seeds under each scale.—Only one Japanese species. Its yellowish white close and straight-grained wood is very durable and is used in Japan in boat- and bridge-building.

Thujopsis is one of the most beautiful Japanese coni- fers and forms a pyramidal tree, in cultivation some- times shrubby, with spreading branches, the branchlets arranged in a frond-like fashion, much flattened and closely appressed. Var. aurea aurea, var. with golden glossy green foliage. It is well adapted for planting as a single specimen on the lawn wherever it can be grown successfully. It is hardy as far north as Massachusetts, but usually suffers from summer drought. It thrives best in a sheltered and

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shaded position and in moist loamy soil, and seems to grow to perfection only in cool and moist climates. Propagation is by seeds, also by cuttings and by grafting like thuja. Plants raised from cuttings usually grow into bushy round-headed plants. Plants grafted on thuja are said to be short-lived. Seedlings are there- fore to be preferred.


T. boreális, Hort.—Chamæcyparis nootkatensis.—T. Stiádáhlí, Gorden.—Thuja Standishii. ALFRED REHDER.

THUNBERGIA (after Karl Peter Thunberg, profes- sor of botany at Upsala and successor to Reichenbach and Linnæus; died 1828). Acañhaceae. 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 bracts which often incline to the side of the flower-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 mucro- nate at the base; ovary sessile on a fleshy disk, 4-loculed, each cell with 2 ovules (rarely only 1). The Thunbergian are distinguished by the contorted corolla, the 4-seeded caps., and the globose seeds.—About 75 species, in the tropics of the world, particularly in Afr.
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. grandiflora*, *T. mysoresensis*, and *T. coccinea* 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 in arid regions, but bloom freely the second season. As a rule, the plants flower in late summer or autumn, but the time of flowering may be varied 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 Gn. 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 whitish. Thunbergias and amaranthas are great favorites in central and southern Florida, being used on verandas, arbors, small trees, old stumps, 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 taller-growing and choicer 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 glomixia-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. Nehling.)

**THUNBERGIA**

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**KEY TO THE SPECIES.**

**A. Fls. axillary, solitary.**

1. *affinis*.
2. *alata*.
3. *alba*.
4. *albiflora*.
5. *aurantiacae*.
6. *Backeri*.
7. *Bakeri*.
8. *cervulceae*.
9. *chrysops*.

**B. Lvs. entire.**

1. *affinis*.
2. *Doddii*.
3. *elegans*.
4. *flora*.
5. *natalensis*.

**C. Petioles winged.**

1. *alata*.
2. *aurantiacae*.
3. *Backeri*.
4. *Bakeri*.
5. *cervulceae*.

**D. Color of fls. white; corolla-lobes truncate and sinuously toothed at the apex.**

1. *affinis*.
2. *alata*.
3. *aurantiacae*.
4. *Backeri*.
5. *Bakeri*.

**E. Plant erect or suberect.**

1. *affinis*.
2. *Doddii*.
3. *elegans*.
4. *flora*.
5. *natalensis*.

**F. Throat of the corolla yellow.**

1. *affinis*.
2. *Doddii*.
3. *elegans*.
4. *flora*.
5. *natalensis*.

**G. Plant climbing.**

1. *affinis*.
2. *Doddii*.
3. *elegans*.
4. *flora*.
5. *natalensis*.

**H. Color of fls. blue.**

1. *laevis*.
2. *laurifolia*.
3. *mysoresensis*.
4. *sulphurea*.
5. *unicolor*.
6. *vestita*.

**1. affinis, 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. 6795. G.L. 3:2.461. G. 291.1.—This plant is closely allied to *T. erecta*, from which it differs by its entire lvs. and larger throat, which are about twice the size of those of *T. erecta*. When grown in a pot the plant forms a compact shrub, but when grown more room it is a rambling climber.

**2. alata, Bojer. Black-eyed Susan.** Fig. 3802. St. square, climbing, hairy; lvs. opposite, triangular-ovate, hastate, repand-toothed, rough-pubescent, tomentose beneath; petioles winged, about as long as the lvs.; fls. solitary, on axillary peduncles; calyx very small, surrounded by 2 large inflated bracts; corolla-tube somewhat longer than the involucre, dark purple within; limb rotate, oblique, of 5 rounded segments, buff or cream-colored. S. E. Afr. B.M. 2501. P. 2:2. B. 5:238 (non A.). L.B.C. 2:461. I. B. C. 2:242. G.L. 27:38.—A perennial climber which may be correctly treated as an annual greenhouse plant. Usually prop. by seeds. It is used either as greenhouse climber or to grow on trellises outdoors. Outside it flowers mostly in Aug., but prop. at various times plants may be had in blossoms nearly the whole year in the greenhouse. There are many varieties, some of which have been described as species.


**3. fragrans, Roxbg.** St. slender, climbing; lvs. lanceolate to triangular-ovate, corulate or subcordate, mostly angularly toothed on each side of the base, rough on both sides, petiolar: fls. white, axillar; corolla-tube narrow; limb spreading, 1½ in. across,
THUNBERGIA

lobes truncate and repandly toothed at the end. Summer.
Var. indica.
Var. lavis, Clarke, is glabrous. B.M. 1881. L.B.C. 20:1913; G.C. III. 46:410. Var. vestita, Clarke, is more hairy and the fls. are not fragrant.
5. natalénsis, Hook. Plants erect, 2 ft. or more high, shrubby at base, green above: sta. quadrangular, mostly glabrous: lvs. somewhat crowded, opposite, sessile, ovate, acute or subacuminate, sinuate-dentate, glabrous above, hairy on the veins beneath: fls. large, pale blue, yellow in the throat, subhorizontal on erect peduncles which are shorter than the lvs.; tube of the corolla yellow, 2 in. long, curved upward, limb of 5 broad spreading obcordate lobes; calyx of 6 teeth. Natal. B.M. 5082. G.C. III. 37:162.—Very near T. erécta, which has petiolate lvs. and a greater number of calyx-teeth (if constant?).
7. grandifóra, Roxbg. Fg. 3803. St. tall, climbing: lvs. broadly ovate, angularly cordate and toothed or lobed, somewhat roughened on both sides, petiolate: fls. solitary or in short, stout racemes in the lf.-axils, bright blue, becoming whitish in the throat; corolla-tube bell-shaped; limb 3 in. across, of 5 large, spreading rounded lobes. Bengal. B.M. 2366. P.M. 7:221. L.B.C. 4:69. B.M. 47:159. 42:32. G.C. III. 9:759.—A very large perennial greenhouse climber; flowers during the summer or autumn. There is also a white-flowered variety.
9. mysoresénsis, T. Anders. (Hexacéntris mysoresénsis, Wight.) Climbing shrub, with long, slender branches: lvs. opposite, petiolate, oblong-lanceolate, acuminate, entire or somewhat distantly toothed; racemes long, pendulous: fls. yellow, 2 in. across, the tube purple, inclosed by the spathè-like bracts; limb 4-lobed, the upper lip erect, concafe, with reflexed side lobes, lower lip of 3 subequal, spreading lobes. India. B.M. 4786.

THUNIA

Var. látæa, Hort. (Hexacéntris látæa, Hort., Veitch. G.C. 1854, p. 151, not T. látæa, 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. coccínea, Wall. (Hexacéntris coccínea, Nees). A very tall climber: st. much branched, 4-angled; lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cordate angled base, the upper ovate, cordate, all angularly toothed or the upper entire: fls. in terminal or axillary racemes, 1½-3 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. 12:1195. F.S. 23:2447-48. R.H. 1890, p. 197. G.W. 3, p. 44.

11. élegans, Borzj. Resembles T. coccínea. 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 in S. France.

T. Gbarni, S. Moore. Sta. prostrata: lvs. about 1 in. long, triangular, glossy above; peduncles axillary, erect, 3 in. long; fls. solitary, about ½ in. across, yellow, each with a pair of inflated and united crimson-streaked bracts. British E. Afr. B.M. 8604. T. primulína, Hemsol. Perennial, silky hairy at first;

3803. Thunbergia grandiflora. (X½)

lvs. rhomboïd ovate, 1½-2½ in. long, with 1 small lobe on each side: fls. axillary, solitary, about 1½ in. across, resembling the common primrose in shape and color. E. Trop. Afr. B.M. 7999.—T. Véodkína, Benth. (Megénia Véodkína, Benth.). Erect: lvs. large, ovate or oblong, dark green; fls. about equaling those of T. erécta, deep bluish violet, with yellowish throat, handsome summer-flowering species. Fernandez P., A.B. 5389.

HEINRICH HASSELBRING.

THÜNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the nineteenth century). Orchidácææ. 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; labelium convolute over the column, spurred, ornamented with several crests consisting of lines of fong hairs; pollinia 5: fls. 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. 3304. Suberect, 2-3 ft., clothed with sheathing, oblong-lanceolate, striate lvs. 6 in. long: raceme dropping at the end of the st., 6-12-fld.; fls. white, 3-4 in. across when fully open; sepals and petals oblong-lanceolate, acuminate; labellum shorter than the segms., not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wavy and finely crisp; color of labellum white veined with purple in the throat, with 5-9 purple or yellow fringed keels; wings of the column entire. April-Aug. Burma and S. Himalaya region. B.M. 3391. B.R. 24:33. P.M. 5:125. F.C. 3:125. R.H. 1874:450. Gt. 47, p. 233. G. 31:475.—There are several varieties of this species. The throat of the labellum is often yellow.


**Marshalliana**, Reichb. f. (*Phaius Marshalliae*, Nichols.). Closely related to *T. alba*. Sts. somewhat stronger; segms. pure white, acuminate; labellum evident 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisp; color of labellum 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. ionophlebia, Reichb. f., has the center of the labellum bright yellow, paler toward the margin. Var. *alba*, 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 HASSELBRING.**

**THUYA**: *Thuja*.

**THUYOPSIS**: *Thujaopsis*.

**THYMELÆA** (Greek, *thyme* and *olive*, referring to the thyme-like foliage and the small olive-like fruit). *Thymelæaceae*. Hardy or half-hardy perennial herbs, subshrubs or small shrubs, which are very much branched: lvs. sparse, frequently small or narrow; fls. small, glabrous and fascicled on the stems, hermaphrodite or polygamous by abortion; perianth ovate, rarely, especially in male fls., with a slender cylindrical tube; lobes 4, spreading; stamens 8; ovary sessile, 1-celled: fr. dry.—About 20 species, Medit. region, chiefly, also in Canary Isls., and in Asia. **hirsuta**, Endl. (*Passerina hirsuta*, Linn.). Decumbent ground-humus or half-hardy shrub, 1-2 ft. high, slender, fastigiate branched: lvs. coriaceous, ovate, nearly round or oblong, obtuse, 2-3 lines long, glabrous above, white-tomentose beneath: fls. white, in axillary or terminal few-fl. fascicles, which equal the lvs. July. Medit. region. B.M. 1949. T. **Tartantara**, All. (*Döpfne Tartantara*, Linn., *Passerina Tartantara*, Schrad.). Small hardy shrub, woolly silky-canescent, plants of becoming fulvous: lvs. coriaceous, obovate or obovate-oblong, 5-10 lines long: fls. white, numerous, 2-5-gomerae in the upper axils. June. S. Eu.

**F. TRACY HUBBARD.**

**THYMUS** (the old Greek name used by Theophrastus either for this plant or for savory). *Labiatae*. *Thyme*. Small shrubs or subshrubs, mostly hardy, and excellent for edging and the rockery. *Thuja*, *Thujaopsis*.

Leaves small, entire; fls. lvs. similar or changing to bracts in the spike: floral whorls usually few-fl., sometimes all distant and axillary, sometimes gathered in terminal short or lax spikes; bractlets minute; calyx ovoid, 10-13-nerved, 2-flapped, 5-toothed; corolla-tube included or exerted, naked inside, limb somewhat 2-lipped, stamens 4, sessile, ovary of 4 carpels, smooth.—About 120 species, broadly dispersed in temperate regions, although the greatest number are natives of the Medit. region.

Thymes are erect or prostrate plants with strong mint-like odor. Most of the species are grown as a 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 woolly 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. All thymes are easily propagated by means of division, and may be propagated by seeds. Seeding beds and 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
which is not a true Thymus. See Sage, where general culture of such herbs is given.

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THYMUS

9. villosum, Linn. Subshrub, about 3 in. high: sta. much branched, erect, pubescent: lvs. narrow-linear, acute, ciliate, fasicled at the axis; floral lvs. broadly ovate, acuminate, villous: floral whorls in an ovate-globose spike: fls. purplish crimson; calyx villous, teeth of upper lip short, ovate-lanceolate, of lower thicker. Portugal.—Some of the material offered in the trade under this name may be a form of T. Seryllum.

10. striatus, Vahl (T. Zogis, Sibth. & Smith, not Linn.). Subshrub, about 3 in. high: branches woody, procumbent; flowering branches erect, somewhat hairy; lvs. stiff, sessile, linear or subsessile, glabrous, more or less ciliate beneath; floral lvs. broadly cordate-ovate, striate and pubescent: fls. congested in a dense, ovate head with the uppermost lvs. forming an involucre, white (purple?); calyx-teeth lanceolate; corolla-tube rather included.


T. corymbosum, Pers.—Satureja corymbosa.—T.  erecta, Hort., is offered in the trade as a small shrubby evergreen about 9-12 in. high, with a rigid habit and clusters of rose or pale pink fls.—T. erioclanclus, Roth.—Mieromeria varia, Benth. Subshrub, procumbent, pubescent or villous; lvs. sessile, lower ovate, upper lanceolate, somewhat ciliate beneath: fls. minute, sessile in a sessile or peduncled fascicle; calyx usually puberulent. Canary Is.

F. TRACY HUBBARD.

THYSACANTHUS (Greek, thysa and flower). Acanthaceae. Erect, glabrous, pubescent or villous herbs, which are adapted to the warmhouse. Lvs. opposite, entire, usually large: fls. red, fasicled at the axils, pedicellated; fascicles or cymes arranged in a terminal thyrsoid, simple raceme or paniculate branched; calyx short, rather 5-parted, segments narrow, acute or acuminate; corolla-tube elongate, straight or somewhat incurved, limb somewhat 2-lipped, 4-leafed; stamens 2, staminodia 2; disk rather thick: caps. oblong; seeds 4 or fewer by abortion.—About 25 species, Trop. Amer. The oldest and most accepted name of the genus is Odontosia.


F. TRACY HUBBARD.

THYRSÓPETÉRIS (Greek, bunch or raceem and fern; the fruition is disposed in racemose bunches). Polypodiaceae. Tree-like fern: lvs. decompound, the fertile portions appearing like bunches of stipitate acorn-cups, the sterile portions twice-pinnate and then deeply pinnatisect. One species, Isl. Juan Fernandez. T. speciosus, Kunze. 1 ft. high: lvs. decompound, reaching a length of 5-6 ft., one-third of which is sterile; petals bipinnate, with lanceolate incised pinules; fertile parts tripinnate, each pinna becoming a raceme of stalked involucres: sori globose; involucres cup-shaped.

THYRSÓSTACHYS (Greek, thyrs and spike). Gramineae. A genus of 2 species of arboreous bamboos native to Upper Brazil and the Girls, South America. About 2 species, one referred to Rottboellia but is probably sufficiently distinct. The st-sheaths are long, thin and persistent, with a long narrow blade. The lvs. are small or moderate-sized. T. staminea, Gamble, is a tender, deciduous, "giants bamboo," with very graceful tufted stems 25-30 ft. high and 1½-3 in. thick: st-sheaths waved and trilobate at the top, the lobes triangular: blade narrowly triangular: lvs. small, narrow, linear, 3-6 x ½-2½ in. Siam.—Once in intro, in S. Calif., but it did not persist. Probably not now in cult. in this country outside test-gounds.

THYSANOTUS (Greek, fringed and ear, alluding to the 3 inner perianth-segments which are fringed). Liliaceae. Perennials, suitable for the greenhouse. Rhizomes sometimes very short, sometimes stout and horizontal: lvs. radical, grass-like, flat or terete: scapes leafless, now erect and simple or paniculate above, now much branched or in one species tufting: fls. sometimes densely fasicled, with 1 terminal fascicle or few at the tip of the scape, sometimes variously paniled; perianth and calyx white, inner usually enlarged, limb narrow, margin entire, inner with a broad colored margin, beautifully fimbriate-ciliate; stamina 6; ovary sessile or short-stipitate, 3-celled: caps. globose 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 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.


F. TRACY HUBBARD.
TIARELLA (Latin, a little tiara or turban; in reference to the form of the pistil). Saxifragaceae. False Mitrewort. Slender erect hardy perennial herbs, useful for the wild-garden or any shaded spot.

Leaves several, radical, long-petioled, simple or 3-foliate; 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, 1 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 lf-coloring. Prop. by division.

a. Lvs. simple.

b. Petals oblong.

cordifolia, Linn. Foam-Flower. Fig. 3806. A handsome native perennial, forming a tufted mass, 6-12 in. high, of broadly ovate lobed and serrate lvs. and simple erect racemes of white fls. borne well above the foliage in May. Fls. about ½ in. across; petals oblong, clawed, somewhat exceeding the white calyx-lobes. In rich, moist woodland, Nova Scotia to Ont., south to Ga. Gn. 22, p. 21; 32, p. 511; 53, p. 456; 55, p. 40; 66, p. 87. V. 11:35. G. L. 26:163. C. L. A. 4:340. G. 6:27; 10: 144; 12:127; 17:464. Gn. M. 1:188. Gn. W. 21:803. J. H. III. 54:423.—An elegant plant well worthy of general cult. It is a lover of cool shaded places and of rich moist soil. It will do well, however, in ordinary soil and flower freely in a half-shaded place, but the varied lf-markings of bronzey red and other signs of luxuriance are not brought out to their fullest extent except with moisture, coolness and a fairly rich soil. The plant forces well and easily in a coolhouse for early spring flowering. It is tenacious of life and generally easy to manage. Var. alboflora, Hort., is a fine white-flld. form. Var. purpurea, Hort. (T. purpurea, Hort.), is a purple-flld. form, of which the following variations are also offered in the trade: purpurea major, with salmon-rose or wine-red fls.; purpurea major compedeta, a more compact grower with bronzy chamois-colored fls.; purpurea marmorata, with very attractive bronze foliage passing to blackish green and marbled with purple: fls. very numerous, maroon.

BB. Petals filiform, inconspicuous.

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.

TIARELLA

TIBOUCHINA


F. W. Barclay.
F. Tracy Hubbard.

TIBOUCHINA (native name in Guiana). Including Pieroëma. Melastomaceae. Shrubs or subshrubs, rarely herbs, sometimes climbing, usually strong-smelling or hispid, adapted to the warmhouse or to out-of-doors in the extreme South.

Leaves usually large, leathery, petioled, ovate or oblong, entire, 3-7-nerved: fls. generally in trichotomous terminal panicles, large, violet or purple, rarely 4-merous; 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-ribs, 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. semi-decandra, 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 plantings, 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 summer the plants may be placed in a dry sunny porch, 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. These plants are excellent for exhibition purposes and conservatory decoration. The species *T. elegans* and *T. semidecandra* are worthy of general cultivation. (George F. Steward.)

**Pellanára**, Cogn. (*Lasianára macrándtha*, Lind. & Seem. *Plerómá macrándtha*, Hook.). Fig. 3807. A tender shrub: lvs. ovate or oblong-ovate, 2-6 in. long, round at the base, short-petiolate, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved: bracts broadly subsorublic, somewhat rounded at the apex and shortly apiculate, margin not translucent: fls. red, the tube to violet, the calyx, bracts, and terminal or 1 ft. terminal and 2 in the upper axis on the branchlet; stamens purple; style setulose. Brazil. B.M. 4412 (as *P. Kunitkanum*); 5721. F.S. 23:2430. Gn. 44:120. F. 1868:193. I.H. 16:594. G. 29:34. G.W. 7, p. 390. O.Z. 15:1. J.H. III. 42:210. H.F. 12:25. 1 var. floribánda is more suited to pot than the type. It bears flowers more freely than the type when small. *Lasianóra*, or *Plerómá spléndens*, Hort., 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 Chile, where it makes a showy shrub 3 ft. high. It endures a few degrees of frost without injury, and even if cut down it spurts readily.


There is a plant offered in the trade under the name of *Plerómá adnédim*, Hort. Bull. described as being a shrub with dark green ovate-lanceolate lvs., densely silky-hairy, the 5 longitudinal veins very prominent beneath: fls. snowy white, about 1½-1¾ in. across, bore in loose terminal heads. Said to have been introd. from S. Austral. As there are no Tibouchinas known outside of S. America, it is not likely that this is correctly placed in *Plerómá*; the proper identification of the plant is at present impossible.—*T. licipódá, Baill.* (*Lasianóra lepidóta, Naud.*), is a plant which has been much confused and is still uncertain. F.W. 1874:298.—There is a plant at least formerly cult. under the name of *Plerómá arménátum*, Hook. Small villous shrub with the branches and branchlets sarmentosó: fls. short-petiolate, ovate or oblong, acute, base rounded or cordate, 7-nerved, pilose: fls. blue, about 2 in. across; calyx-tube tubed or subglúdose, densely tomentose; petals eunáte-ovobálve. Peru. Its position and name in Tibouchina is uncertain. B.M. 5629. F.W. 1869:225.—*T. stenocárpa*, Cogn. Shrub with acutely 4-angled branches which are sometimes somewhat winged: fls. short-petiolate, usually oblong, base generally short-attenuate, 5-nerved, silky villous; fls. many in a terminal panicle, usually rather large, of a cherry-purple; style short-petiolate; calyx-tube narrowly ovate-cuneate. Brazil. F. TRACY HUBBARD.†

**TIEDEMANNIA**: *Oxydia*.  

**TIGER-FLOWER**: *Tigría*. T. Lily: *Litiúm tigrián*.  

**TIGRIDIA** (*tiger-like, referring to the peculiarly marked flowers*). *Iriádez*. Bulbous plants, grown in the greenhouse and also making very showy summer-blooming subjects.  

Bulbs tunicated: st. erect, mostly unbranched, 1-2½ ft. tall, with a few narrow plicate lvs. at the base, and 2 or 3 smaller ones higher up: spathe 1 or 2, leaf-like, each bearing 1 or few blossoms: fls. broad in a circle, yellow, orange or purplish, variously spotted, often very showy; perianth wide-spreading, with no tube, the segms. 6, in 2 dissimilar series, convinent into a broad cup at the base; stamens 3, the filaments united into 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. Pavónia*, from S. Mex., was in cult. in Euc. in the 17th century. L’Obel described it in 1576. The younger Linneus referred it to the genus Ferraria, and some of the tigridías are yet yellow or red. The genus Ferraria, however, is a S. African genus, and all the parts of the perianth are nearly equal. *T. Pavónia* is cult. in many forms, and is the only common species in gardens. The fls. of all tigridías are fugitive, lasting only for a day.  

Tigridías are tender "bulbs" requiring the treatment given gladiolus. Plant in well-prepared soil when settled weather comes, 2 to 3 inches deep and 4 to 8 inches apart. The principal blooming period is 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 gladiolí 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.  

A. Fls. large (often 4 in. or more across); the 2 rows of perianth-segms. very dissimilar in appearance. (*Tigría* proper).  

*Pavónia*, Ker.-Gawl. *Tiger-Flowe*, Shell-Flower. Fig. 3808. Erect, usually unbranched, 1½-2½ ft. tall, glabrous, with several sword-shaped, strongly plicate long-pointed lvs., the spathe-lvs. 3-5 in. long: fls. produced in succession through the warm season, very large and showy, in some forms 5-6 in. across, odorous, marked with a cup-shaped or saucer-shaped center and wide-spreading limb formed by the obovate outer segms. which are bright red on the limb, and purple, yellow, or red-spotted on the claw; inner segms. pan- 
durniform (fiddle-shaped), about half the length of the outer ones, the blade ovate-acute, orange-yellow, and copiously spotted. Mex. and Guatemala. B.M. 532 (as *Ferraria Tigría*). I.H. 38:142. G.C. III. 55, suppl. Feb. 21. Gn. 64, p. 56. G.W. 11, p. 200; 14, p. 674. R.B. 26:73. Var. conchíflora, Hort. (T. conchíflora, Sweet), has bright yellow fls. Var. Wátkinsonii, Hort. (var. albá, Hort. T. conchíflora Wátkinsonii, Paxt.). Raised from seeds of var. conchíflora pollinized by *T. Pavónia*, before 1840, by J. Horsfield, Manchester, England. Horsfield is quoted as follows by Paxton: "In habit and strength this hybrid resembles *T. Pavónia*, the male parent; but in color and the markings of the flower it resembles *T. conchíflora*, the female parent; the large outer sepal, however, are of a very deep yellow, inclining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free in blooming, and as it is not easily increased as *T. Pavónia*, whereas *T. conchíflora* is rather delicate, increases slowly, and is easily lost." Dutch bulb-dealers may still offer it. P.M. 14:51. Var. álba, Hort., has white fls., with red spots in the throat. G.L.
TILIA

the classical Latin name. *Tilia*ceae. 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, petioled, usually coriaceous, serrate, with caducous stipules: lvs. small, in long-peduncled drooping cymes; the peduncle for about half its length adnate to a membranous ligulate bract; sepals 3; 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 cult., 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-

TILIA (as T. alba). Var. *alba immaculata*, Hort., is a spotless white variety, a sport from *alba*. Gn. 49, p. 361. Var. *flava*, Hort., has pale yellow lfs. with red-spotted center. Gn. 50:22. Var. *canariensis*, Hort., is also a pale yellow-fl. form, but named as if an inhabitant of the Canary Islands. Var. *flava immaculata*, Hort., has pure yellow spotless lfs. Var. *rosea*, Hort., has rose-colored lfs. with yellow-variegated center. Var. *lilacea*, Hort., has lilac-colored lfs. with spotted center. Gn. 45:26. 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. 36:350. Var. *grandiflora*, Hort., has lfs. much like those of *T. Pavonia* itself except that they are larger and brighter colored. Gn. 45, p. 265. 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.

AA. Fls. relatively small; the 2 rows of segms. differing less in size; stigmas capitate, or at least not strongly recurrent. (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 outer end of the tube approaching each other in the form of 2 check-like prominences,—these are colored 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 1888 by Horsford.

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 for propagation have the tendency to grow horizontally instead of strictly upright.

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KEY TO THE SPECIES.

A. Lvs. green or glaucous beneath, glabrous or pubescent with simple hairs.
B. Under side of lvs. and branchlets pubescent; lvs. without staminodes

1. platyphyllos

BB. Under side of lvs. glabrous except auxiliary tufts of hairs.
C. Auxiliary tufts present at the base of the leaf. and elsewhere.
D. Margin of lvs. finely serrate; lvs. with staminodes

E. Lvs. green beneath; the tertiary veins prominent.

3346  TILIA

3811. Tilia platyphyllos. (\(X\frac{1}{2}\))

P. Upper surface of lvs. dull green, margin with short-pointed teeth.
F. Upper surface glossy dark green, margin with long-pointed teeth.
E. Lvs. glaucous beneath; the tertiary veins not prominent.
D. Margin of lvs. coarsely serrate; lvs. often S-lobed; lvs. with staminodes
C. Auxiliary tufts of hairs present on the leaflets. and elsewhere.
B. Branchlets glabrous.
A. Lvs. with stellate hairs or stellate tomentum beneath; lvs. with staminodes.

1. platyphyllos. Scop. (T. grandifolia, Ehrh. T. europaea, Linn., in part). LARGE-LEAVED LIME. Fig. 3811. Tree, 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: lvs. in usually 3-flid. pendulous cymes; petals oblanceolate, longer than sepals; stamens 30; style glabrous; fr. globose, ovoid or pyriform, 3-5-ribbed, aepiculate, tomentose, thick-shelled. June; the earliest species to bloom. Eu. G.F. 2:256 (adapted in Fig. 3811). H.W. 3:42, p. 24, 25. R.F.G. 6:316, 317, 318.—Very variable; some of the most important varie-

2. *vulgāris*, Hayne (T. *intermedia*, DC. T. europeā, 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 axillary tufts of hairs, 3–4 in. long; petiole about half as long as the blade: frs. 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. 2:256 (adapted in Fig. 3812). R.F.G. 6:313. M.D.G. 1904:158, 189. —Supposed to be a spontaneous hybrid of the preceding species and *T. cordātā*. This is one of the best species for general planting and fine old trees of it are occasionally seen in this country.

3. *euchlōra*, Koch (T. *dasystyla*, Kirchn., not Stev. T. *rubra* var. *euchlōra*, 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 axillary tufts of brown hairs, 2–3 in. long; petiole slender, more than half as long as the blade: frs. 3–7, in pendulous cymes; style pubescent near the base: fr. ovoid, slightly 5-ribbed, tomentose, thick-shelled. July. M.D.G. 1901:381, 540. —Supposed to be a hybrid of *T. caucasica*, Rupr., and *T. cordātā* and seems to occur spontaneously in the Caucasus and Transcaucasia. It is one of the most beautiful lindens on account of its dark green glossy foliage. It is usually prop. by budding.


—Very distinct with its small coarsely serrate, birch-like lvs. reddish when unfolding; it flowers when only a few feet high.

7. *americānā*, Linn. (T. *glōbra*, 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. neglēcta, Spach (T. Michauxii, Sarg., not Nutt. T. pubescens, Hort., not Vent.). Tree, to 80 ft.: branchlets glabrous, red: lvs. broadly ovate or ovate, acuminate, obliquely cordate 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, 5–6 in. long, turning yellow in autumn; cymes many-fl.; bract deciduous nearly to the base, tomentulose above; peduncle glabrous; fr. subglobose or ovoid, slightly furrowed. Linn. Bot. Mag. Can. ed. 3: 9. From E. Canada to Ga. and Texas west to Ohio. S.M. 673.—This species has often been confused with T. pubescens and with T. heterophylla.

9. heterophylla, Vent. (T. alba, Michx. T. Michauxii, Nutt.). Tree, to 60 ft.: young branchlets glabrous and red: lvs. broadly ovate to oval-ovate, short-acuminate, obliquely truncate or cordate 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-fl. pendulous cymes; bract deciduous often nearly to the base, 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 it is sometimes sold as T. macrophylla.

10. Oliveri, Szszyrowicz. Tree, to 50 ft.: young branchlets reddish brown, glabrous: lvs. ovate, short-acuminate, cordate or truncate at the base, sub- or nearly denticulate, with short gland-tipped teeth, dark green and glabrous above, white-tomentose beneath, with cut-leaf axillary tufts, 3–5 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 introd. species promises to be a handsome ornamental tree.

11. spectabilis, Dipp. (T. alba spectabilis, Hort. T. Blumbergii, 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. ind. and about 1 in. wide of fls. like those of T. americana, but tomentose though less dense than those of 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. Mōłkei, Rehd. (T. Mōłkei, Spach). Branchlets and buds quite glabrous: lvs. often without long hairs on the veins, 4–7 in. long. Originated at Spach's nursery near Berlin, Germany.

12. tomentosa, Moench (T. argentea, DC. T. alba, Ait. T. alba pyramidaliss, Hort.). WHITE LINDEN. Tree, to 100 ft. with upright branches: young branchlets stellate-tomentose: lvs. nearly orbiculate, abruptly acuminate, truncate or cordate at the base, serrate or doubly serrate, often lobulate, with short-pointed teeth, sparingly pubescent above, white-tomentose beneath, 3–5 in. across; petiole 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: 324. H. W. 3: 38, p. 26. F. E. 14: 1154, pl. 39. G. W. 8, p. 615. M. D. G. 100: 1904: 180.—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. mandsłurica, Rupr. & Maxim. Tree, to about 60 ft.: young branchlets and buds with brownish tomentum: lvs. orbiculate-ovate, short-acuminate, usually cordate 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 cordate 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. L. F. 1: 72.

16. Maximowicziâna, Shirasawa (T. Miyójii, Jack. T. Miquéliana, Sarg., not Maxim.). Fig. 3815. Tree, to 100 ft.: young branchlets tomentose: lvs. broadly ovate or orbiculate-ovate, abruptly acuminate, obliquely cordate at the base, coarsely serrate with broad macro-
TILLAGE

cuspidate, 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; petiole stout, less than half the length of the blade: fls. small, 10-18 in pendulous tomentose cymes; style exerted: fr. globose, thick-walled. Japan. S.I.F. 2:50. G.F. 6:113 (adapted in Fig. 3513).


ALFRED REHDER.

TILLIÆ (named for M. A. Tili, 1653-1740). Crossulaeceæ. Annual herbs, usually very small, aquatic or terrestrial, somewhat succulent, generally very glabrous; lvs. opposite, cylindrical, subulate or flat, very entire: fls. minute, axillary, solitary or cymose or arranged in terminal cyme panicles, white or red; calyx 3-5-lobed or parted; petals 3-5, free or connate at the very base; stamens 3-5; carpels 2-3, free; follicles many, rarely 1-seeded. About 25 species, cosmopolitan. The genus has: stately, tall, slender plants, and decumbent at base, reddish, about 1 in. or more long: lvs. oblong, blunt: fls. axillary, sessile; sepals ovate or lanceolate; petals nearly subulate, white tipped with red. Eu., in moist barren places.

TILLAGE. The working or stirring of the land, with the purpose to improve it for agricultural purposes, is known by the general name of tillage. There is a tendency to use the word cultivation for these operations. Tillage is a specific technical term, and is to be preferred.

In the eager discussions of scientific matters, as applied to agriculture in recent years, there is a tendency of forgetting that the fundamental practice in all kinds of farming, after all, is the tillage of the land. The knowledge of the importance of tillage has developed late in the world's history. In fact, it was only within the latter part of the last century that the real reasons for tillage, as a means of soil improvement, were discovered. Even now there are many persons who think that the object of tillage is to kill weeds.

The modern conceptions of tillage probably date largely from Jethro Tull's book on "Horse- hoeing Husbandry," which reached the second and full edition in 1733. This book is not the first, but the first to bring the discussion to a clear conclusion that the system of "horse-hoeing husbandry," as it was called, was the "new husbandry." There had been tillage of land before Tull's time, but his writing seems to have been the first technical effort to show that tillage is necessary to make the soil productive rather than to kill weeds or to open the ground to receive the seeds. He contrived various tools whereby grain crops could be sown in rows and afterward tilled.

The tillage of the land in early times was confined very largely to that which preceded the planting of the crop. In the vineyards of southern Europe, however, Tull observed that tillage was employed between the vines during the season of growth. Such vineyards prospered. He made experiments and observations on his return to England and came to the conclusion that tillage is of itself a very important means of making plants thrifty and productive wholly aside from its office of killing weeds. He supposed that tillage benefits plants by making the soil so fine that the air penetrates it, and improves its physical condition with respect to warmth and dryness.

Tillage also saves 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 is merely fine and the tillage is shallow tillage. The capillary connection between 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 conservation 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. Nitrification, decomposition, and other bacterial activities are hastened. The stores of plant-food are rendered available. The soil is made more productive.

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 practiced 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 it. The gardener adds a little peat or leaf-mold, 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 as a handful of soil as a farmer will produce from a bushel.

L. H. 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, archebias, guzmannias, pineapples, and the like; ornamental glasshouse 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. Vriessa is distinguished by having 1 or 2 scales or ligules at the base of the petals on the inside, whereas the petals of Tillandsia are elagulate. By some authors the Spanish moss is placed separately, as Dendropogon usneoides, Raf., distinguished by the habit and also in characters of flower and seed. Some of the cult. tillandsias belong to still other genera. This is the ease with T. zebrina, which is properly Cryptanthus zonatus (Fig. 1120, Vol. II). This is an odd plant, producing crinkled deflexed saw-edged lvs., which are 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. but most of these are known only to amateurs and in collections where species of botanical interest are chiefly grown. In the American trade about 30 names appear, many of which are to be referred to other genera. The generic limits of Tillandsia, as of most bromeliaceous genera, are ill defined. By different authors a given species may be placed in any one of a half-dozen genera. Lately, Tillandsias and Vrieesia have been merged, but in this book Vrieesia is kept distinct, following Mez's monograph. It is useless to attempt a description of all the tillandsias that by chance may occur in collections. Persons who want to know the species other than those regularly in the trade should consult Baker's Handbook of the Bromeliaceae, 1889, or Mez's Bromeliaceae in DeCandolle's Monographie Phanerogamarum, 1896. The latter work, which regards Vrieesia as a separate genus, admits 248 species of Tillandsia. In the United States, the plants are most commonly found on the Gulf coast.

3816. The Spanish moss (Tillandsia usneoides) hanging from the trees. Gulf coast.

the South. The native upright tillandsias are not in the general trade, but they are sometimes offered: of such are T. recurvata, T. tenuifolia, T. fasciculata, T. utriculata.

Tillandsias are grown both for foliage and for flowers. The foliage is usually scurvy and sometimes blotted. Many of the species are very showy while in bloom, sending up strong central clusters of blue, violet, red, yellow, or white flowers. In nature, the seeds are 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. In cultivation, most of the species are treated as pot-plants. The growing season is short, and the plants may 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.

a. Plant-body slender and hanging; fls. solitary in lf.-axils.

usneoides, Linn. Spanish, Florida, or Long Moss. Figs. 3816, 3817. Whole plant hoary-gray, hanging from 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. 6398. 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.

aa. Plant-body stiff and nearly or quite erect.

b. Stamens shorter than the petals.

c. Fls. few in the cluster.

recurvata, Linn. (T. Bartramii, Ell., at least in part). A few inches high, tufted, with seuriy terete or filiform recurved 2-ranked lvs.: fls. 1-5 on spike that is sheathed at the base but naked above, the corolla blue and exceeding the calyx. Fls. to Argentina and Chile.

c. Fls. many, distichous.

aniceps, Lodg. (Vrieesia anicps, Lem.). Erect, the fl.-st. 6-12 in. tall and bearing a spike with large distichous green bracts from which small blue fls. emerge: lvs. stiff, about 1 ft. long, dilated and striped at the base: fls. 2 in. or less long, blue or purplish, the perianth much exceeding the calyx. Costa Rica, Trinidad. L.B.C. 8:771.

Lindeniina, Regel (T. Lindeni, Morr. Vrieesia Lindeni, Lem.). Lvs. rosulate, about 1 ft. long, dilated at the base, long recurving: spike large, the showy distichous bracts carmine: fls. large, much exerted beyond the bracts, the large wide-spreading segms. bluish purple. Ecuador, Peru. I.H. 16:610; 27:370 (as var. usneoides). G.C. II. 12:461. B.H. 1808: 206 (as var. tricolor). F.M. 1872:44.—A handsome and popular species. This interesting species has also been described as Phytarrhiza Lindeni, Morr.
bulbosa, Hook. Small scurfy 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, or in a congested spike; petals narrow, the much exerted but not spreading petals purple. Var. pica, Hook., has the upper lvs. and bracts scarlet. W. Indies to Venezuela. B.M. 4288. F.S. 3:221.

cc. St. not prominently swollen.

d. Lvs. linear or filiform from the base or abruptly from a dilated base.

polystachya, Linn. (T. angustifolia, Swartz. T. parviflora, Baker.) Lvs. rosetulate, lepidote or scurfy, curved, equaling or exceeding the st.: infl. compound, somewhat paniculate, the lateral branches or spikes bearing distichous keeled acutish petals, glabrous, or red-tinged, or red-tinged, red-villous, or red-tinged and villous; fls. narrow, the central ones, the bracts distichous and pointed and little exceeding the calyx: fls. blue. S. Fla. to Brazil.

tenifólia, Linn. (T. cespitosa, Le Conte, not Cham. & Schlecht. T. Bidrromitum, Ell., in part.) Plant less than a ft. in. tall, reddish, clustered: lvs. awl-shaped and erect, not 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.

dd. Lvs. gradually narrowed from a broad base.

fasciculata, Swartz (T. bracteata, Champl. T. glaucophila, Baker. Vri$ssia glaucophilla, Hook.). Tall, strong species with st. 2 ft. tall: lvs. 1-1½ ft. long, concave or channeled above, erect or ascending, scurfy and bluish; st. longer than the lvs. and branched, the branches or spikes bearing distichous keeled acute petals, glabrous or red-tinged, or red-villous, or red-tinged and red-villous, or red-villous and glabrous, or red-villous and glabrous beneath: the blue petals villous, 1-3-branched at apex, bracts umbellate: fls. blue, with their pedicels conspicuously bracteolate at base. Known also as Tradescantia erecta, T. undata, T. latifolia. B.M. 1340. B.R. 1403. L.B.C. 13:1300.

Sometimes seen in old gardens but not offered in the trade.

TINNÉA (named in honor of Mlle. Tinné). Labiáceae. 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. fusco-vitexaceous, yellow, green, or pale. petals 4-2; ovary 2-lobed; corolla-limb somewhat 2-lipped; stamens 4, didynamous; ovary shortly 4-lobed: nutlets obovovoid-clavate. About 23 species. Afr. T. Sacleuxii, Sprenger. Dwarf shrub with the branches shortly and densely pubescent: lvs. short-petioled, oblong or ovate, entire, ½-1 in. long, villous, or calyx membranous, deeply 2-lipped; corolla nearly 1 in. long, lower lip much longer than upper. Trop. Afr. (7).

TIPUANA (name apparently Latinized from a Brazilian name). Leguminóseae. Showy unarmed trees, used ornamentally in the extreme southern U. S. Lvs. unevenly pinnately compound, without stipules. Lfts. several, alternate; stipules minute, caducous; fls. showy, yellow or pale purplish, in loosely branched terminal panicles; calyx tubinicate, teeth short and broad; standard ovate or suborbicular, notappendaged; 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 introd. to S. Calif. as Macherium Tipu, which is said to yield one of the roseneeds of S. Brazil.

speciosa, Benth. (Macherium Tipu, Benth.) Tender yellow-fl. tree: lfts. 11-21, oblong, emarginate, entire, 1½ in. long; veiny, parallel; standard broadly orbicular; wings very broadly half-ovate, much larger than the keel; pod veiny. S. Amer.

F. TRACY HUBBARD.

TIPULARIA (Latin, Tipula, a genus of insects, alluding to the form of the flower). Orchidáceae. Small terrestrial orchids in N. Amer. and the Himalaya region. Herbs with solid bulbs, having several generations connected by offsets: if solitary, basal, appearing in autumn long after the flowering season; fls. in a long, loose terminal raceme, green, nodding; sepals and
TIPULARIA

petals similar, spreading; labellum 3-lobed, produced into a long spur behind; column erect, winged or nearly winged.—Two species, one Himalayan.


TITTHÔNA (of mythological derivation; Tithonus was the favorite of Aurora). Compôsîte. Robust half-hardy annuals sometimes shrubby at base: lvs. alternate, petaled, entire or 3-lobed; heads large, on a long stalked peduncle, heterogamous; ray-fls. noting, disk-fls. perfect and fertile; involucre hemispherical or broadly campanulate; receptacle convex; corolla yellow, ray-fls. ligulate, disk-fls. tubular, 5-toothed: achenes somewhat plicate. —About 10 species, Mex., Cent. Amer., and W. Indies.

diversifolia, Gray (Mirabilla diversifolia, Hemsl.). Large shrub with rather stout branches, glabrous or nearly so: lvs. petaled, membranaceous, glabrous or puberulent, ovate or almost orbicular, entire or 3-5-lobed, 9x6 in., crenate: 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.

speciosa, Hook. (Leighia speciosa, DC. Heliénthus speciosus, Hook.). Shrub with erect, terete st.: lvs. petaled, cordate, 3-lobed or entire, crenate: peduncle with a single head, which is scarlet and about 3 in. diam.: achenes obtusely 4-angled. Mex. B.M. 3295. G.C. III. 57, suppl. Mar. 13. F. TRACY HUBBARD.

TOCÔCA (tococo is the native name of T. guianensis). Including Sparáphyge, Melastómâceae. Glabrous or hispid-pilose shrubs, sometimes bearded with setae at the axis, grown in the warmhouse for their foliage.

Leaves petaled, large, membranaceous, rarely coriaceous, entire or denticulate, 5-nerved: fls. rather large, arranged in terminal and sometimes also lateral pani- cles, white or rose; calyx glabrous, pilose or hispid, tube campanulate, terete or ribbed, limb obtusely rarely acutely 5-6-lobed; petals 5-6, obovate or oblong; stamens 10-12; ovary 3-5-celled: berry fleshy; seed obvoid or pyramidal.—About 30 species, natives of Brasil, N. Venezuela, and Guiana.

Tococo requires a warmhouse temperature, with shady and fairly moist place. 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. (Sparáphyge imperialis, Linz.). St. simple or little branched, erect, robust: lvs. opposite, decussate, oval, with 5 longitudinal ribs running from base to apex and many parallel transverse veins connecting them. Peru. J.H. 24:284.—Native of Peru, and intro. to Eu. by Linden in 1871. It is said to be easily grown in a warmhouse.

platyphyllos, Benth. (Sparáphyge latifolia, Naud.). Short-stemmed plant with succulent somewhat tortuous st.: lvs. broadly ovate, minutely denticulate-ciliate, 7-nerved on the nerves; ovary 5-loculed. Colombia, Venezuela, Costa Rica—Coppinoux puts this species in a section characterized by having the lvs. desti- tute 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 (Kaka Toddâli, Malabar name of T. aculeata). Rutáceae. Shrubs usually somewhat climbing or scrambling, unarmed or prickly, adapted to warmhouse and hardy outdoors in the tropics. S. Lvs. alternate, 3-foliate; lfts. sessile, lanceolate, leathery, entire or crenate, pellucid-punctate: cymes or panicles axillary and terminal: fls. rather small, unisexual by abortion; calyx short, 2-5-toothed, -lobed, or -parted; male fls., stamens 2, 4, 5, or 8, ovary rudimentary, ovary ovate, oblong or globose, 2-7 rarely 1-celled: 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.

laceolata, Lam. (Vepris laceolata, A. Juss.). Small tree or large shrub, erect, without prickles, entirely glabrous; petioles 1-2 in. long; lfts. oblong-lanceolate, 2-3 in. long, acute, entire, waved at the edge, 3-4 in. broad: panicles axillary and terminal, thyrsoid: petals a line long, imbricate; stamens 5, in the male exserted: fr. the size of a pea, 4-lobed, fleshy, gland-dotted. Mauritius, Mozambique, Cape.—Intro. by Reasoner Bros., 1891.

WILHELM MILLER.

TODEÁ (H. J. Tode, a German botanist, 1733-1797). Osmundacées. GABLE FERN. A group of ferns with fleshy sporangia, as in Osmunda, but having these borne on the backs of ordinary lvs. The last three species, although frequently united with Todea, more properly form a distinct genus Leptopteris, differing widely in habit from the original Todea; they form delicate foliage plants resembling the filmy ferns in habit. For cult., see Ferns.

a. Texture leathery: lvs. bipinate.

bárbara, Moore (T. africana, Willd.). St. short, erect: lvs. in a crown, 3-4 ft. long, 9-12 in. wide; pinna 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: lvs. with linear divisions.

l. lvs. triplinattifid.

hymenophylloides, Rich. & Less. (T. pelluâda, Hook.). Lvs. 1-2 ft. long, 8-12 in. wide, lowest pinnae about as long as the others; mez瑱es mostly naked. New Zel.

supérbâ, Col. St. erect, woody: lvs. 2-4 ft. long, pinna often crisped, the lower gradually reduced; rachises densely tomentose. New Zel.

bb. Lvs. bipinate.

Frâseri, Hook. & Grev. St. erect, woody, 18-24 in. high: lvs. 1-2 ft. long, lowest pinna nearly as large as the others; rachis narrowly winged. Naked. Austral.

L. M. UNDERWOD.

TOFIELDIA (named after Tofield, a Yorkshire botanist). Liliâceae. Perennial herbs, mostly hardy: st. erect, from a short or repent rhizome: lvs. radical or clustered at the base of the st. short-linear, somewhat dichotous; cauline lvs. few or none, flat, spiny; in a terminal spike, subsessile or short-pedicelled; 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. rales 2-5, B.S.P. (T. pubens, Michx. Trinâthia racemosâ, Small). St. and lvs. sub-erect, 1-2 ft. high: lvs. glabrous, linear-juniar: lvs. 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
TOMATO

TOLMIEA (named for Dr. Tolmie, surgeon of Hudson Bay Co.). Saxifragaceae. Herbaceous, glandular pubescent, hardy; rhizome scaly; sts: simple: cauline lvs. alternate, radical petioled, cordate-insected-lobate; stamens and stigmas united, simple: fls. rather secund, nodding, green; calyx-tube elongate, funnel-form-campanulate, 5-lobed; 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.

Menziesii, Torr. & Gray (Leptádia Menziesii, Raf.). Perennial herb, 1–2 ft. high, with slender creeping rootstocks and some summer runners: lvs. round-cordate, more or less coriaceous and rather toothed, emarginate, stalked, all alternate, those of the st. 2–4 in number: raceme ¾-1 ½ ft. long; fls. and caps. nearly ½ 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 the fruit is ripe and grooved.

Wilhelm Miller.

TOLPIS (name unexplained). Composita. Herbs, annual and perennial, allied to Crops, with showy yellow heads, suitable for the flower-garden or border, 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, involute, the involucre campanulate with narrow bracts in several series; receptacle naked or pitted; achene suberete, 6–8-ribbed, the pappus of 8–10 very slender setae. T. barbata, Gaertn. (Crepis barbata, Linn.), from S. Eu., is an erect branched annual with attractive yellow heads, the outer scales of involucre subulate; lvs. lanceolate, dentate, the upper ones near the fl.-heads long-subulate; blooms from midsummer till frost. B.M. 35.

TOLÚFERA: Myroxyylon. The following species now planted as a shade tree in S. Fla. was mentioned under Myroxyylon M. Pereraz, Klotsch (Tolúfera Pereraz, Baill.). Tree: lvs. uneven-pinnate; lfs. 6–9, from 2–3 in. long, 14–16 lines broad, obovate, glabrous; petiole ¾ in. long, terete and sparsely puberulent; pod 2½–3 in. long. Cent. Amer.

TOMATO. The plant Lycopersicum esculentum (which see, page 1981, Vol. IV), grown extensively for its edible fruit, 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. 3815.) 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 home 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 straights 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 stake. The back 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 peduncle rot will occur, 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 perennials; in some cases it is grown from seeds as an annual. It may be grown 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 80° F., makes very slow growth in one below 40° F. and, unless hardened 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 (but 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 sun 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 different in cultural practice as to bring one crop into the fruiting-stage in better condition, or at a time when the weather was more favorable for a full setting of fruit. The plant, however, is very tenacious of life and will continue to ripen 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 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 composition, from “goose” prairie, marsh muck, stiff clay, to a light sand provided the conditions of drainage, fertility, and tillth 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 tomatoes or potatoes.

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 of vines ripening 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 vine 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 3 inches wide, with heat of two-fifths potting earth or garden loam, two-fifths old well-rotted cow-manure, and one-fifth coarse sharp-grained sand. Soils used in plant-boxes or beds should always be sterilized by steaming. Steam-pipes perforated on the lower side and filled with live 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 plantlets show above the soil, when they should be set in full sunlight and kept at a constant temperature below 100°, 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 for the plant-boxes. The plants may be set three to twenty-four in the square foot, but the smaller the number the more the plants will be 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 soil should be watered as necessary to prevent the plants wilting, but this should be done as far as practicable in evening or early morning, rather than during bright sunshine. If necessary the beds may be protected from frost 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 creep 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 slow 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 cutworms 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 ground broadcast by thorough 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 and the next day the plants should be again sprayed with bordeaux.

Field culture should be as close as possible. 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 plants, 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.

...quantity and quality 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, particularly if the season or 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 plants have their pet 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 practiced 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 hundreds of vines 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.*—Rank-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.

*Cherry,* both *Red and Yellow.*—Strong-growing vine, very productive of cherry-shaped fruits, which are excellent for pickles and preserves.

*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 varieties).—Comparatively small vine, with broad entire leaves.

*Dwarf Champion.*—Vine very short, compact, leaves thick, crumpled, nearly entire.

*Tree.*—Vine very short, compact and upright in growth, with distinct thick nearly entire leaves.

*Golden Banded.*—Fruits covered with down similar to that on a peach or plum.

*Diced.*—Fruit bright red, distinctly striped with yellow.

*White Apple.*—Round smooth yellowish white 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 classified them as one of the more distinct of the varietal forms listed by seedsmen under different names.

*Earlana.*—Comparatively small weak-growing vine, but matur- ing very early a large crop of smooth bright red fruit.

*Bunny Bost.*—Vigorous vine, ripening very early and evenly a large crop of uniformly round bright red fruit.

*Matchless.*—Large smooth bright red fruit, with red fine-flavored but not very solid flesh.

Red Rock.—A healthy productive vine, with uniformly flattened globular fruit of fine flavor.

*Pedestal Giant.*—Vine dark red, but very hardy and productive of large handsome bright red fruit of superior quality.

*Sterling Castle.*—Vine does particularly well under glass, producing large crop of small well-formed fruit, bright red fruit.

*Prince Bourgogne.*—An Italian sort, wonderfully productive of bright red, long plum-shaped fruit of fine flavor.

*Stone.*—Very vigorous and productive vine, with oval purplish red fruit.

*Ponderosa.*—Very large solid-shelled fruit with small seed cavities, little pulp, and few seeds.

*June Pink.*—Early-maturing, purplish pink fruit.

*Acme.*—Large vigorous vines, with round purple-pink fruit.

*Beauty.*—Strong-growing vine, with a large flattish oval purple fruit.

*Honor Bright.*—Vine, although apparently unhealthy, is very productive of very firm hard-shelled fruit, which in ripening changes from white to distinct yellow, then to very bright red.

Many carefully conducted trials have shown that first germination crosses will generally give a larger yield of fruit than either parent. In the experience of breeders, such increased yields have been in proportion to the varietal distinctness and purity of stocks crossed.

No distinct difference in the varietal character of plants from seed of different fruits of an isolated vine of pure stock has been discovered from seed of the first and the last ripe fruit of the same vine showing no difference in earliness. Nor has any consistent difference been detected in size or form of fruit in plants grown from seed of a small smooth and a large rough fruit from the same plant.

Although the flowers are seldom self-fertilized, it is thought that they are with few exceptions pollinated from those of the same plant, generally from those of the same cluster and one should be guided in seed selection by the general character of the plant, rather than by that of single fruit. When plants are grown so that the branches intermingle, there would very likely be crossing and it is wisest to save seed from isolated plants.

One should first form a clear-cut conception of the exact varietal character desired, then carefully select isolated plants which come nearest to ideal and save, separately, seed from a number of fruits. A few seeds from each lot should be grown to fruit maturity under glass during the winter. It is quite possible that this will reveal some lots which do not breed true; such can be rejected and the best and purest lots planted for seed crop.

Seed is often viable when taken from fruit set early in the season, it shows but little color and plants from such seed sometimes show a little gain in earliness, but they are weaker, less fruitful and do not carry their individuality so well as those from fully ripened seed. Plumper, heavier seed, which will retain its viability much longer, is secured from fruit which is fully ripe. The amount to a bushel of fruit varies greatly from only one to two ounces in sorts like the Ponderosa to as high as twelve to fourteen ounces in the smaller more seedy sorts.

When the amount of fruit is less than a bushel and the appearance of the seed is important, the best plan is to spread the fruit in the sun until it is fully ripe. Cut each fruit through the center, and by squeezing the pulp seed can be pressed out. Let this stand, and in one to three days, depending on the ripeness of the fruit and the temperature, it will separate, the seed falling to the bottom. Pour off the liquid, add to the seed two or three times its bulk of water, stir, let settle and pour off the water and repeat with fresh water until seed is clean. Spread not over three or
four seeds deep and stir every hour or two until seed is thoroughly dry.

Larger quantities can be handled as follows: Separate the pulp and seed from the flesh and skins. Seed-growers usually do this by running the ripe fruit through rollers about ¼ inch apart. (In a small water-hand cider-mill will do this very well.) Then run the pulp and seed through a slowly revolving cylinder of wire netting of about ¼-inch mesh, set at a slight incline so that the seed will fall through the netting, while the flesh, skins, and the like will gradually work out of the lower end. Allow the seed and pulp to stand and ferment until the seed settles and is covered with liquid, which will require from ten to forty-eight hours, according to condition. Care should be taken not to add water or rain while ground fruit is fermenting. Pour off the liquid. Put two or three pails of seed in a barrel, add four to eight pails of water, agitate, and then let seed settle and carefully pour off the water, carrying what pulp and bits of skin it will. Repeat with fresh water till seed is clean. Spread seed not over ¼ inch deep on cloth- or wire-bottom screens. Expose to sun and every few hours stir the seed until it is entirely dry, then bag. Care should be taken to be sure that seed is quite dry, because bagging, for it will seem dry to a novice long before it is fit.

W. W. TRACY.

GROWING 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, it is necessary to start the seeds in the winter months, and, as the tomato is very sensitive to cold, it must be given careful protection for the first six weeks or two months of 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 or three acres and does all the detail work connected with the growing and harvesting of the crop.

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 young seedlings are not to be allowed to go over 30° F., during the day, nor below 65° 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, under which conditions they 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, 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.

The seeds for the early market should be planted on well-drained elevated land, that has some form of windbreak on the north side. The land 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
Tomatoes should receive frequent and thorough cultivation from the time they are set in the open field until the plants are mature. bloom 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 their first cluster of blooms and are also beginning to force out shoots from the axis of the leaves. The plants should be gone over carefully every few days and all lateral shoots 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 rotting 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. Moist sponges are placed in the 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 crates 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.

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.

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 500 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
ble part of the crop. The fruit is attacked at the bloss-

dom-end. A small black speck first appears, which
gradually increases in size until the entire fruit is
affected. There is practically no remedy. The best
thing to do is to gather and destroy the fruit as soon
as it becomes affected.

Tomato-wilt often attacks the plants when the crop is
grown on the same land more than one season in
succession. Rotation should be practiced as a safe-
gard against this disease.

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 infesta-
tion, cowpeas should not be planted on the land pre-
ceding tomatoes, as most varieties of peas encourage
the development of the nematode.

The boll-worm sometimes causes considerable dam-
age. This is a large green worm that enters the fruit
near the stem-end. As soon as the fruit becomes
infested, it is entirely worthless and should be removed
and fed to hogs or destroyed. The boll-worm can be
paralyzed control by applying 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.

E. J. KYLE.

Tomato-growing under glass.

The tomato ranks next to the cucumber and perhaps
next to lettuce in importance 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. In fact, it is the custom of forcing the grower to
plant until early spring and then the beds and benches
are planted in tomatoes which will ripen during the
months of May, June, and July. An early summer crop
is considered more profitable than late fall and winter
tomatoes, notwithstanding the fact that prices are
always much lower. The larger net profits are due to
larger yields obtained at much less expense, and there
are no fuel bills to pay during the months of June and
July and very little artificial heat is required in April
and May. These remarks are not intended even to
suggest that the forcing of tomatoes should be restricted
to late spring and early summer, for many growers
realize substantial profits on the fall crop and some-
times on midwinter tomatoes.

The tomato is also a popular vegetable in houses
which are used solely in providing fresh vegetables at
all seasons for the home table. No fruit or vegetable
is more appreciated in the winter months than well-
grown greenhouse tomatoes which are superior in qual-
ity to those grown in the open ground.

Numerous varieties are used for forcing purposes.
English varieties have received much attention and
some of them, such as Comet, have been grown on a
large scale. American sorts, however, are now relied
on mainly by the most extensive American growers.
Bonny Best is undoubtedly taking the lead among red-
fruited varieties. It is very prolific and the round
smooth fruits are popular on most markets. Beauty,
Globe, and Trucker Favorite are planted most exten-
sively wherever pink or purple fruits are wanted.

In the starting of tomato plants for forcing, there
should be a space of about 12 inches between each
plant until the plants have attained full size in the beds.
It is customary to sow the seed for the fall crop soon after
June 20, 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 crowd-
ing. 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 uni-
form soil-moisture conditions. Benches are an advan-
tage 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 satisfac-
tory. Large pots and boxes are often used in small
houses but they are not practicable on a large commer-
cial 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 bal-
anced. An excess of nitrogen, with copious watering and
high temperature, causes a rank growth of plants and
low yield. The tomato, like other vegetables, requires
with the mineral elements and enough nitrogen to
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 material and should receive
special attention to the supply of fiber or organic
matter. The productiveness of greenhouse soils, what-
ever the crop may be, depends more on their physical
properties than upon their chemical composition.
Stable manure, used in ample quantity for lettuce, will
make the best preparation for tomatoes and no addi-
tional manure will need to be applied to the tomatoes,
extcept as a mulch. Special fertilizers have not been
found necessary, and seldom 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 gar-
dener sets the plants in inches apart in paths 3 feet
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 immedi-
ately after the tomato plants have been set. The prac-
tice 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. In order that
the laterals do not make too much growth, it is best to
look over the plants every three or four days. When
the plants are grown on a support of about 5 feet the tops
are nipped. The stems may be supported in any conven-
ient way. Various arrangements of wire, or wire and
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 tilted, if it is pre-
ferred, but the better practice is to mulch the ground
with 3 or 4 inches of fresh horse-manure which has been aerated 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 perfect leaved mulch; 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 rises 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 outdoors. Jarring the plants daily is usually sufficient to get the desired results. The hot setting 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, is a good yield, and four pounds for the winter crop is considered satisfactory. An average of 10 cents a pound for the spring crop makes it a profitable undertaking, and 50 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: Angélica. The following species, in the lists under Tommasinia, should be entered with Angelica in Vol. I, p. 287. Angélica verticillarís, Linn. (Tommasinia verticillarís, Bertol. Peucedanum verticillarís, 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-pinnate, the lfts. 1-lobed, and this lateral ones often 2-lobed and the terminal one 3-lobed, the petiole much dilated at base. Piedmont region, S. Eu.


TORNÉNIA (named for Olaf Toren, clergyman; traveled in China 1750-1752 and discovered T. asiatica). Scrophulariaceae. Glabrous, pubescent or hisurate annual or perennial herbs, mostly low, branching and somewhat decumbent, grown sometimes in the greenhouse for winter bloom, but more generally grown outdoors.

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-lipped; corolla-tube cylindrical or often broadened 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.

Toreniais are of easy cultivation and are very useful for window-boxes, low 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. Fournieri has the best habit for a bedding plant, but it may be bordered with T. flav. They are easily raised from seed, sown indoors or in the open, but may also be grown from cuttings.

In Florida Torenia Fournieri 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 situations, where only cacti and succulents 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. Nehring.)

3824. Torenia asiatica. (X ¾)

flava, Buch.-Ham. (T. Ballonii, Godefr.). Usually decumbent and creeping: lvs. 1-2 in. long, ovate to oblong, coarsely serrate; 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-
TORENIA

Plants also somewhat resemble the orchids, with broad, fleshy, ovate to oval leaves, and a green, column-like structure at the top of the plant. They are native to tropical regions and are commonly used as ornamental plants. The flowers are usually small and borne in clusters at the ends of branches.

**Fournieria**, Lind. (T. edentula, Hort. var. dustiannum). Low, bushy, usually annual, becoming nearly 1 ft. high; st. 4-angled; lvs. petioled, cordate-lanceolate, 1-1/2 in. long, crenate-serrate; petiole 1/8 in. long; corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lobe not cut, pale blue, the anterior lobe 3-lobed; lobes round-obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. R.H. 22:249. R. H. 1879, p. 465. B.M. 6747. G. 1: 5-8. Var. alba, Hort. (var. White Wings), has pure white ffs. A.F. 5: 401. G. M. 36: 87. Var. compacta, Hort., is a more compact form than the type and rather larger-st. G. W. 10, p. 610. Var. grandiflora, Hort., has somewhat larger ffs. and is more free-flowering. Var. speciosa, Hort., is a showy form offered in the trade, probably very similar to var. grandiflora.

**B.B.** Les. ovate or obovate-ovate.

asiatica, Linn. Fig. 3824. Annual, erect or diffuse: st. quadrangular: lvs. ovate or ovate-lanceolate, long-acuminate, serrate, obtuse, not cordate at the base, rough to the touch; peduncles axillary, single-st.; corolla large; tube dark purple; limb 4-lobed, of a deep purple-blue, with a dark blue blotch on the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B. M. 4249. Var. pulcherrima, Hort., has larger, dark violet-blue ffs. with a white spot on the upper lip. G. Z. 4: 96.

atropurpurea, Ridley. Lvs. ovate or ovate-deltoid, 3/4-1 1/2 x 1/4-3/4 in., short-petioled, serrate: ffs. usually solitary on peduncles at the ends of the branches; calyx narrow, wingless; corolla dark purple, 1 1/2 in. long, tube narrow at the base, much enlarged, and curved above, limb about 1 in. across with 4 rounded lobes. Malay Penins. B. M. 8688.

P. TILACY HUBBARD.†

TORREYA (named for Dr. John Torrey, one of the most distinguished of the earlier American botanists; 1796-1873), Syns., T. longifolia, Cephalotaxus. Taxaceae. Ornamental evergreens, grown for their handsome foliage and interesting habit.

Strong broad trees: lvs. 2-ranked, linear or linear-lanceolate, with 2 narrow glaucous lines beneath, becoming fulvous with age; when bruised the foliage emits a pungent or fetid odor except in T. grandis: ffs. dioecious, rarely monocious; staminate ffs. ovoid or oblong, composed of 6-8 whorls of stamens, surrounded at the base by bud-scales; pistillate ffs. consisting of a solitary ovule surrounded at the base by a fleshy aril and several scales: fr. drupe-like, consisting of a rather large seed, with thick wooly shell entirely covered by a thick fleshy aril.—Four species in N. Amer. and B. Asia. The hard, strong, and close-grained wood is much valued in Japan for cabinet-making and building. It is very durable in the ground. In this country it has been used for fence-posts.

The torreyas are handsome evergreen trees, with spreading usually whorled branches, clothed with yew-like two-ranked dark green foliage; the fruits are drupe-like and about 1 inch long. They are but little known in cultivation and rarely seen in a flourishing condition. The Japanese T. nucifera is the hardest and has proved fairly hardy as far north as Massachusetts; also T. grandis survives in very sheltered positions in the vicinity of Boston, but the other two species are much tenderer. Torreyas grow best in shaded and sheltered positions and in a somewhat moist loamy soil. Propagation is by seeds; also by cuttings and by grafting on Cephalotaxus. Plants raised from cuttings grow very slowly and usu-
TOURNEFORTIA
world. Mostly trees and shrubs, rarely subshrubs, with alternate simple lvs. and small fls. in terminal cymes. *T. heliotropoides*, Hook.—*Heliotropium anchusaefolium*, which see.

TOWNSÉNDA (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 perennials have much shorter 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 fls. As a genus, *T. condensata*, *T. Wilcoxiana*, and *T. Rothrockii* are 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; sts. spreading from the base or crowded along the lower lvs, of the terminal heads: rays white or purplish-tinted; involucral bracts narrowly lanceolate, mostly acute; pappus-brisistles 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 feathery; lvs. spatulate-obovate, crowded around the large, broad, sessile heads: rays 100 or more, narrow. Wyö.—*T. Rothrockii*, Gray. Lvs. spatulate, rostrate around the solitary head which is closed; pappose at surface of ground, or at length with 1 or 2 additional heads from same crown. Colo.—*T. Wilcoxiana*, Wood. A small stemless plant: lvs. in rosettes, spatulate, hairy; fls. yellow, on short scapes. May. Dry plains and hills, Okla. to Colo.

WILHELM MILLER.

TOXICODÉNDRON (Greek, poison tree): Hyz- 
anchez, but by some retained as the tenable name. This *Toxicodendron* dates from 1796, but the To-xicodendron of Tournefort and Miller is much earlier and is revived by some botanists for the poison sumac and poison ivy (*T. Vernix* and *T. radicans*) and their kin but which in this book are still retained in *Rhus. T. capense*, Thunb., a very different plant and one of the Euphorbiaceae, is treated under *Hymenanche*, Vol. III, page 1618.

TOXICOPHLÉA: *Acocanthera*.

TÓXYLON: *Marula*.

TRACHÉLIUM (Greek, trachelos, neck; from its supposed efficacy in diseases of the throat). *Campanulo- 
aceae*. THROATWORT. Perennial herbs or subshrubs, glandulose, brownish in, a much-branched corymbose panicle, sometimes short, many-stemmed or cespitously much branched, with the fls. rather umbellate at the ends of the branches: fls. blue; calyx-tube adnate, obovoid or subglobose, angulate; limb 5-parted, lobes narrow; corolla naupseate, ovary viscid; ovary 2-celled; style 3- 2-celled, many-ovuled: caps. subglobose, angulate, membranaceous; seeds small.—About 6 or 7 species, Medit. region. Prop. by seeds or cuttings.

TRACHELOSÉRUM 3361

**caruléum**, Linn. A half-hardy biennial or perennial, 1–3 ft. high: lvs. ovate, acuminate, unequally serrate: fls. blue or white, in dense terminal cymes, in late summer. Shaded places in S. Eu. Br. 72, G. 28, p. 181; 47, p. 303; 51, p. 84. J. H. III. 50:17.—An attractive late- flowering perennial suited to cult. as an annual. According to G. 28, p. 151, the species is fairly hardy in 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 G. 47, p. 303, plants from cuttings are dwarfer than seedlings.

F. W. BARCLAY.

TRACHELOSPÉRUM (Greek, neck and seed, referring to the fact that the seed has a neck). Syn., *Rhynchospermum*, *Apocynaceae*. Glabrous or slightly tomentose-puberulent shrubs, 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 salver-shaped, tube cylindrical, 5-lobed, lobes oblong, twisted to the left, overlapping to the right; disk annulate, truncate or 5-lobed; ovary 2-carpelled: follicles elongate, slender, terete.—About 16 species, E. Asia and Malaya.

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-ripened 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 jessamine.” 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**, Lem. (Rhynchospermum jasminoides, Lindl.). STAR JASMINE. Also called “Confederate,” “Maayan” or “African” Jessamine. Fig. 3826. Tender, evergreen, climbing shrub: lvs. short-stalked, ovate lanceolate, acute, glabrous: peduncles much longer than lvs.: calyx-lobes reflexed; corolla-tube contracted

3826. Trachelospermum jasminoides. (X⅔)

_T. demiriodicum_, Kuntze (T. crocostomum, Stapf). Similar to _T. jasminoides_ in habit, but differs in having slightly smaller buff or pale orange-colored fls. with exerted stamens, pointed in bud, and smaller lvs. Japan, Korea. G.W. 12, p. 415.—It is more hardy than _T. jasminoides_.

**TRACHEOPERMUM**

**TRACHEOPERMUM** (Greek, _rough_ and _fruit)._ _Palmaceae_ tribe Coryphæae. Indoor and outdoor palms, one of which is widely grown and very hardy.

Tall unarmed palms: lvs. suborbicular or reeniform, folded, many-cut; segms. narrow; rachis none: spadices many between the lvs., stout, branched; spathes many, sheathing, coriaceous, tomentose, compressed; bract minute, small, polygamous, monoeious; sepals 3, ovate; petals 3, broadly ovate, valvate; stamens 6; carpels 3: drupes 1-3, globose or oblong.—About 4 species, Himalayas, China, and Japan. Monographed by Beccari in Webbia 1:41-72 (1965).

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. CHAMBERL. excelsa, Thunb. C. Fortunei, Hook. f.). _FORTUNE'S PALM_. Fig. 3827. Trunk robust, clothed with old fl.-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 California, 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 to middle) with stiff segms., while _T. Fortunei_ (China) has lvs. divided much below the middle (as in Fig. 3827), and the segms. more flaccid at least in older lvs. This group needs further study botanically, and also horticulturally in this country.

**Martiana**, H. Wendl. (_T. Khasiana_, H. Wendl. CHAMBERL. Martiana, Wall.). Trunk slender, tall, annulate-scared, for the most part naked: lvs. nearly orbiculate, divided to the middle into numerous segms.: female fls. solitary, sessile: fr. oblong-elliptic, rather compressed, rounded at both ends; seeds deeply sulcate. Himalaya region, Khasia, Burma, and Assam.

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TRACHEMENE


F. W. Barclay.

TRADESCÁNTIA (named for John Tradescant, gardener to Charles I; died about 1635). Commelinaeáceae. SPIDERWORT.

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 branched: Lvs. various: cymes simple, sometimes umbellate or densely paniculate; fls. more or less pedicelled, few or numerous, rarely solitary, red, blue, or white; petals distinct, concaev. green or colored; petals distinct, obvolve or orbiculate; stamina 6, all usually perfect; ovary 3-celled with 2 suprposed ovules: caps. loculicidally dehiscents. About 90 species, all American, ranging from Manitoba to Argentina. The genus was monographed in 1881 by C. B. Clarke (DC. Monogr. Phaner. 3). 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 warmhouse 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. Regina 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 essentially foliate plants. Several species have handsomely striped leaves. All tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

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<tr>
<td>elouagata, 10</td>
<td></td>
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<tr>
<td>fluviatilis, 1</td>
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<td>fuscata, 2</td>
<td></td>
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<tr>
<td>gemiculata, 9</td>
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A. Plant prostrate, rooting at the joints.

1. fluminenses', Vell. (T. mundula, Kunth. T. albi-flora, Kunth. T. renips, T. renips oviata, T. viridis, T. viridis oviata, T. viridis Gotschel). Prostrata, T. procumbens, T. stridula, Hort. T. tricolor, Hort., in part. T. myriophylla, Hort.). WANDERING JEW in part. Figs. 3829, 3830. Glabrous, with shining seta's and Lvs., the nodes conspicuous, trailing, or the ends of the shoots ascending: Lvs. ovate-acute, without distinct petiole, ciliate at the very base, the sheaths 2/3-3in. long: fls. white, hairy inside, the 6 stamens all alike, borne several together in a sessile cluster subtended by 2 unequal Lvs. or bracts, the pedicel not all of same age. Cent. Brazil to Argentina. H.B.K. 13, p. 297. G.W. 13, p. 508. One of the commonest of greenhouse and basket-plants. In greenhouses, usually grown under the benches. When the plants grow very vigorously and have little light, they are usually green, and this is the form commonly known as T. viridis. There are forms with Lvs. striped in white and purple, but they will not hold unless there is abundance of sunlight. In light places, the Lvs. become red-purple beneath. Very easily prop. by cuttings or pieces of shoots at any time of the year. The plant needs plenty of moisture in order to grow vigorously. Three plants are known as wandering Jew, and although they belong to 3 genera, it is not easy to tell them apart when not in flower (Fig. 3830). These plants are Tradescantia fluminensis, sheaths hairy or ciliate only at the top, fls. white; Zebrina pendula, sheaths hairy throughout or at least at base and top, Lvs. redder beneath and always colored above, fls. rose-red; Commelina nudiflora, sheaths glabrous, fls. blue. The first two are tender to frost; the last is hardy in the open ground in Cent. N. Y. All of them are used for baskets and vases. The first two are best known and are the plants commonly called wandering Jew. All of them may have striped foliage. See Commelina and Zebrina.

AA. Plant erect, or ascending from a decumbent base.

B. St. none, or scarcely rising above the ground.

2. fuscata, Lodd. (Pyrhæna Loddigesii, Hassk.). Stemless, brown-tomentose or hairy: Lvs. 6-8 in. long, obovate-ovate, entire, about 7-nerved, short-petioled; fls. blue or blue-purple, 1 in. or more across, borne in the midst of the Lvs. on very short pedicels; stamina 6. S. Amer. L.B.C. 4:374. B.R. 452. B.M. 2330.

3829. Wandering Jew.—Tradescantia fluminensis. (Natural size.)

BB. St. evident, usually branching (often very short in T. brevicaulis).

c. Lvs. distichous (in 2 rows).

3. Reginea, Lind. & Rod. Stiff-growing upright plant: Lvs. lanceolate-acuminate, sessile, set closely on opposite sides of the stem and spreading nearly horizontally, about 6 in. long, the central purplish crimson, with feathered border, the space toward the margins silvery, the very edge of the leaf darker, the under side purplish. Peru. I.H. 39:147; 40:173 (3); 41, p. 14. G.C. III. 11:699; 13:477. G.W. 5:483. R.B. 19:113—Intro. into Belgium from Peru in 1870. Named for the Queen of the Belgians. It was intro. as Dichorisandra Regina, which see, p. 1003.

c. Lvs. not distichous (in several rows).

d. Infl. not peduncled.

e. Plants villous.

4. brevicaulis, Raf. Villous, 1 ft. or less high, sometimes nearly acaulescent: Lvs. mostly from near the ground, linear-lanceolate, more or less ciliate; fls. about 1 in. across, blue or rose-purple, in a 4-12-fl. umbel.; pedicel slender, 1-2 in. long; sepals ovate-lanceolate, villous. Ky. to Mo.
TRADESCANTIA

ee. Plants glabrous.

f. Blades ovate.

5. navicularis, Ortg. Stoloniferous: st. creeping, geniculate-ascending, glabrous: Ivs. sessile, ovate, acute, glabrous: Fls. bright rose, in terminal umbels which are sessile; sepals spreading, keeled; petals broadly ovate. Peru. Gt. 26: 901.

ff. Blades linear to lanceolate.

6. reflexa, Raf. Slender, glabrous or nearly so: Ivs. 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., Kan., Tex., and S. C.


3830. Three kinds of wandering Jew. A. Tradescantia fluminensis: tender, sheaths hairy at top; flowers white. B. Zebrina pendula: tender; sheaths hairy at top and bottom; flowers rose-red. C. Commelina andrica: hardy; sheaths glabrous; flowers blue. (X ½

8. occidentalis, Smythie (T. virginiana var. occidentalis, Brit.). Slender, 1 ft. high: Ivs. narrowly linear, involute, base often enlarged and sericous: Fls. blue or roseate; sepals glandular-pubescent. Iowa to Neb., Texas, and New Mex.

dd. Inf. peduncled.

e. Fls. white.

9. geniculata, Jacq. (T. hypophila, Koch & Bouché). Procumbent, sts. geniculate, elongate, pilose: Ivs. ovate-

oblong, 7-10 x 4-6 lines, pilose, violet-brown beneath: Fls. small, white, terminal, sepals ovate-lanceolate, base cuneate. Trop. Amer. G.W. 13, p. 588.

ee. Fls. rose or purplish.

f. Stamens unequal, 3 long and 3 short.

10. elongata, Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1-2 ft.: Ivs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath: peduncles 1-5, terminal: Fls. rose-colored, the sepals green. Trop. Amer.

ff. Stamens all equal or nearly so.

g. Lvs. narrowly linear; sts. tufted.

11. rosa, Vent. Slender and nearly or quite simple, glabrous, 12 in. or less tall; Ivs. very narrow-linear: bracts short and scale-like: Fls. ⅓-⅔ in. across, rose-colored. Md. to Mo. and south. Mn. 2, p. 36.

gg. Lvs. lanceolate to ovate-lanceolate.

h. Plant with a stout caudex.

12. Warscewiczniana, Kunth & Bouché (Dichoriandra Warscewiczniana, Planch.). Fig. 3831. Dichoriandra-like, having a stout caudex or trunk, marked by fls. and finally branching Fls. green, stiffish, 1 ft. or less long, clustered at the top of the fl., recurving, lanceolate-acuminate: Fls. lilac-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5188. R.H. 1860, p. 136.

h. Plant without a stout caudex, more or less decumbent at base.

13. draconoides, Gremm. Roots fascicled, tuberous: sts. erect or nearly so, 8-20 in. high, simple or sparingly branched: Ivs. lanceolate-attenuate to ovate-attenuate, 4-8 x ⅔-1¼ in., villous-pubescent, strongly ciliolate: infl. an open, oblong racemose panicle: Fls. rose; sepals oblong, apex rounded; petals obovate. Mex.

T. auro-striata, Hort., is offered in the trade as a form with green lvs. striped with yellow. T. bengalensis, Hort., occurs in the trade, having small, red, fleshy lvs. and blue Fls.—T. courtaulu, Cav. (T. iridescent, Lindl.). Something like T. virginiana, but lvs. short and broad, oblong-ovate, ciliate, as also the st.: fls. ⅓-¼ in. across, blue-purple, in terminal and axillary sessile umbels, the stamens all equal. B.M. 1598. G.W. 7, p. 91.—T. Crassa, Link & Otto. Somewhat succulent, ascending: Ivs. thick, oblong and nearly or quite obtuse, glabrous except on the edges: Fls. about ⅓-½ in. across, white, in terminal and lateral often stalked umbels, the calyx and pedicels hairy. L.B.C. 16: 1596. T. decora, Bull. Foliation Fls.: Ivs. long-lanceolate, dark olive-green with a central gray band. Brasil. T. discolor is Rhoeo discolor, which see.—T. draconoides. "A noble and rapid-growing plant, with luxuriant and handsome foliage. The lvs. in many respects resemble a drooping corn, and are a deep green, marked with chocolate or black. . . . When fully grown the plant will send out long runners, bearing out tufts of lvs. at the end." John Lewis. Chilton. 1800.—T. latifolia, Hort., is offered in the trade as a form with green and pink lvs. T. lanceolata, Hort., is offered in the trade as having large, green, downy lvs. T. multiflora, Hort. See Zebrina.—T. quadriloba, Hort. See Zebrina.—T. satyriaca, Swartz., equals Rhoeo discolor—T. sorbea, Lindl. & Rod., has oval-oblanceolate, sessile lvs., which are dark metallic green with a white band on either side of midrib and are purple beneath. Peru. I.H. 39: 155; 40: 173, fig. 6. Gt. 46, p. 163. Perhaps not a Tradescantia. T. transslucens, Hort., is said to have green-and-white lvs.; offered in the trade.—T. transslucens, Hort., is Rhoeo discolor var. vittata.—T. verticillata, Sallé., is Rhoeo discolor. T. majestica, Hort., occurs in the trade.—T. zebrina, Hort., is Zebrina pendula.

L. H. B.

F. TRACY HUBBARD.
TRAGIA (from Hieronymus Bock [or Tragus], a German botanist, 1498-1554). *Euphorbiaceae*. Herbs, sometimes twining and often with stinging hairs, rarely cult.; cv. alternate, toothed or lobed; fls. monocious, racemose, apetalous, 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. cannabin*, Linn., of *T. cannabina*, Linn., *T. sollicitis*, Linn. *Twining Cowranch*, of the W. Indies, has stinging hairs. Probably not cult. Several species of *Tragia* are native in the U. S.

J. B. S. Norton.

**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 *Cichorieae*).

Mostly weedy plants with a tap-root: florets perfect, with slender style-branches and sagitate 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.

s. Fls. purple.

porrifolius, Linn. *Salsify*. *Vegetable Oyster. Oyster Plant*. Figs. 3332, 3832. Tall strict biennial, sometimes 4 ft. high when in bloom, glabrous: lvs. keeled, tapering from broad often clasping base: fls. showy, closing at noon or before, the outer rays exceeded by the involucral scales; pedunule 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 3½ in. wide: peduncle scarcely swollen. A weed, from Eu.

L. H. B.

**TRAGOPÉTRUM** LANCEOLATUM var. LATIFOLIUM: *Atriplex Muchelsetowii*.

**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 uptake 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. The evaporation also tends to equalize temperatures. That an enormous amount of work 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 larch 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 beech 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 closely tie it to the stem of the plant. This prevents evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring-glass, 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 evaporate 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 the cutinization and 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.

Stomata characteristic of and genus 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.

D. T. MacDOUGAL
TRANSPLANTING 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 in 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, and 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 seed-beds 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, transplanted better than those that are long, "leggy," and weak. The stocky 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 again to the earth. Many plants may be "hardened off" or gradually acclimated to the cold and heat 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 transplanting. The operation of transplanting a plant is performed with a spade, dibber, or similar instrument. The root-system is drawn from the ground. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent transplanting. The root-system is drawn from the ground. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent transplanting. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent transplanting.

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 promptly in fresh, recently turned soil, because it contains a relatively large amount of moisture. To bring the earth into contact with the roots, it should be formed 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 decrease 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 very 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 watering may be done at nightfall. The water should 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 roots in order to provide a surface mulch and 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 special 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 prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust into the ground all around the tap-root. The difficulty is the inability of the plant to make new feeding roots quickly, as in some of the asminas or papaws. 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 transplant is probably due to the excessive rate of transpiration from the foliage. In these cases cutting back the top rather severely and providing shade may contribute to success. In some cases the difficulties are so great as to be practically impossible to transplant.

So-called transplanting machines have been perfected within the last few years for setting small herbaceous stuff, as cabbages, tobacco, and tomatoes. These are really vehicles, drawn by horses, that open a furrow and drop a small quantity of water when the plant is inserted in the furrow by the hands of an operator who rides on the machine. The plants, already prepared for setting, are placed in the furrow, the operator places these between guards which automatically measure the distance. These machines 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 otherwise 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. (Fig. 3834.)

Plants grown in pots and small shallow boxes transplant more readily than those raised in the open soil. Particularly is this true of pot-grown plants, for the bottom 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 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. (Fig. 3833.) The seeds are sown directly in these boxes. More conveniently, quick-draining other plants that are difficult to transplant are often grown in pieces of inverted turf, taken from old pastures.

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
TRANSPORTATION

transplanting

3834. A dibber. One of the most useful Implements to aid in the transplanting of small plants. The plant is dropped into a hole made by the dibber; this hole is closed by inserting the dibber at the side and moving it against the plant.

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 production, distance from markets, cost of transportation, the condition in which the produce reaches the markets, methods of marketing, and the supply and demand of the crop.

The locality of production is often a thousands of miles distant from the larger markets, there is no factor of greater importance than rapid and efficient transportation. Every 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 products cannot be transported and delivered in good condition.

The transportation 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 preerving 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 alone on conditions in transit but on the preconditioning of the produce prior to shipment. The responsibility for the condition of these products when delivered at the markets 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 merchandizing 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 the losses sustained. There are not paid, or deterioration for which no claims are made, and the injurious effect on the price received for the produce actually sold. The economic losses to consumers, carriers, shippers, and 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, the transportation is the only factor 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 deterioration in transit depends on accurate knowledge of the stages of decay and the steps that can be taken to 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 handling prior to shipment, and to temperature conditions in transit. The types of troubles that may destroy or lessen the value of these 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 is termed natural death. Decay, causing decay in transportation may for convenience 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. Parasitic fungi causing decay in transit usually orchard or field diseases that ordinarily can be controlled through proper cultural sanitation practices in the fields or orchards. 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 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 come under the following heads: (1) the cultural conditions prevailing at time of picking; (2) 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-rust (Sclerotinia) or Monilia usually show serious development of brown-rust after shipment. In certain humid sections of the Pacific coast, for example, the prevalence of brown-rust makes long-distance shipment of cherries and fresh prunes an extremely hazardous venture. Certain vegetable crops, such as lettuce, celery, and tomatoes, when shipped over long distances, sometimes develop serious decay in transit through diseases that attack the growing crops in the fields. Decay in transportation, caused by diseases commonly affecting crops in field or orchards, can be controlled only through proper orchard- and field-sanitation practices. While the rapidity of the development of such decay in transportation can be controlled, to some extent, by quick prompt cooling and the 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 state 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 undergone abuses of this nature with resultant poor quality because the consumers never had an opportunity to taste 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, hardripe, 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 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 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 the storing of the load in the car in such a way as to facilitate cir-
culation and consequent quick cooling or refrigeration. The practicability of successfully transporting more nearly tree- or plant-ripened fruits, possessing the maximum firmness, (6) flavor, (7) color, and quality at time of picking; (3) care exercised in all handling operations; (4) promptness of cooling; precooling; (5) temperatures in transportation.

Care in harvesting and handling.

The care exercised in harvesting and preparing horticultural products for shipment determines, to the greatest degree, its shipping or keeping quality. Extensive investigations conducted on a commercial scale by the U.S. Bureau of Plant Industry, U.S. Bureau of Chemistry, and the Department of Agriculture, for a number of years, covering a wide range of fruits and vegetables, have clearly and conclusively demonstrated that decay in transit and 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 injury or breakage of the cells of the skin offers lodgment for fungous spores which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moist atmosphere favor rapid development and growth of these organisms. Temperatures 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.

Nearly all growers and handlers of fruit or vegetables realize that rough handling, resulting in mechanical abrasions of the skin, is more or less responsible for decay occurring in transit. Few, however, have a clear idea of the many precautions necessary to prevent ordinary commercial handling, nor do they realize fully the importance of the most careful work, or what constitutes proper and careful handling of a perishable product. 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 citrus 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 clippers 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. Additional injury may result as the fruit goes through the washing-machines, brushes and driers, and over the sizers, and into the bins. Long sharp stems also cause much injury as they roll against the adjoining fruit in the baskets and the various operations of washing, drying, grading, and sizing. The pickers and packers, where gloves are not worn, may cause much injury through finger-nail cuts. The washing of fruit in dirty water, or slow and incomplete drying, both afford ideal or favorable conditions for infection of every injury and the consequent development of decay. The so-called soft fruits require
TRANSPORTATION

even more careful handling to avoid bruising and to preserve the skin of the fruit in a sound unbroken condition through 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, by rough handling in loading, and bruising in the various operations of grading and packing. While 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 cars. The success 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-receptacle, 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 fruits, that are very liable to injury by the rubbing of one fruit against another, ought to be picked in receptacles with rigid sides. In such receptacles the fruits 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 the maintenance of 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 decay-producing organisms. The 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 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 unheated 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 use the precooling is accomplished by forcing large volumes of cold air through the load in the car. More recently 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 precooling 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 markedly to justify the expense. This difficulty has been nullified to a considerable extent by the rapid rise in temperature of fruits or produce while in transportation. No matter what system is employed, the full value cannot be obtained from precooling unless the produce has been properly and carefully handled in the first place. Used as a means to overcome the effects of ripening, precooling only retards decay and deterioration and is not sufficient to prevent it; it is necessary to give the produce a uniform degree of coolness, and as quickly as possible, 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 precool ed product should be sufficiently insulated to maintain reasonably low and uniform temperatures in transit. Temperatures in transit.

The necessity for the maintenance of low temperatures in transit has already been emphasized. The question is often raised whether it is even possible to maintain reasonable or even low temperatures in a refrigerator car to be for best results? The only answer to this question 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 growth prevented. While growth of decay-producing organisms checked. While most of them 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 growth and development sufficiently to allow of sound delivery. The necessity for prompt and quick cooling is therefore very apparent.

The cooling in an ordinary refrigerator car is usually rather slow and very unequal. It requires from six to eight days to cool a load of oranges in transit and several days to cool wrapped deciduous fruits. Unwrapped fruits in open containers cool relatively fast because of the opportunity for free air circulation around each individual fruit. The lower tiers cool relatively fast in any load, especially near the ice-bunkers. There are marked differences in temperature between the ends and middle of the car, and between the top and bottom tiers. In the quick-ripening fruits these temperatures are reflected in the condition 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 in the car.

One of the principal problems in transportation and refrigeration of fruits and vegetables in transit is to secure quicker and more uniform cooling throughout the car. This can be done, to some extent, through methods of loading and stowing and care exercised at the time of loading to retain as much as possible of the refrigeration within a pre-cooled car. With deciduous fruits and vegetables, cars intended for loading should be pre-cooled several hours before loading begins.

The shipper in loading should not only stow the load so as to prevent shifting and breakage in transit but, first of all, so as to facilitate free circulation from both ends to the middle of the car. If crates are used, this can be done by leaving straight uninterrupted aisles between rows from floor to ceiling. Closeness 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 underneath the load will greatly facilitate quick cooling of every package in the load. In loading fruit into pre-cooled cars, it is very common 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 are factors for which the carriers must share responsibility. When the 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
the transportation company, both as relates to freedom from breakage and efficient refrigeration. The care exercised in handling freight trains and cars in switching is mainly responsible for the condition of a properly stowed load as regards shifting, breakage, and the like. The driver of the 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-bunkers, and facilities for effecting 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 the necessary low temperatures in transit.

The methods of icing and charging for refrigeration in transit vary considerably in different sections of the country. From Pacific to the points to the East, the trains start off from the blanketing down, the shipper maintaining 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 citrous 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 citrous 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 with no re-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 all re-icing stations enroute, but 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 of the bunker. In the eastern states the situation is different. Refrigeration rate for all 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 earners 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. Tight load tends to hold the heat more effectively and the heavier the insulation the easier it is to prevent 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 decided value in minimizing the damage 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 other states such as Maine, heater cars are used to a considerable extent. 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 the stoves 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). "Trapaee or Hydrocharideae; by some retained in Onagraceae. Floating plants adapted to the aquarium.

Flowers small, axillary, solitary, short-peduncled, carpellate, the ovary inferior, 3-loculed, the pericarp and testa of the seed 4-valved: petals 4; ovary 4-loculed; ovules solitary, long, pendulous, affixed to the septum: fr. top-shaped, leathery or somewhat bony, 1-seeded.—Three species, native to the warmer parts of the eastern hemisphere.

Trapa natans is one of the daintiest aquatic culture. It is perfectly hardy and very desirable for aquaria, pools, ponds, or tub-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 tasty 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 moisture to retain their vitality. (William Tricker.)

natans, Linn. Water Chestnut. Water Caltrops. Jesuit's Nut. Petiole of floating lvs. 2-4 in. long, nearly glabrous; blade rhombic-ovorbicular, dentate in upper half, slightly villous along the nerves beneath: fr. 4-spined, but the 2 lateral ones shorter. Eu. Orient. Gn. 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 floating rosette. The flowers are white. The fr. is an inch or two across and has 4 spine-sectes. It is roasted and eaten in some parts of Eu. like the common chestnut. It is sparingly
TRAPA
naturalized in this country. Var. *verbanus* Cessati (*T. verbanus*, De Not.), of Lake Maggiore in Italy, has deltoid leaves and compressed 3-angled fr. with 2 short horns.

*bispínosa*, Roxbg. *SINGHARA-NUT.* Pelote of floating lvs. 4–6 in. long, woolly; blade 2 x 3 in., slightly crenate in the upper half, very villous beneath: fr. ½ in. thick, 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. bicérra*, Linn. f., the Ling of China, is by some referred to *T. natans* fr. 2 strong opposite long decurved horns like those of a bull's head.

*WILHELM MILLER.*

TRAVETTÉRIA (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, corymbose-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 prop. 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.


*grándis*, Nutt. (*T. palmáta* var. *occidentális*, Gray. *Actea grándis*, Dietr.). Much like the above species: lvs. membranaceous, more deeply lobed, often to the base, that is, sparsely hairy beneath along the ribs; reticulations less distinct: styles longer and somewhat curved. Wash., Idaho, Brit. Col.

The genus *Travettèria* is variously interpreted. Many authors regard it as monotypic, the Japanese form (*T. japonica*, Sieb. & Zucc.) being included in one of the cosmopolitan species (*T. carolinínsis*). E. L. Greene, on the other hand, described 6 new American species at one time in 1912: *T. nervosa*, from Ca.; *T. fimbriáta*, from Oreg.; *T. planipetala*, Mo.; *T. rotundáta*, Calif.; *T. sanícula*, Idaho; and *T. media* from New Mex.

*K. C. DAVIS.*

TRAVELER'S TREE: *Rasenada.*

TREE OF HEAVEN: *Ailanthus.*

Trees:

*Arboriculture.*


TREFOIL: *Clover, Trifólium;* sometimes applied to Lotus, *Desmodium* (tiek trefoil), and other Leguminosae.

TRÉMA (Greek, *trema*, hole, alluding to the pitted stone). *Ulmáceae.* 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-nerved or penninerved, stipulate: fls. small, in nearly sessile clusters, monococcious or dioecious, apetalous, 5- or rarely 4-merous; sepals of staminate fls. valvate, below, imbricate above; stamens 4–5; ovary 1-celled, superior style with 2 linear arms: fr. small ovoid or subglobose drupe; embryo curved or involuted. Adapted for cult. in tropical and subtropical regions only and sometimes planted for its evergreen foliage. The first of the two species described below has been offered in Calif., the second in Fla.

*Pecteoláta*, Blume. Small tree, to 30 ft.: lvs. ovate-oblong to ovate-lanceolate, acute, rounded at the base, crenate-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, Natal Pl. 4:356.—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.

*orientális*, Blume (*Célííis orientális*, Linn.). Small tree; branchlets pubescent: lvs. rigid, ovate-oblong to ovate-lanceolate, acuminate, cordate at the base, crenate-serrulate, subcordate above, clothed with silvery, appressed pubescence beneath, 3–6 in. long: fr. ovoid, ½ in. long, red, 1-seeded. Asia. An old plant offered under this name seen by the writer proved to be a true Celsits, not a *Trema.*

*ALFRED REINDER.*

TREMÁNDRA (Greek, *hole* and *anter*; the anthers burst open through a hole). *Tremándraceae.* More or less stellate-tomentose shrubs, sometimes grown in the greenhouse. Lvs. opposite, ovate, dentate: fls. in 3's; petals not inlosing the stamens, which are rather in 1 row, dehiscing by a single somewhat 2-valved pore; disk glanulare, crenate, almost 5-lobed: caps. loculicidally 2-valved.—Two species, Austral. *T. stellígera*, R. Br. densely stellate-hairy, 2 ft. or more high: lvs. short-petioled, ovate, obtuse, 1–1½ in. long, coarsely and irregularly toothed: fls. on pedicels shorter than the lvs.; sepals villous or tomentose. Austral. Rarely cult.

A plant is mentioned as in cult. under the name of *T. ericóla* *bírskák,* Bedingff., but there seems to be some confusion and also doubt as to what it is. The plant in question has brown sts., small, subulate, heath-like lvs. and bright purple or pink drooping blooms borne on rather long slender pink pedicels. Extra-Trop. Austral. R. B. 29:133.

TREVÉSSIA (after the family Trevesi di Bonfigli of Padua, patrons of botany). *Araliáceae.* Showy and rather striking small trees or shrubs from Trop. Asia and the islands in that region: lvs. either palmately cut and simple, or digitately or pinnate compound: fls. rather large for the family: bractes, 1–1½ ft.; petals 8–12, valvate, somewhat thick; stamens 8–12; ovary 8–12-loculed: fr. large, ovoid.—About 9 species. Should be grown in a warm moist house, as the plants naturally grow in damp jungles.

*palmáta*, Vis. (*Gastónoia palmáta*, Roxbg.). A small tree frequently 20 ft. in cult., with the ends of the branches sparingly prickly and the young parts tomentose: lvs. coarsely divided at the ends of the branches: 1–1½ ft.; petals palmately 5–9-lobed to below the middle; petioles 1–1½ ft. long; panicles long-peduncled, erect; umbels 6 in. through, long-stalked; fls. 1 in. across, yellowish white, showy. Himalayas. B. M. 7008.

*T. Sánderi,* Hort. lvs. handsome, deep cut, borne on long cordial petals; *H.*-blade nearly circular in outline, 2 ft. across, digitate, the divisions irregularly pinnatifid and joined at the base. Perhaps a form of what is known in cult. as *T. Sundaica.* Annam. G. C. III. 53:206.—*T. sundáica,* Regel, is apparently a form of *T. palmáta; T. sundáica,* Miq., is a distinct species from Java and Sumatra, with infl. becoming recurved. See Gilchristina.

K. C. DAVIS.

TREVÍRÁNA: A section of Achímenes.

TREVÓRIA (named for Sir Trevor Lawrence). *Orchi dóceae.* Epiphytic orchids, grown in the warmhouse.

Pseudobulbs elongated-pyramidal, not compressed, 1-lvd.: lvs. large, rather leathery, folded, contracted at the petiole: segments arising from the base of the pseudobulbs, simple, bearing a lax few-fl.d. raceme: fls. large, fleshy, pedicelled; sepals rather thick, free-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, laxly surrounding the column; midlobe linear-nastate; column rather long, terete, clavate or abruptly truncate at apex; rostellum 2-toothed, membranaceous; pollinia 2: caps. fusiform.—About 3 species, Trop. Amer.

*Chióris,* Lehm. Laxly cespitose: pseudobulbs long-pyramidal: fl. oblong-lanceolate, acuminate, long-
TREVORIA

two-lobed, oblong-oblong, or oblanceolate, glabrous; fls. two-angled, ovate to ovate-oblong, acute or acuminate; ovaries small, greenish; stigmas 2-5 parted. —About 15 species, Trop. and S. Afr. —Lvs. 2-5-lobed, subsessile, glabrous, obtuse; ovaries small, ovate to ovate-oblong, acute or acuminate; stigmas 2-5 parted. —About 15 species, Trop. and S. Afr. —SONDERIÁNA, Hiers. (Krassia coriácea, Sond.). Shrub: lvs. elliptic, obtuse or minutely apiculate, wedge-shaped at the base, coriaceous, 1½-3½ in. long: eymes about 4-fl.; frs. pentamerous; pedicels ¼-½ in. long; throat densely bearded; stigmas deeply 2-lobed, lobes revolute; fr. globose, the size of a pea. Natal. —

a. Lvs. elliptic, obtuse.

b. Lvs. ovate, obtuse.

Sonderiána, Hiers. (Krassia coriácea, Sond.). Shrub: lvs. elliptic, obtuse or minutely apiculate, wedge-shaped at the base, coriaceous, 1½-3½ in. long: eymes about 4-fl.; frs. pentamerous; pedicels ¼-½ in. long; throat densely bearded; stigmas deeply 2-lobed, lobes revolute; fr. globose, the size of a pea. Natal.

TRICHOCENTRUM

(syn. MELIOCEAE)

(Trichocen.), tree, 2-5 ft. high; lvs. 2-4-angled, ovate to ovate-oblong, obtuse or acuminate; stigmas two-angled, ovate to ovate-oblong, acute or acuminate; ovaries small, greenish; stigmas 2-5 parted. —About 120 species, Trop. Amer. and Trop. Afr. —Spondioides, Jacq. Tree, 15-20 ft. high: lvs. pinnately compound; lfts. 7-10-paired, ovate-oblong, oblique and rounded at base, glabrous; panicles puberulent, divisions 3-11-fl.; lfts. greenish yellow; stamens tubular, anther 10, hairies: caps. tomentose, rugulose, 5-6 lines diam. Trop. Amer. and intro. into S. Fla. —T. undulatifolia, Hort., is offered in the foreign trade. —F. TRACY HUBBARD.
If.: inf. a few-fld. raceme on which usually only 1 fl. opens at a time: sepals and petals free, spreading; label- luum larger, spurred, with 2 lateral lobes and a 2-parted middle lobe; column short; pollinia 2, on a wedge- shaped slip.—About 20 species. Epiphytes on 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.

TRICHOCENTRUM

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 purplish spot on each of the lateral lobes. Brazil. B.M. 5688. A.F. 6:609. J.H. III. 51:352.

TRICHOCENTIUM

f. Similar in habit to the preceding: lvs. oblong, obtuse, speckled with red; fls. pendulous, nearly 3 in. across; sepals and petals broadly linear, yellow, speckled with red; labellum cuneate-obovate, emarginate, white, rose toward the disk. May. Cent. Amer. B.M. 7380. I.H. 24:252.

T. panamense, Rolfe. Fls. light green, with white lip, red- purple blotch at base; spur yellowish, short, dilated, divided at apex into 4 short lobes. Panam.

HEINRICH HASSELBLING.

TRICHOGLOTTIS (Greek, hair and tongue, referring to the fine hairs on the labellum.) Orchidaceae. Epiphytic herbes, occasionally grown in the warmhouse. Sts. leafy, elongated, not pseudo-bulbous: lvs. distichously arranged along the st., narrow: peduncles lateral, very short, 1- to few-fld.: 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. Solerederi, Kästel. Sts. elongated; lvs. fleshy, somewhat lanceolate, up to 5 in. long, about 1 in. wide: racemes 1-fld.: sepals obvolute-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 3-5 in. long, white, soon becoming yellowish with 2 blood-red spots on the disk. Philippines. T. Solerederi, Reichb. f. (Clus. Solerederi Dawsoniana, Reichb. f.). Scape 6-10 in. high, stout: lvs. 2-8 in. long, oblanceolate: fls. 2 in. diam., yellow-green, spotted with brown; sepals oblong-lanceolate; petals shorter; lip sub sessile, side lobes oblong, midlobe ovate, acute, with a short falcate wing on each side of the tip. Burma.

F. TRACY HUBBARD.

TRICHOLÉPIS (Greek, hair and scale, the involu- cular scales are narrow with long hair-like tips.) Com- pòsice. Annual or perennial herbs, which are branched and unarmed: lvs. alternate, entire, toothed on the lower pinnatifid: heads terminal, solitary, homogamous; involucrum ovoid or broader; bracts many-rowed, very narrow, usually with long recurved hair-points: fls. all hermaphrodite, similar and fertile, yellow, red, or purple; tube slender; limb 5- or 6-lobed; nectaries glabrous, oblong or obovoid, ribbed.—About 7 species, India.

f. falcate, DC. Glabrous or puberulous herb, 1½-6 in. high, branched from the base: lvs. 2-6 x 2½-6 in., elliptic-lanceolate, acute or acuminate, dentate, short-petioled; head rather large, yellow; involucral bracts needle-like. Himalaya. Grown for ornament.

TRICHOMANES (Greek, soft hair.) Hymenophyl- laceae. A group of filmy ferns distinguished by its tubu lar cup-like indium 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, 1½-6 in. wide, bipinnatifid; pinnae ovate, obtuse; indusium terminal, on short slender stalks. Trop. regions, extending into the southern states as far as Ky.

Theo, Kunze (T. Íncepta, Hook.). Lvs. 12-18 in. long, 6-12 in. wide, tri-quadrirrhiziform; pinnae ovate lanceolate; sori 2-12 to a pinnule, small, in sinuses; indusium with a much dilated lip. Trop. Amer.

L. M. UNDERWOOD.

TRICHONÉMA: Remulea.

TRICHOPHILA (Greek, hair and cap; the anther is concealed under a cap surrounded by three tufts of hair.) Orchidaceae. Handsome orchids, usually grown in pots, although epiphytic.

Pseudobulbs crowded at the short rhizome, flattened and often elongate, 1-vld., 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, midlobe spreading; anther bent over; pollinia on a triangular caudicle; cinandraum fimbriately 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


—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. álba, Hort., has fls. pure white.


crispa, Lindl. This plant was described by Lindley in Linden's catalogue. It is closely related to T. marginata, which is sometimes classed as a variety of T. crispa. The following description is taken from Watson's Orchids: Pseudobulbs ovate, flattened, 2-3 in. long, dark green, 1-lvd.: lvs. leathery, 6 x 2 in., keeled, acute-pointed: fl.spires basal, drooping, short, 3-fld.: fls. with pedicels 2 in. long; sepals and petals spreading. 2½ in. long, ¼ in. wide, wavy-edged, twisted, brownish yellow; lip folded over the column, spreading in front, 1½ in. across, colored deep crimson with a white margin. May, June. Costa R. C.O. 2.

TRICHOPTERIS (from Greek for hair, and Pteris). Cyathæceæ. A generic name applied to several American species of Asphodea which, however, probably do not deserve separation. T. Alberti, Hort., said to come from the Congo, is not botanically known.

TRICHOSANTHES (Greek, hair and flower, alluding to the fringed edge of the petals). Cucurbitaceæ. Snake Gourd. 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 cleft: fls. rather large or small, white, monocoeous; 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: fl. usually large, fleshy, globose, oblong, ovoid- fusiform, or conical.—About 50 species, Trop. Asia, N. Austral, and Polynesia. Monographed in DC. Monogr. Phaner. 3:351. The fl. 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. Bracts small or none on the racemes of male fls.

b. Fr. ovoid.

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-fld.:
TRICHOSANTHES

Angulina, Linn. (T. colubrina, 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 fls. 4-10 in. long, 8-15-ftd.: body of petals oblong, less than ½ in. long, fringes ½ in. long: fr. slender, contorted, soft, exceeding 3 ft. in length. India, but widely planted. B.M. 722. B.R. 32:18. R.H. 1859, p. 595.

AA. Bracts large on the male raceme.

b. Calyx-segms. entire. c. Lvs. lobed.

Kirilowii, Maxim. (Epipon vitifolius, Naud.). Perennial root tuberous: 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-ftd.: petals triangular-wedge-shaped, deeply cut and the segms. much cut and longly fimbriate, ovoid, somewhat acute; base shortly attenuate, yellowish orange, about 4 in. long, 2½ in. thick. Mongolia.

cc. Lvs. not lobed.

cordata, Roxbg. (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-ftd.: calyx-segms. finely acute: fr. globose, red, orange-streaked, not acute at the apex. India.

BB. Calyx-segms. toothed.

bracteata, Voigt (T. palmata, Roxbg.). St. stout, climbing to 30 ft.: lvs. broadly ovate, scabrous above, usually deeply 3-7-lobed; lobes acute; margin dentate: peduncle bearing male fls. 4-8 in. long, 5-10-ftd.: fr. globose, red with orange stripes about 2 in. long. India.

F. W. BARCLAY. F. TRACY HUBBARD.†

TRICHOSOMA (Greek, three and ridge, referring to the 3-lobed labellum). Orchidaceae. A genus of 1 species resembling Cologonie. Sepals and petals similar, erect-spreading; the lateral pair forming a distinct mentum with the projecting foot of the column; labellum 3-lobed, the lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges: sts. slender, 2-lvd.: infl. racemose. T. albo-marginata of the trade is unidentified.

suavis, Lindl. (Eria coronaria, Reichb. f.). Lvs. lanceolate, undulate, 3-nerved: lvs. few in a terminal raceme, white, yellowish or purplish, fragrant; sepals ovate-lanceolate; petals oblong; labellum ovate-oblong, streaked with purple; disk yellow, middle lobe with several crenate ridges. Himalaya. B.R. 28:21.

HEINRICH HASSELBRING.

TRICHOSPORUM

TRICHOSPORUM (Greek, hair and seed; seeds with 1 or more long hairs at the ends). Syn., Eschynanthus. Gesneriaceae. Subshrubs or shrubs, often climbing over trees, glabrous or rather villous, grown in the warmhouse.

Lvs. opposite, fleshy or leathery: fls. showy, scarlet, garnet or yellow and green mixed, fuscated in the axil, or at the ends of the branches, rarely solitary; calyx truncate, 5-leaf or 5-parted; corolla-tube elongated, ventricose or broadened above; lip somewhat 2-lipped, usually strongly oblique; perfect stamens 4; disk annular, usually thick, cup-shaped; ovary superior, oblong or linear: caps. long-linear, 2-valved.—At least 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 osmund 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°. In winter they may be kept 55° 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 in, manure-water should be given. These plants are not subject to insect pests. (George F. Stewart.)

A. Calyx deeply 5-parted, the lobes acute.

grandiflorum. D. Don (Eschynanthus grandiflorus, Spreng.). St. creeping, mostly herbaceous, 4-5 ft.: lvs. lanceolate, acuminate, 4-5 in. long, repand-serrate, fleshy; fls. aggregated; calyx fleshy and short; corolla arching-tubular, 2-3 in. long, downy, orange-scarlet. E. India. B.M. 3843. P.M. 5:241.—Will succeed in an intermediate house.

A. Calyx tubular, entire or shortly 3-toothed.


Lobbiannum, Kunze (Eschynanthus Lobbiano, Hook.). The commonest species in cult. in this country; differs from T. pulchrum in narrower and nearly 5-lobed entire lvs. corolla downy and projecting only twice or less the length of the purple downy
calyx. Java. B.M. 4260, 4261.—A very attractive plant which well grown.


F. TRACY HUBBARD. TRICHOSTEMA (Greek, hair and stamen, referring to the filaments). Lobote'a. Blue Curls. Hardy or half-hardy herbs, adapted to the wild-garden or rockery.

Leaves entire; floral lvs. similar: floral whorls axillary, densely or laxly many-flb.; calyx campanulate, 10-nerved, 5-toothed; corolla tube slender, usually exerted, without a ring inside; limb subequally 5-lobed, lobes oblong or broadly deltate; stamina 4, didymous; ovary deeply 4-lobed; nectaries obvolute, rationally rugose. —About 10 species, N. Amer.

dichotomum, Linn. Bastard Pennyroyal. Low, viscid annual; lvs. oblong or lanceolate-oblong, obtuse, short-petioled; corolla blue or pink, sometimes white. Sandy fields, Mass. to Ky., Fla., and Texas.

lanatum, Benth. A perennial shrubby plant with rosemary-like lvs. and cymes of fls. in a naked terminal thyrse. lvs. B.M. 4262. P.M. 15:196. Sts. dichotomous, leafy, 7-nerved, sessile, margins revolute; calyx and corolla covered with dense violet or purple wool; corolla 2½ in. long. S. Calif. —A very handsome shrub, known as "ramero."

Pépussi, Brandeg. Perennial, somewhat woody, much branched, 1-½ ft. high; lvs. short-petioled, ovate, 3/4-1 in. long, dark green; floral whorls axillary, few-flb.; forming terminal loose leafy panicles; fls. showy, scarlet; corolla shortly hairy, about 3½ in. long, upper lip helmet-shaped, 3-lobed, lower lip pendulous. S. W. Mex.

F. TRACY HUBBARD.

TRICHOSTIGMA (named for the hairy stigma). Phytolaccaceae. Three Trop. American erect or scendent shrubs, as described by Walter in Engler's Das Pflanzenreich, hft. 39 (IV. 89), 1906, of which T. peru, Kuntze, Wall. (Villamilla peru/sià, Hook. f. V. ríove-ana, Rusby. Ledenbergia ríove-ana, Lem.). May be expected to appear in choice greenhouse collections. It is a climbing woody plant prized for its ornamental lvs., prop. by cuttings under glass; 6 ft. or more tall, with slender branches; lvs. erect, linear, usually rounded or cordate but unequally at base, thickish, shining metallic green above and rose-violet beneath; fls. small and whitish, in elongated lax partially erect but becoming drooping racemes. Andean region. I.H. 16:591, which represents a handsome purple plant, with a long race of physalodes-like flowers.

Trichostigma is characterized by alternate petiolate entire or ovate elliptic lvs. and hermaphrodite racemose small 4-parted fls.: sepals nearly equal, free, ovate or elliptic, reflexed in fr.; petals none; stamens 8-25, more or less inserted on the hypogynous disk; ovary 1-celled, the style very short or none: fr. berry-like, globular.

TRICUSPIDÁRIA (Greek, three and points; the petals are divided into 3 pointed lobes). Syn. Tricuspis. Elaeocarpaceae. 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-fl.; fls. rather large; calyx campanulate, truncate, oblately 5-toothed, deciduous; petals 5, 3-dentate or -lobed; stamens numerous; ovary 3-5-celled, ovules many in a cell: caps. leathery, usually angled, loculicidally 3-5-valved. —2 species. Chile. The accepted name is now Crinodendron.

C. déependens, Schneid. (Tricuspidaria déependens, Ruiz & Pav.). Compact tree; lvs. broad oblong-obovate or obovate, apex rather blunt, crenulate-dentate; fls. white, campanulate, pedicels slender. Chile. B.M. 8115.—Intro. into Calif.


F. TRACY HUBBARD.

TRICYRTIS (Greek, three convexities, referring to the nectar-bearing sacs at the base of the three outer perianth-segments). Liláceae. Toad-Lilies. Half-hardy perennials, pretty garden plants; also used for pot culture.

Rhizome short-creeping: sts. erect, simple below the infl., leafy; infl. terminal, or leafy dichotomous in the upper axis: fls. few, rather large, in a cluster, sometimes 3 more or less pedicelled; perianth usually beautifully spotted inside, campanulate, segms. distinct from the base, lanceolate, acute or acuminate; stamens 6; ovary oblong, 3- cornered, 3-celled: caps. narrowly oblong, prominently 3- cornered, septically dehiscent, erect, usually more than 1 in. long.—About 9 species, native to Japan and Formosa.


A. Base of lvs. not clasping the st.
B. Plant not stoloniferous.

fornessána, Baker. Sts. flexuous, about 1 ft. high; lvs. few, sessile, oblongate, acute, base cuneate, lower 4-5 in. long, ½-1 in. broad, both surfaces green; fls. few, in a lax corymb, white or yellow, curiously spotted, about 3½ in. long; style as long as the stigmas. Formosan.
TRICYRTIS

In sile stigmas. Ivs. narrow, Ivs. T. wicz spots. the BB. bately yellow 3378 Hort. in., latifdlia, flava, hirta, hirta, stolonifera, cult. a racemose, hairs: St. with oblong: broadly glabrous base, acuminate, 30, with in long, acuminate, of the spotted, not yellow, 3-lobed, Mex. T. trilobata, Hemsl. (Galinsagh tri-lobata, Cay.). About 1 ft. high: Ivs. variously pinnatifid or trifid, lobes linear: Ivs. yellow, rays 5-lobed. Mex. T. giallardioides, Hook. & Arn.—Layia giallardioides. F.S.R. & 7-2:72.

TRICYRTIS

BB. Plant stoloniferous.

stolonifera, Matsum. Herbaceous, 2 ft. high, with a stoloniferous base: st. reddish purple below, greenish above, at first hairy, later glabrous: Ivs. elliptic-lanceolate, acuminate, narrowed to a sheathing base, 5x13 in., glabrous above, with dark blotches and sunken nerves: Ivs. purple, indistinctly blotched; periaurth yellow at base, segms. elliptic, acute, 1 in. long, 2-lobately saccate at base. Formosa. B.M. 8560.

AA. Base of lvs. clasping the st.

b. St. pilose, with spreading hairs.

hirta, Hook. (T. japónica, Miq.). Fig. 3841. St. 1-3 ft. high, everywhere clad with soft whitish spreading hairs: Ivs. 6-15, racemose or suborymbosse, 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. 12:204. 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, unsotted.

flava, Maxim. St. dwarf: Ivs. oblong-lanceolate: Ivs. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

c. Fls. spotted, not yellow.

d. Spots rather large.

pliosa, Wall. St. 2-4 ft. high, very slightly pilose: Ivs. numeros, 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. narrow, oblong). F.S. 12:1219.

DD. Spots minute.

E. Style as long as the stigmas.

latifolia, Maxim. St. glabrous, flexuous, 2-3 ft. high: Ivs. broadly oblong or the uppermost ovate: Ivs. 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: Ivs. oblong: Ivs. in a loose corymb, whitish purpe, 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. 6544 (segms. broadly ovate, decidedly yellow, spotted red and veined red near tips).—In F. S. 18:1820 is figured a plant with sessile Ivs. striated with white, and no fls., which he refers to T. macropoda. This was sent out by Van Houtte as T. hiruta, 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 Ivs.

TRIFOLIUM

T. grandiflora, Hort., should be compared with T. hirta var. nigra. It is a name scarcely known to botany. It is said to have orchid-like fragrant fls. in Oct. and Nov. (Baker says the genus has no fragrant fls.). Dutch growers say that T. grandiflora has white fls. mottled with black.

Wilhelm Miller.

F. Tracy Hubbard.

TRIDAX (an old Greek name used by Dioscorides, meaning summer-egg, alluding to a plant that was a summer vegetable). Compositae. Dwarf clovers, possessing little beauty. Plants branched, his- surate or glabrescent: Ivs. opposite, incise-dentate or pinnately cut, segms. few and narrow: heads medium-sized, long-peduncled, heterogamous: ray-fls. yellow, male disk-fls. greenish, fertile; involucre ovoid, cam- ppanulate or rather hemispherical; bracts few-curved, slightly unequal: achenes turbinate.—About 27 species. T. coronopsis, Hems! About 1 ft. high: Ivs. variously pinnatifid or trifid, lobes linear: Ivs. yellow, rays 5-lobed. Mex. T. trilobata, Hemsl. (Galinsagh tri- lobata, Cay.). About 1 ft. high: Ivs. 3-lobed or pin- nately incised: Ivs. yellow; rays 5-toothed. Mex.


TRIENTALIS (Latin for the third of a foot; referring to the height of the plant). Primulaceae. Star- Flower. Chickweed-Wintergreen. Very glabrous small perennials sometimes grown in wild borders. Rhizomes slender, creeping: st. solitary, slender, erect: Ivs. usually the same number as the petals, somewhat whorled, obovate-elliptical or obovate-lanceolate, very entire: peduncles 1-3-ft., filiform, without bracts: Ivs. 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.

a. Ivs. acuminate at both ends.

americana, Pursh. St. naked below, 3-8 in. high, 5-9-lvd. at the summit: Ivs. lanceolate: divisions of the white corolla finely acuminate. Damp woods, Lab. to Va.

aa. Ivs. obtuse (acute in var. latifolia).

europaea, Linn. St. either naked or with a few scattered Ivs. below the cluster of obovate or lanceolate oblong, obtuse or abruptly somewhat pointed Ivs.: divisions of the white or pink corolla narrowly ligulate or mucronate. Alaska, Eu., and Asia. Var. arctica, Ledeb. Dwarf: Ivs. 1 in. long, decreasing below: corolla white. Var. latifolia, Torr. St. naked below the cluster of 4-7 oblong-obovate, or oval, mostly acute Ivs.: 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. lati- folia, Hook., making 8 species in the genus.

F. W. Barclay.

TRIFOLIUM (name refers to the three leaflets). Leguminales. 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 fall- ing off, more or less adnate to the base of the stamens; stamens 9 and 1; ovary small, ripening into a few-seeded, mostly indehiscent pod.—Between 200 and 300 species, most abundant in the Near Temp. zone. Pasture clovers are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops and green-manures. See Clover, page 805, Vol. II. For the rôle of clovers as nitrogen-fixers, see Legumes, page 1834, Vol. IV. The species described

3842. Trifolium repens.—The white clover. (X½)
TRIFOLIUM

here 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 soils. Three annual yellow-flowered species are weeds 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, Sibth., 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. Fl. in a long spike.

incarnatum, Linn. CRIMSON or SCARLET CLOVER. Fig. 1033, Vol. II. Annual, erect, 1-3 ft. high, soft-haired; 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: fls. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. It is naturalized in old pastures and 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 sts. erect: lvs. short-stalked, the lfts. oblong-lanceolate and strongly denticulate, the stipules broadly obovate: peduncles long and filiform, bearing sessile yellow fls. in umbellike-heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing, but little known in this country.

b. Corolla yellow.

filiforme, Linn. YELLOW SUCKLING CLOVER. Annual, of diffuse growth: fls. small, white: stipules somewhat denticulate, the terminal one stalked, the stipules broadly obovate; peduncles long and filiform, bearing sessile yellow fls. in umbel-like-heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing, but little known in this country.

BB. Corolla white or ochroleucous (yellowish white).

alexandrinum, Linn. EGYPTIAN CLOVER. BERSEEM. Annual, with appressed hairs, the sts. tall, erect or ascending and branching: lvs. numerous, the lfts. oblong or lanceolate and somewhat denticulate, the stipules lanceolate-subulate and partly free from the petiole; head stalked or sessile, ovate, becoming oblong-conic in fr.: lvs. ochroleucous. Egypt, Syria.

pannonicum, Jacq. HUNGARIAN CLOVER. Perennial, very hairy, the sts. usually simple, 2 ft.: lfts. lance-oblong and subacute to retuse, ciliate and entire, the stipules narrow and longer than the short petioles: heads obovate-oblong, stalked: fls. pale yellowish white or creamy yellow. Eu., Asia.—Handsome plant for the border; also recommended for forage.

répens, Linn. WHITE CLOVER. Fig. 3842. Low creeping grassy perennial: lvs. long-stalked, the lfts. obovate 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 parts prized 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. purpuratum, Hort., has fine bronzy purple foliage. The species assumes many forms.

BB. Corolla rose-tinted or red.

c. Individual lfts. pedicelled.

hybridx, Linn. ALSIKE or SWEDISH CLOVER. Ascending or nearly erect, 1-3 ft. high, branching, glabrous: lvs. long-stalked, the lfts. obovate and serrulate, mostly lanceolate and thin: heads small and shallow, nearly globular, long-stalked: fls. 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 hardy. Perennial.

c. Individual lfts. sessile.

d. Plant perennial.

pratense, Linn. (T. pratensis perennis, Hort.). COMMON RED CLOVER. PEA-VINE CLOVER. COW-GRASS. Fig. 3843. Ascending and somewhat hairy, 1-1½ 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 by farmers for hay and forage.

médium, Linn. MAMMOTH or ZIGZAG CLOVER. Stouter and less erect: lfts. oblong and entire and without spots: heads usually stalked, and lfts. rather deeper colored. Eu., and intro., and much grown by farmers for hay and forage.

DD. Plant annual.

resupinatum, Linn. (T. suaveolens, Willd.). Annual, diffuse or trailing glabrous plant: lfts. obovate and serrulate and as long as the petiole, the stipules lanceolate-acuminate: heads globose, with rudimentary involucre; fls. purple. Greece, Egypt to Persia.—Grown for ornament.

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 Schiucherdaceae. Thirteen species of 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 fleshy, sheathing at base: fls. small, spicate-racemose, 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.

3843. Day and night positions of red clover leaf; unfolding young leaf at the right.

TRIGLOCHIN 3379
TRIGONÉLLA (Latin, a little triangle; probably referring to the shape of the fls.). *Leguminosae.* Annual or perennial herbs, usually strong-smelling; lvs. pinnately 3-foliate; lfts. with the veins often running out into teeth; stipules adnate to the petiole: fls. yellow, blue, or white, solitary, capitate, somewhat umbellate or shortly and densely racemose, sessile or peduncled at the axis; calyx tubular; petals free from the stamens, standard obovate or oblong; wings oblong, keel shorter than the wings, obtuse; stamens 9 and 1; ovary sessile or short-pedicelate, many-ovuled; column footless; long-beaked, sometimes linear, compressed or terete.—About 58 species, 1 from Austral., the others from Eu., Asia, and extra-Trop. Afr.

*Fénem-Gracum*, Linn. *Fenugreek*, which see. White-fl. 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 obl. to the peduncle; stipules lanceolate-falcate, entire: calyx pioxe: pods falcate, twice as long as the beak. Eut., Orient. F. TRACY HUBBARD.

TRIGONIDIUM (Greek, three, and small angle, alluding to the triangular form of several parts of the plant). *Orchidaceae.* Epiphytic herbs, grown in the warm house.

Stems very short, soon thickened into fleshy 1-2-ldv. pseudobulbs: lvs. leathery, not folded, linear or oblong; scape from below the pseudobulb or from a simple rhizome, many-sheathed, 1-fl.: fls. rather large, short-pedicelled, between spathe-like bracts: sepals about equal, connivent or coherens into a 3-angled tube at base; petals much shorter; sepals the lateral lobes clasping the column, midlobe spreading, fleshy or callous at base; column without wings and footless; pollinia 4.—About 10 species, Trop. Cent. and S. Amer.

*spatalárum, Lind. & Reichb. f.* Pseudobulb ovate, 2-edged: fl. broadly ligulate, 8 in. long: fl. terminal; petals sepal ovate from a ligulate base, acute, lateral sepals obl. to the main leaf: bracts pilose; petals lanceolate, with a fleshy disk below the apex; lip narrow, angularly 3-lobed, midlobe transversely semi-ovate, rather acute. Colombia.

*subrèps, Rolfe.* Rhizome subterrep, stout: pseudobulbs rather distant, oblong, somewhat compressed, obscurely 3-ribbed, about 1 in. long, 1-ldv.: if. ligulate, rather obtuse, 6-7 by about 1½ in., rather leathery: scape 5-6 in. high, with the sheaths: dorsal sepal rhomboid-ob lanceolate, about 1 in. long, lateral suboblique, broad-elliptic, all greenish yellow; petals whitish with 3 brown lines, narrowly elliptic-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 cult.: *T. acuminátum, Batem.* Pseudobulbs ovate, acute, sulcate: fl. linear; fl. dull straw-color, peneled with rich brown inside; sepals acuminate at apex; petals oval-lanceolate. British Guiana.—*T. Egeretii-din., Batem.* Pseudobulbs clustered, ovate, compressed, 3-ldv.: fls. narrow ensiform, often 1½ ft. long; fl. pale liver-colored, clawed and veined with brown; sepals acute; lateral ones reflexed; petals slightly acute. Honduras.—*T. flatii, Lindl.* Lvs. ovate-oblong, 6 x 2 in.; fls. yellow and purple; lip with a fleshy yellow front above; keel acuminate. *T. obtusum, Royle.* Pseudobulbs oblong or elongate obovoid, 2-ldv., compressed; lvs. lanceolate: fl. terminal; sepals reddish yellow, oblong: petals white, veined with rose, brown at the apex, obtuse; lip white, dorsally tubercled, lateral lobes red-margined, midlobe yellow in front. British Guiana. B.B. 1924.—*T. tenua, Lodd.* Pseudobulb ovate, compressed, 1-ldv.: fl. ensiform, very acute: fl. brownish purple; sepals reflexed, very acuminate; lip obtuse, glabrous, reflexed at apex. Ceylon.

F. TRACY HUBBARD.

TRILÍSA (anagram of Lístris). *Compósita.* Autumn-blooming plants 2 to 3 feet high, with numerous small, purple or white, rayless flower-heads.

Closely related to Lístris, from which it differs in the fibrous roots (those of Lístris being tubercous): the inf. panicked instead of racemose or spicate, and the involucral bracts in only 2 or 3 series, while those of Lístris are in many series.—Two species. Trílisa is not so well known to gardeners as *T. signum*. Although a native of the low pine barrens from Va. to Fl. and La., it is hardy at N.Y., along the coast. It is mentioned in some English books as a hardy plant, thriving in light soil and prop. by division or by seeds sown in autumn. It is more fully described in the native botanies.

*odoráta-sima, Cass.* (Lístris odoráta-símá, Michx.). *VANILLA PLANT.* Also called Carolina vanilla, dog’s-tongue, etc. Rather stout, glabrous, chartreuse to green, 2-3 ft. high, corymbose branched above: lvs. thick, entire or sometimes dentate, obtuse, 4-10 x 1-1½ in., oblong, ovate or oval, sometimes spatulate: infl. corymbbose-paniculate: fls.-heads about ¾ in. long. Aug., Sept. B.B. 3:319.—The other species (*T. paniculata, Cass.*) has a similar range and is distinguished by its vescic-pubescent st. and thyrsoid-paniculate infl.

WILHELM MILLER.

TRILÍUM (Latin, tríplum, triple: leaves and floral parts in threes). *Liliaceae.* 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: st. simple, erect, sheathed at base: lvs. 3, whorled at the top of the st., broad, subsessile or long-petioled, 3-5-nerved: fls. 1, between the lvs., sessile or pedicellate, erect, cernuous or reflexed, violet, white, or greenish; perianth persistent, segments, distinct, spreading, 3 exterior thin herbaceous, green or rarely colored, 3 inner petal-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.

High trilliums are amongst the characteristic flowers of American woods. The best-known species is *T. grandiflorum*, 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 pup. 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 choiceest 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.

INDEX.

album, 10. atriperniporum, 10. angustipetalum, 4. californicum, 4.

2. nivale, Ridd. A dwarf species, 5 in. or less high, early: Ivs. narrow and obtuse, 1-2 in. long: fls. white, on a short erect or declined pedicel, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B.M. 6449.

3. undulatum, Willd. (T. erythrocirrum, Michx. T. pietum, Pursh). Of medium to large size, 1 ft. or more high: Ivs. large, ovate or acute or acuminate, short-stalked: fls. rather large, white, on a short but slender erect or inclined pedicel, the petals oblancoate 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: Ivs. broadly ovate or rhomboidal, acute, more or less spotted: fls. sessile in the whorl of Ivs., 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 Ivs. 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 Ivs. often 6 in. long and spotted, and the petals sometimes 4 in. long: fls. purple, rose-color, or white, the petals rhombic-ovate or narrower. Calif. and Ore. G.F. 3:321 (adapted in Fig. 3845). Var. Nuttallii, Wats. (T. viridiscens, Nutt.). Lvs. pubescent beneath, as also the upper part of the st.: petals linear-lanceolate, purplish green with brown base. Ark. Var. rufrum, Hort. A form of var. californicum, with fls. deep red-purple. Var. Wracy, 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: Ivs. lanceolate, sessile: fls. dull or brown-purple, an inch or

3845. Trillium sessile

var. californicum.

(X about \(\frac{1}{3}\))

KEY TO THE SPECIES.

A. Ovary 3-lobed, not winged.

B. Peduncle longer than the Ivs.

C. Lvs. oblong, acute.

D. Lvs. ovate, acuminate.

E. Lvs. sessile.

F. Flowers pedicellate.

G. Pedicel longer than the fl.: Ivs. nearly or quite sessile.

H. Sepals much shorter than the petals.

I. Petals nearly or quite as long as the petals.

J. Petals narrowly lanceolate or narrowly ovate (fls. white).

K. Petals ovate or broadly ovate (usually purplish).

L. Filaments stout, much shorter than the anthers.

M. Filaments slender, as long as the anthers or nearly so.

N. Vaseyi

O. Pedicel generally not exceeding and usually much shorter than the fl.

P. Fl. erect.

Q. Fl. declinate under the Ivs.

R. Lvs. rhombic or orbicular-rhombic.

S. Lvs. ovate-lanceolate.

3846. Trillium grandiflorum. (X 34)
TRILLIUM

TRIPETALEIA

more long, narrow-lanceolate or linear, the sepals ascending or somewhat reflexed, the filaments usually exceeding 1\text{ in.} in length. Ga. and Ala.—Little known in cul.

6. recurvatum, Beck. Strong-growing, usually 1 ft. or more high: Ivs. 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 nearly reflexed. Woods, Ga. to Minn. and Ark.

7. petiolatum, Pursh. St. scarcely arising above the ground: Ivs. ovate-elliptic to reniform, with stamens as long as the blade or even longer (blade 3-5 in. long): fls. purple, the petals 1-2 in. long and narrow-oblanco-late, the sepals erect. Idaho, Ore. and Wash.—Little known in cult.


9. ovatum, Pursh. Much like T. grandi-florum, but the petals narrow-lanceolate or narrow-ovate, the sepals usually nearly as long as the petal: plants 1 ft. or less high: Ivs. ovate to nearly orbicular, often somewhat rhombic. Calif. to Brit. Col.—The Pacific coast representative of T. grandiflorum.


11. Vaseyi, Habison. St. erect from a horizontal rootstock, 10-20 in. high, glabrous; Ivs. sessile, broadly roundish-rhomboidal, abruptly acumen-tate, 4-8 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: Ivs. lanceolate or oblong, obtuse, sessile: fls. pale flesh-color, less than 1 in. long, on a short erect pedicel, petals lanceolate and exceeding oblate petals. Pine lands, N. C., S. C.

13. cernuum, Linn. Plant 1 ft. or more high: Ivs. very broadly rhombic-ovate, nearly or quite sessile: fls. white, the petals 1 in. or less, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 554. Mn. 10:49.

14. stylobum, Nutt. (T. nervosum, Ell. and T. Calthifolium, Ell.) Stout, 2-4 ft. high: fls. 18-20 in. high: Ivs. 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 Fla.

T. Geonoma, Wall. A species of Temp. Himalaya, little known and described by Hooker as follows: "Ivs. shortly petiolate, ovate or ovate-elliptic, acute; sepals subequal, narrowly linear."—T. obtatum, Pursh. Founded on a Canadian plant, which has been referred to T. erectum, differs in the flowers more than 12 in. long, the anther-cells and very short stigmas." Maximowicz says that the plant differs from T. erectum in the petals being broader and longer than the calyx, the fls. nodding from the first, and the Ivs. broader than long, sessile, not attenuate at the base.—T. Trifoli, Maxim. One of the T. erectum of the N. E. Maximiowicz (T. japonicum flore-pleno, Gray), of Japan. Fls. smaller than those of T. obtatum (2 in. across), deep tawny red, the petals not exceeding the sepals in oblanceolate, the flowers soon elliptic, ovary orbicular, the capsula oblong-lanceolate, 2-3-seeded. About 1 ft. tall: Ivs. sessile, broad-ovate or orbicular, somewhat rhombic, acuminate; fls. dull purple, 1 in. or less across, the petals oblong-lanceolate. According to Hooker, this differs from T. erectum chiefly in the longer filaments. Himalaya to Japan.

L. H. B.

F. TRACY HUBBARD.

TRÍOSTÉTUM (name shortened by Linneus from Tri-osteosperrum, which is from Greek for three branches). Caprifoliaceae. Hoose GENTIAN. Coarse hardy perennial herbs, glabrous or glandular-pilose: sts. rather simple, terete: Ivs. opposite, sessile, rather fiddle-shaped or obovate, entire: fls. usually axillary, solitary or clustered, dirty white, yellow, or purple; calyx-tube ovoid, limb 5-lobed, persistent; corolla tubular-campanulate, base rounded, limb oblique, lobes unequal; stamens 5; disk small, swollen; ovary 3-5-celled: berry fleshy or leathery, 2 (rarely 3-5)-celled, 2-3-seeded.—About 8 species. N. Amer., Himalayas, and China.

perfoliatum, Linn. St. 2-4 ft. high, stout: Ivs. ovate, shortly acuminate, narrowed below into conuate-perfoliate or simply conuate 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.

F. W. BARCLAY.

TRIPETALÉIA (Greek, three and petals). Ericaceae. Two species of Japanese shrubs with deciduous alternate, short-petioled, shiny Ivs. and white or pinkish fls. in terminal racemes or panicles: sepals and petals 3; stamens 6, shorter than the petals, the anthers opening with a longitudinal slit; ovary 3-celled, superior, short-stalked; style slender, curved: caps. septical, many-seeded. Closely allied to Elliottia, but easily distinguished by its 3-lobed capsular caps. The species has grown hardy at the Arnold Arboretum; it seems to like humid, but well-drained, peaty or sandy soil and will probably grow best in a rockery in a partly shaded place. The second species was only recently intro. and has not yet been tested. Prop. is by seeds treated like those of rhododendron and probably also by cuttings. T. panic-ula, Sieb. & Zucc. Shrub with short, erect, purplish or white, 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, ½ in. long, style exerted; bracts subulate. Aug.
CXIII. Tsuga canadensis.—The hemlock spruce of the northeastern United States and Canada.
TRIPTERYGIUM

Japanese. T. bracteata, Maxim., has smaller obovate obtuse lvs. and pink lvs. in racemes, with elliptic or obvate bracts. Japan.

WALTER T. SWINGLE.

TRIPHÁSIA (from the Greek for triplex). Rudáceae, tribe Citraceae. Small ornamental shrubs or trees distantly related to the orange, sometimes used as hedging or ornamental.

Plants with spreading branches: spines double, axillary; lvs. alternate, sessile, trifoliate; lvs. 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.

dactyloides, Linn. (T. violaceum and D. Dictyolis of the trade). GAMA-GRASS. SESAME-GRASS. Culms in bunches, 4-7 ft.; spike 2-3 at summit and often single from the upper axis. 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.

TRIPTÉRYGIUM (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 lvs. in terminal panicles: lvs. polygonáceous; 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 pistillate spikes separate into the joints. —Prop. by seeds and probably by cuttings.

T. Régelii, Sprague & Takeda (T. Wilforii, Regel, not Hook. f.). Glabrous shrub, to 2 ft., with angled warty reddish brown branches: lvs. peltioid, broadly elliptic, acuminate, broadly cuneate at the base, serrate, 3-6½ in. long; lvs. greenish white, ½ in. across, in terminal panicles leafy at the base, and to 3 in. long; fr. little over ¼ in. long, with 3 broad wings. July, Aug. Manchuria, Korea, Japan. Gt. 18:612. Not yet in the American trade.

ALFRED REHDER.
TRISTÉTUM (Latin, three and bristles: the florets are 3-awned). *Grammea*. Tufted hardly perennials of no real horticultural interest: infl. 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 awn; palea narrow, 2-toothed. About 90 species, widely distributed throughout the temperate regions of the world. *T. flavescens*, Beauv. (*Aevra flavescens*, Linn.). Culms 1¼-2½ ft. high, erect, simple, glabrous: sheaths shorter than the internodes; ligule ¼½ 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. Eu., 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 *Stephanotantrion*. *Liláceae*. Herbs with subglabrous tunicate corms, used for fall-blooming. Lvs. radial, few, narrowly linear; scape simple, leafless; fls. in a terminal umbel, not numerous, pedicellated; perianth salver-shaped, tube cylindrical, 6-lobed; crown fleshy at the throat or lacking; stamens 6, in 2 rows; ovary sessile, ovoid, 3-celled; caps. loculicidally dehiscent.—About 7 species, Chile and Patagonia; probably to be planted in spring in this country.

*nivális*, Foëpp. (*Milla nivalis*, Baker). Lvs. 6-8 in. long, about 2 lines wide; scape slender, about 1 ft. long: fls. 1 in. long, 2-8 in an umbel, the segms. linear and glabrous; crown none.—Now treated by Baker as *Brodíza nivalis*, Baker. Likely to be offered by Dutch bulb-growers.

*T. narcesolídes*, Benth. & 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 narcesolus-like crown of 3-6 broad unequal more or less connate lobes.

F. TRACY HUBBARD.†

TRISTÁNIA (in honor of Jules M. C. Tristan, 1776-1861, a French botanist). *Myrtáceae*. Tall trees or shrubs, evergreen, cultivated as greenhouse shrubs in Europe and hardy in California and Florida.

Leaves alternate or somewhat whorled and approxi- mate at the ends of the branches, rarely opposite: fls. usually rather small, yellow or white, in axillary, per- dudced cymes; calyx-tube turbinate-campanulate, limb with 5 short segms.; petals 5; stamens numerous; ovary inferior or semi-inferior.—About 23 species, Malayas, New Caledonia, and Austral. Prop. by half-ripened cuttings in sand under glass, or by seeds.

*confréta*, R. Br. (*Lophosténon arbórescens*, Schott.). BRISBANE BOX. Fig. 3849. An unembarrassing tree attain- ing 150 ft.; young shoots and calyx hoary-pubescent: lvs. 3-6 in. long, ovate-lanceolate, glabrous, usually crossed at the base, the segments 3-5, recurved at the apex, verticillate: fls. mostly on the branches well below the lvs.; petals about ¼ 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 highly valued hard and durable timber. *T. macrophylla* grows in New S. Wales as a boulevard tree. Hardy in Cent. Calif., withstanding an exceptional temperature of 26° F. at Berkeley.

JOSEPH BURT DAVY.

TRISTELLÀTEÍA (Latin, three and star: each flower has 3 winged frs. which have the appearance of stars). *Malpíghiaceae*. Scandent shrubs, probably adapted only to the warmhouse. Lvs. opposite or verticillate in 4s., entire, petioles usually 2- glandular at the top, base with 2 very short stipules: racemes terminal or lateral, sometimes paniculate: fls. yellow; calyx 5-parted; petals clawed, keeled outside, sagittate-ovate; stamens 10, all perfect; ovary 3-lobed: samarae 3, many-winged. About 20 species, Madagascar, Indian Archipelago, and Austral. *T. australis*, A. Rich. Strong climbing shrub with pendant shoots; lvs. ovate or ovate-oblong, 2-5½ in. long, 3-5½ in., glabrous: racemes 2-6 in. long, 12-16-fl.; fls. opposite, short-peduncled, yellow; petals 5, oblong or ovate-oblong, 5-6 lines long; filaments finally deep red. Malayas and Australasias. B.M. 3834.


L. H. B.

TRÍTHRÍNAX (apparently triple *Thrinax*, alluding to leaf-division). *Palmeáceae*, tribe *Córyphae*. 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. hermaphrodite; petals imbricate; 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 in this work as *Acanthorrhiza Choco*. The inf. segms. of the former are bifid; of the latter apparently not. André says the first species described below is unique by reason of its sheathes at the base of the lvs.

These, he says, "are composed of fibers which are at first parallel and longitudinal, then obliquely inter- crossed 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.

brasilién, Mart. Trunk slender, 6-12 ft. high, 2-3 in. thick: lvs. palmate-lobelliform, glabrous and often
glaucescent, the If.-segms. 22–30, linear, free for two-thirds their whole length, deeply bifid; spadix much branched, with many spirally arranged fls. on its branchlets: stamens 6. Brazil. I.H. 22:202.

campéstria, Drude & Gris. Fig. 3850. Differs from T. brasilienensis 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 cæudix with netted sheaths: lvs. large, fan-like, cut nearly to base into about 40 narrow bifid segms.: spadix branched. Brazil. Gt. 27:361.

L. H. B.

TRITICUM (old Latin name for wheat). Gramineae. The genus as now limited comprises 2 sections, Egilops, 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 speltse themselves, that are referred by Hackel to 3 species. Annual grasses with fls. in a terminal spike: spikelets 2–5-fl.d., placed flat-wise, singly on opposite sides of a zigzag rachis; glumes ovate, 3- to many-nerved, these and the lemmas more or less awned; grain free. The common wheat is T. aestivum, 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, 56:237). 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 properly 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.

TRITÔNIA (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 Montróbrosa, Iridaceae. Blazing Star. Showy-flowered corn-bearing herbs used both as greenhouse and summer-blooming subjects.

Corns 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 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, Adenophora, Sparaxis, and Glad lioli. 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 gladiolii; 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. crocosma florai and T. Potsii. Most of the Latin names in catalogues belong to these, as sulphurea, tigridea, pyramidalis, grandiflora, elegans, floribunda. To gardeners, tritonia are usually known as montbretias. Garden tritonia grow 1 ft. or more tall, producing several to many showy fls. of a yellow, orange, or red color, and bearing several stiffish linear or sword-shaped lvs.

A. Three lower perianth-segms. bearing hatchet-shaped processes.

bractéata, Worsley. True lvs. about 3, appearing after flowering, about 1 ft. high and $\frac{1}{2}$in. broad; the early lvs. are really bracts. scape about 1 ft. high, flexuous, much branched: fls. 30–40, tawny red, scentless, opening singly or in 2's, subtended by the large following bracts, irregular in shape, about 1 in. across; outer segms. about $\frac{1}{2}$in. broad, inner segms. about $\frac{1}{4}$in. broad and recurved. S. Afr.

AA. Three lower perianth-segms. without hatchet-shaped processes.

b. Fls. hooded.

Clusiana, Worsley, Allied to T. secu rigera, from which it differs in having lvs. twice as long and wide, no obtuse or other indentation on the outer-spathe-valves: 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. ovate.

crocàta, Ker-Gawl. 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 Izia crocata). Gn. 54:82. Var. miniáta, Baker (T. miniáta, Ker-Gawl.), has light red fls. B.M. 609. There are color varieties, as purpú rea, Hort., coccin-
TRITONIA

rosea, Klatt. Tall and branched, with short linear lvs. and loose 6-15-fld. racemes: fls. bright red, with oblong, somewhat seriate, (or lower ones yellow-blotched at the base) as long as the tube and anthers just protruding from the tube. Cape Colony. B.M. 7280.—Can be left in the open as far north as Mass, if well protected, but are usually safer if taken up.

Pottsi, Bentth. (Montbretia Pottsi, Baker.) Fig. 3851. Strong branching plant 2–4 ft. tall, with several lax racemes, and few or several small flat racemes: lvs. about 1 in. long, bright yellow tinged red, the tube broadly funneliform and twice longer than the oblong unequal ascending segms., the stamens about half the height of the limb. Natal, Transvaal, etc. B. M. 6722. G.C. III. 7:301, showing how the corns form one above the other.

crocossmaflora, Lemoine, T. T. 3081. x pollen of Crocosmia aurea [Fig. 1112, Vol. II]. Fig. 3852. Slender much-branishing erect plant 3–4 ft. high, with several or many sword-shaped lvs. and loose more or less distichous racemes: fls. 2 in. across, orange-crimson, with a slender curved tube nearly or quite equaling the oblong spreading segms. R.H. 1882: 124. Gn. 25, p. 363; 31:490. G. M. 36: 484. G.Z. 27:169. Crocosma flava was intro. into England in 1847, and Tritonia Pottsi intro. from Natal, by G. H. Potts. Fig. 3852. Tritonia crocosmeflora. (X 9/9)

TROCHODENDRON

crocossmaflora.—T. flava, Ker-Cawl. Fls. bright yellow, the segms. oblong and the 3 lower ones with a callus in the throat: lvs. very short. B.R. 747.—M. germanica, Hort., is offered in the trade as a form with scarlet fls.; fr and segms. 3 in. across.—M. pachytricha, Baker. Difffers from T. crocets in having the perianth-segms. narrowed at the lower part into a claw with hyaline margin. B.M. 704 (as T. tenestretts).—T. hilairei, Ker-Cawl. Fls. white or pink, with short oblong segms. and protruding anthers, of the shape of gladiolus lvs. B.M. 487 (as Gladiolus lineatus).—M. Pritchathes, Hort., is a boreal natural hybrid, a form which grows up 3 ft. high and bears spikes of rich orange or orange-red fls., 3½ in. across, their center crimson. Gn. 71, suppl. Jan. 19. G.M. 49:515.—M. rosea, Hort., is offered in the trade as a form growing 3 ft. or more high with long arching spikes of rose or bright salmon-rose fls.—T. scillaria, Baker. Small and slender: fls. pink, with wide-flaring narrow segms., inax, like. B.M. 629 (as Ixia polythacthya).—T. securigera, Ker-Cawl. Lvs. short: fls. red or copper-colored, the 3 lower segms. with a callus on the claw. B.M. 705 (as Gladiolus pericarpium).—T. undulata, Baker. Lvs. short and narrow, much crisped: fls. pink, with oblong equal segms. B.M. 599 (as Ixia crispa).—T. viridis, Ker-Cawl. Lvs. plane or crisped; linear: fls. green, with nearly equal oblong-lanceolate segms. B.M. 1275.—T. Wilsonii, Baker. Lvs. very narrow-linear: racemes simple or forked, lax, few-fl.: fls. white, tinged with purple, the segms. obovate-cuspidate.

L. H. B.

F. TRACY HUBBARD.

TRIUMPÆTTA (named for Giov. B. Trionfetti, 1643–1705 or 8). Strelitzieae. Shires, shrubs, or herbs, evergreen, grown in the greenhouse or greenhouse. Plants stella-tetragonous: lvs. serrate, entire, or 3–5-lobed: fls. yellow, axillary or opposite the lvs., few or densely fasciculately cymose; sepals 5; petals 5, rarely none; stamens numerous; ovary 2–5-celled, cells 2-ovulated: caps. small, subglobose, spiny or bristled. About 100 species, widely dispersed over the world. Several species have been intro. abroad but none of them is cult. to any extent.

TROCHEÌTA (named for R.I.G. du Trochet, 1771–1847, Paris). Strychniumae. Shires, shrubs, or herbs, evergreen, grown in the greenhouse or greenhouse. Lvs. entire, leathery; peduncles axillary, 1–3-fl.: fls. usually pendulous, rarely large; calyx 5-parted, leathery; petals 5, flat, broad, and persistent; staminal column short, bearing 5 ligulate staminodia; anthers 10, 15, or 20, stipitate; ovary sessile, 5-celled, cells with many ovules; caps. loculicidally 5-valved.—About 6 or 7 species, natives of Mauritius, St. Helena, and Mascarene Isls.

Blackburniana, Bojer. Shrub or small tree; branches, petioles, and ribs of the lvs. rusty-scurred with stellate hairs: lvs. long-petioled, elliptic-ovate-oblong, acute or obtuse, or crooked-forked, with obtuse-toothed margin, which is slightly cordate: peduncles above the axis, 1-fl., 2-bracted: fls. large, campanulate; sepals elongated lanceolate; petals obliquely obovate-rotundate, white, rose-veined, margins blood-red. Mauritius. B.M. 7209. G.C. III. 36:112.

TROCHÖDENDRON (Greek, wheel and tree, alluding to the appearance of the fls., the anthers of the numerous spreading stamens forming a ring.). Trochodendraceae. Evergreen tree with aromatic bark and foliage, with alternate or whorled long-petioled lvs. and small fls. in terminal upright racemes; fls. long-pedicelled, perfect, without perianth; stamens numerous, filaments slender: carpel ripened in one whole, conical, bearing with short linear spreading styles: fr. consisting of 6–10 follicles inserted below in the fleshy receptacle, dehiscent at the apex, with several linear seeds in each carpel. The tree is probably not in cult. in this country, but may be recommended for its handsome evergreen foliage for the middle and southern parts of the Atlantic states and for Calif. Trochodendron, Sieb. & Zucc. A spreading shrub, glabrous: lvs. rhombic-obovate to elliptic-lanceolate, obtusely acuminate, crenate-serrate, lustrous and dark green above, lighter green beneath, 2½–5 in. long; petioles 3–5 in. long: fls. green, ½¼ in. broad across the stamens; anthers yellow: fr. brown, ½¼ in. broad, June. B.M. 7375. S.I.F. 1:42. G.C. III. 5:725. J.H.S. 27, p. 807. R.B. 30:86.

ALFRED REHDER.
TROLLIUS (old German, trol, something round; trollblume, 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: lvs. palmately divided or lobed: fls. large, solitary, white, yellow, golden yellow, or purplish, those in cult. usually yellow or orange-fl'd.; petals 5 to many, small, unguiculate, 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 Helios 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 incurving 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. europaeanus, Linn. (T. globosus, Lami.). Fig. 3853. Sts. erect, 15 in. or more high, often branching: lower lvs. petioled, others sessile; lfts. only 5-parted, lobed, cleft, and toothed, those of the root-lvs. on short petioles: fls. of a lemon-yellow color, solitary or in 2's, 1–2 in. across, globular in form; sepals 10–15, ovate; petals much longer than the sepals; fl. much as in T. laxus. Wet upland meadows of N. Eu. May–July. Gn. 40:102; 71, p. 310. G. 19:609. G.W. 15, p. 129. J.H. III. 51:594; 54:555.—Different forms are offered or sometimes listed. Var. Loddigesii, Hort., has deep yellow fls.

Var. napelliformis, Huth (T. napelliformis, Roep.). Sts. many-fld. and lvs. deeply divided.

bb. Sepals spreading, making an open fl.
c. Petals longer than the stamens.

2. asiaticus, Linn. Plant much like T. europaeanus, 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 take the best and most brilliant colors of partially exposed to the sun. T. gigzentus, found in garden lists, is a very tall form of this species.

cd. Petals shorter than the stamens or not exceeding them.

3. dschungaricus, Regel. Much like T. europaeanus, 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. altaicus, C. A. Mey. (T. caucasicus Fin. & Gagn.). Plant 1–2 ft., with foliage much like that of T. europaeanus: fls. large (2 in. across), yellow or pale orange, with 15–20 broad and oblique sepals (perhaps sometimes as few as 10); petals 5–15, narrowly oblong 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 lvs. 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 lvs. obsolete; lower st.-lvs. reniform and the upper orbicular-reniform, sometimes 7 in. across, palmately 5-parted, the segms. large-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. 8565.—

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), scape-like and 1-fl'd., the lvs. being radical and involucrate: fl. yellow, with 5 or 6 sepals which are 1 in. or less long. Japan.—Sometimes combined with T. chinesis, apparently closely allied to T. laxus. Franchet & Savatier, in Flora of Japan, maintain the species as distinct.

bb. Petals about equaling the stamens in length (or somewhat shorter in No. 10 var.), and shorter than the sepals.

8. paltus, Salisb. Low, 1 ft. or less high: radical lvs. palmately dissected, the segms. incised-dentate: fl. golden yellow; sepals usually 5, sometimes 6 or 7, ovate spreading petals, the stamens 10, the former 1–5; 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 genuina, Fin. & Gagn. to include T. alsin. Salisb., T. pumilus, Don, and T. pumilus var. yunnanensis, Franch; also var. Ledebouri, Fin. & Gagn. (T. Ledebouri, Reichb. f.), differing from the type in having the sepals longer than the stamens.

9. caucasicus, Stev. (T. ptilus var. caucasicus, Huth). Radical lvs. palmately dissected, the segms. incised-dentate: sepals 5–8, elliptic, spreading; petals 10, about equaling the stamens; style about equaling the ovary. Caucasia, Armenia, etc.—Perhaps a form of T. ptilus, as considered by Huth. Under the name T. caucasicus, the plant offered abroad is described as a hardy perennial, with large orange lvs. in June and July; 2–3 ft. in horticultural literature the lvs. 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 ovate and 3-lobed: lvs. 1 in. across, solitary, yellow; sepals 5 or 6, rounded, notched at the end; petals 10–12, about equaling the stamens, cuneate-oblung: follicles many. Alpine Himalaya.

Var. yunnanensis, Franch. St. to 2 ft. high and sometimes 3-ftd.: lvs. narrowly dentate, the teeth short and rigidly mucronate; cauldine lvs. 1 or 2: sepals 6–8, broadly ovate or suborbicular; petals long-clawed, shorter than stamens. W. China.—Described as horticulturally not unlike Caltha palustris, but superior, with dark green lvs. and bright golden yellow salver-form lvs.

BBB. Petals shorter than the stamens and scarcely equaling the filaments, and shorter than the sepals.

11. latus, Salisb. (T. americana, Muhl.). Sts. slender, weak, 1½–2 ft. long, somewhat ascending: radical and lower st.-lvs. long- or short-petioled; all the lvs. 5–7-parted; lfts. cuneate and much cleft and toothed: lfts. usually solitary, 1–2 in. across; sepals 5–7, 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 fr. ¼ in. across. Bogs and damp places, Mich., to New England and Del. and westward. May–July or Aug. B.M. 1888 and L.B.C. 50 (both as T. americana).

Var. albidiorus, Gray (T. albidiorus, Rydb.). Much like the type but usually lower, more slender: lfts. usually 5: lfts. pale or white; petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

12. acallis, Lindl. Plant only 3–4 in. high: lvs. as in the above, or only 5-parted: lfts. 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. 29:32.

T. aurantiacus, Hort., described as lemon-yellow: probably a form of T. europaeus—T. Excelsior, Hort., and T. hybrida, Hort., with deep orange lvs., are probably T. europaeus forms.

K. C. Davis.

TROPÆOLUM

T. TROPÆOLUM (from Greek word for trophe; the leaves are shield-shaped and the flowers helmet-shaped). Tropéolaceae. NASTURTIUM of gardens (but not of botanists). Climbing or rarely diffusely soft-growing herbs, grown in the garden for their showy flowers. Roots fusiform, sometimes tuberous: lvs. alternate, petate or palmately angulate, lobed or dissected; stipules none or rarely minute, bristle-like or dissected: peduncles axillary, 1-ftd.: lfts. 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; glands on the lobes; pollen, ripening into 3 1-seeded 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 peppery-tasting leaves are sometimes used like cress, in salads, whence the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly T. tuberosum, produce edible subterranean tubers.

Tropæolum thrive in any warm sunny fairly moist place. The tops are tender to frost. For early effects, seeds may be started indoors in boxes. The common climbing species are T. majus and T. peltiformum, both of which are very useful for window-boxes, balconies, for covering banks and walls, and for growing among 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.

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.

1. polyphyllum, Cav. Perennial, half-hardy: st. succulent, prostrate or climbing: lvs. peltate, orbicular, cut beyond the center into 7–9 narrow divisions: lfts. much like T. majus in shape, but smaller; spur slender but rather short, the calyx-lobes triangular; petals obovate-cuneate, unequal, yellow, wavy or emarginate, the 3 upper ones streaked with red. Chile. B.M. 4042. P.M. 10:175. F.S. 20:2066. G.C. II. 20-241. Gn. 45, p. 158. G.M. 58:367. 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

3854. Flower of Tropæolum minus. One of the lower petals shown at a. (X1/2).
numerous and more vivid-colored fls. and said to be more hardy.

**db. Plantis perennial, tall, scendent.**


**cc. Inferior petals ciliate at base (near the claw).**

**d. Plant pubescent.**

3. *peltophorum*, Benth. (*T. Lobbianum*, Veitch). Annual, climbing, hairy all over except the under parts of the lvs. and the petals; lvs. very long-stalked, peltate, nearly orbicular, undulate and with points on the margin: fls. large, long-spurred, orange-red, the 2 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. 4097. F.S. 2:167. P.M. 11:271. Gn.M. 9:16. Var. *fimbriatum*, Hubb. (*T. Lobbianum var. fimbriatum*, Hort.) has all the petals toothed or fringed. R.H. 1856:101. Seldom seen in its pure state. Var. *hederifolium*, Hubb. (*T. Lobbianum var. hederifolium*, Hort.), has variegated lvs. which resemble those of *Hedera helix* in shape. Var. *miniatum*, Hubb. (*T. Lobbianum var. miniatum*, 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; *aireum*, clear golden yellow; *falgens*, dark scarlet; *Chaixianum*, yellow, washed with red.

**dd. Plant glabrous.**

**e. Lvs. orbicular-reniform; nerves terminating in mucrons: petals mucronate.**

4. *minus*, Linn. Fig. 3854. 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. 98.—Very likely blended with *T. majus* by hybridization, in garden forms. *T. pinnatum*, Andr., is either a monstrousity of this species or more probably a hybrid between *T. minus* and *T. peregrinum*, having the lvs. somewhat peltate, with obtuse, unequal lobes: fls. pinnate; petals cuneate with the apex dentate. A garden form. Gt. 62, p. 279. The form known as *luteum*, Hort., has red petals and peduncles and the 2 upper petals bear a dark blood-red blotch. There is also a yellow form known as *luteum*, Hort.

**ee. Lvs. orbicular; nerves and petals muticosus (blunt).**

5. *majus*, Linn. Fig. 3855. Strong-growing somewhat succulent climbing annual: lvs. peltate, nearly orbicular and undulate-angled: fls. large, mostly in shades of yellow or orange, with straight spur, the 2 upper petals entire or undulate (not apiculate), the 3 lower ones narrower and fringed on the claws. Peru, Colombia, and Brazil. G. 4: 2. B.M. 23: 3373 (var. *atrosanguineum*). F.S. 12:1286 (var. *atropurpureum nanum*). P.M. 1:176 (var. *atrosanguineum*). G.C. II. 11:665.—This species has been in cult. in Eu. since 1684. It is the foundation of the common climbing nasturtiums. Some of these garden forms are probably the offspring of hybridization with *T. peltophorum*. Some of the horticultural color forms are *atropurpureum*, dark red; *atropurpureum fœtus-aires*, with golden yellow lvs.; *cocineum*, scarlet and the form of it with golden lvs. known as *cocineum fœtus-aires*; *Hænemannii*, chocolate; *hemisphæricum*, light yellow; *luteum*, yellow; *Regel-Plan*, purple-violet; *Scheuerianum*, straw-colored, dotted; *Scheuerianum cocineum*, scarlet, striped; *Schidlingii*, yellow, brown-spotted; *Schulzii*, scarlet, with dark lvs. Var. *floro-pleno*, Hort., is a strain with double fls. occurring in different colors. Var. *nanum*, Hort. Tom Thumb Nasturtiums. A dwarf strain occurring in numerous color-forms, some of which are *atrococineum*, brilliant scarlet; *atropurpureum*, dark purplish red; *atrosanguineum*, a deep blood-red; *cocineum*, scarlet and also the golden-lvd. form offered as *nanum cocineum fœtus-aires*; *carthure-roseum*, dark rose; *luteum*, clear yellow; *Regel-Plan*, purple-violet.

**bb. Petals 5, serrate-ciliate, lobed or aristate-ciliate above.**

6. *peregrinum*, Linn. (*C. canariense*, Hort.). CANARY-BIRD FLOWER. Fig. 3856. Annual, tall-climbing; gla-
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, elongate-ovate, shorter petals small and narrow and 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. tuberæsum, Ruiz & Pav. Root producing a pyriform irregular 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. Peru and Bolivia. B.M. 3714. F.S. 5: 452. P.M. 5: 49. R.H. 1853: 341 (tubers). J.H. III. 30: 385. H.U. I, 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 catalogues of European dealers. The tubers are usually boiled, or said to be eaten in a partially dried condition.

BB. Tuber longer, moniform 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 1½ 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, sphaeroid or somewhat flattened, rarely elongated: lvs. smaller or small, divided to the base.

c. Throat of the spur ventricoso-turbinate, aperture narrow; spur cone-like, its tip cylindrical-sulcate; petals lemon-yellow.

9. tricolor. Sweet, named by Lindl. (Sweet spelled the specific name tricolorum, but, as Lindley pointed out, this is orthographically incorrect) (T. coecinum, Miers). Fig. 3857. Perennial from a fleshy or tuberous root, half-hardy, climbing: lvs. peltate, orbicular, divided into 6 oblong villos lfts.: fls. about 1 in. long, somewhat cornucopia-shaped, the calyx being the conspicuous part; main part of the calyx vermicillion, the short lobes purplish, the small petals yellow. Chile. B.M. 3169. B.R. 1935. F.S. 4: 369. P.M. 2: 123. Gt. 62, p. 273. G.W. 6, p. 277. —Very choice half-hardy 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. Jarditii, Paxt. T. Yarditii, Buchen.), differs only in having larger fls. P.M. 5: 29.

CC. Throat of spur open; spur short or very short, conical; throat of corolla narrow, almost closed when old; petals blue.

10. azureum, Miers (T. violescens, Dietr.). Very slender glasshouse climber: lvs. peltate, 5-parted, nearly or quite to the base, into narrow-obovate or ob lanceolate divisions: fls. small, the calyx and short spur green, the wide-spread ing corolla azure-blue, the petals 2-lobed or emarginate. Chile. B.R. 28: 65. R.H.

TSUGA


ccc. Throat of spur conical, aperture broad; throat of corolla broad, open; petals yellow.


T. digitatum, Karst. Climber, with root fibrosa: lvs. peltate, 5-7-lobed: fls. yellow, 1 in. diam., the spur long and red, the petals fimbriate. Venezuela.—T. leptopodium, Don (T. edule, Fas.). Climber: lvs. orbicular, with 5 or 6 narrow lfts.: fls. in shape like those of T. majus but small yellow. Produces a short tuberous roots. Chile. P.M. 9: 127.—T. Lindeni, Walla. Beautiful climber with large, peltate, undulate-lobed lvs. that are purplish beneath and beautifully veined with white above; fls. on long pedicels, the long tube red and the calyx-yellow. Colombia. I.H. 41: 17.

L. H. B.

F. TRACY HUBBARD.†

TRÓXIMON (Greek, edible, which does not apply).

Compósita. Mostly perennial nearly stemless herbs, belonging to the Cichoreaceae, 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 Troximon is now given up for Agoseris (Greek, goat chivey).

Agoseris cuspidata, Dietr. (Tróximon cuspidátum, Pursh. Notocalis cuspidáta, Greene). Root thick: lvs. entire, linear-lanceolate, thickish, 4–10 in. long, the margins conspicuously white-woolly and crisped; the fls. about 1 ft. high: fls. yellow, about 1–1½ in. wide: achene not beaked. Prairies 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.†


TSÚGA (its Japanese name). Pinaceæ. HEMLOCK.

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; stamine aments axillary, subglobose; ovule-bearing aments terminal, the scales about as long as the bracts, each with 2 ovules at the base; cones small, oval, 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-
leather. *T. canadensis* should be called "hemlock spruce," but in common speech it is usually alluded to as "hemlock." The "hemlock" of the ancients is a poisonous umbelliferous herb described in this work as *Comium maculatum*.

The hemlock spruces are evergreen trees of pyramidal habit, with spreading irregularly whorled much rami-fied branches clothed with small linear usually two-ranked leaves and small cones which are usually freely produced. The cones are only about 1 inch long except in one 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 tenderer. 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 Gng. 2:289. G. 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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**KEY TO THE SPECIES.**  
**A.** Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½–1½ in. long.

3858. Tsuga Sieboldii. (X½)

**3859. Tsuga diversifolia. (X½)**

**b. Margin of lvs. entire; apex of lvs. usually emarginate, sometimes obtuse.**

c. Scales of cones suborbicular.

d. Branchlets yellowish brown, gla-brous.  
1. *Sieboldii*  

dd. Branchlets reddish brown, pubescent.

**cc. Scales of cones oblong; lvs. often obtuse.**  
2. *diversifolia*  

**BB. Margin of lvs. finely denticulate, at least toward the apex; apex of lvs. obtuse or acutish.**  
3. *caroliniana*  

**cc. Conges pedunculated; scales almost orbicular, glabrous.**  
4. *canadensis*  

**cc. Conges sessile; scales oval, slightly puberulous.**  
5. *heterophylla*  

**AA. Lvs. stomatiferous on both sides, flat or convex above, spirally arranged; cones 2–3 in. long (Hesperoence) . . . . 6. *Mertensiana*.**

1. *Sieboldii*, Carr. (T. Araragi, Koehne). Fig. 3858. Tree, attaining 100 ft., with spreading slender branches: branchlets pale yellowish brown, somewhat glossy, gla-brous, with reddish lil-thers: lvs. linear, usually broadest at the apex, emarginate, grooved and glossy dark green above, with 2 whitish lines beneath, ¾–¾ 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. 32:1301. 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 branchlets: lvs. linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base: cone smaller, ¾–¾ in. long: peduncle not exceeding the bud-scales: bracts truncate, crenulate, not or slightly bifid. Japan. G.F. 6:496; 10:493 (adapted in Fig. 3859). S.I.F. 2:4.


most commonly used in the E. for framing and clapboarding of buildings. It is not used for finishing lumber. A number of garden forms have been raised; the following are the most important: var. sartwellii Nichols. Tips of the young branches creamy white. Var. compacta, Sénécl. (var. compacta nana, Beissn.). Dwarf conical pyramid with numerous short branches clothed with small lvs. Var. globosa, Beissn. (var. globulifera erecta, Kunkler). Dense, globose, much-branched form with numerous upright branchlets nodding at the ends. Var. gracilis, 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 1/4 in. long. Var. nana, Carr. Dwarf and depressed form with spreading branches and short branchlets. Var. parvifolia, Veitch. Lvs. very small, 1/4 in. long or shorter: branchlets stout, closely set and numerous. Var. pendula, Parsons (var. Sargentii pendula, Hort., var. Sargentiana, Kent). Flat-topped form with spreading branches and drooping branchlets. Gn. 32, p. 303/30, p. 81. M.D.G. 1900:367, 368, 491. Very distinct and desirable form.

5. heterophylla, Sarg. (T. Albertiana, Sénécl. T. Mertensiana, Carr.). Tree, attaining 200 ft., with short slender, usually pendulous branches forming a rather narrow pyramidal head in older, but rather broad in young trees: young branches pale yellowish brown, pubescent: lvs. elliptic, obtuse or acutish, distinctly grooved and dark green above, with 2 white lines below, 3/3–3/5 in. long; cones oblong-ovoid, sessile, 3/4–1 in. long; scales ovate, slightly puberulous outside. Ivs. spirally arranged around the branches, linear, usually curved, acutish, mostly rounded or keeled, rarely slightly grooved above, light bluish green or pale bluish white, with white lines on both sides, 3/2–1 in. long; cones cylindric-oblung, usually violet-purple before maturity, brown when ripe, 2–3 in. long; scales obovate, puberulous outside. Brit. Col. to Calif., west to Mont. S.S. 10:605. G.C. III. 12:11. Var. argenteo-variegata, Schneid. Tips of the young branches white.


TULBAGHIA (Tulbagh, a Dutch governor at the Cape of Good Hope, died 1771). Litteczus. Perennial herbs with a short, thick, sometimes corn-like rhizome, usually grown in the greenhouse: lvs. radical, ligulate: scape simple, leafless: lfs. in a terminal umbel, numerous, pedicellate; perianth urn-shaped or almost salver-shaped; lobes 6, subequal; spreading; crown rather fleshy at the throat, shorter than the lobes; stamens 6; ovary sessile, ovoid or globose, caps. ovoid or oblong, loculicidally dehiscent.—About 20 species, Trop. and S. Afr. greenhouse subjects, little cult.; prop. by seeds and offsets.

TULIPA (originally from Persian toliban, turban; which the inverted flower resembles). *Liliaceae*. *Tulip*. Popular spring-flowering hardy bulbs, and much used for forcing in early spring culture.

Low plants, the fls. mostly single (sometimes 2–5) on a scape or scape-like peduncle that arises directly from the bulb and is 30 in. or less high; bulb tuñicated, the outer tunicae of variable form, leafy and woolly on the inner face: lvs. linear or broad; fls. erect, rarely nodding, showy; perianth deciduous, campanulate or slightly funnel-shaped; segms. distinct, often spotted or blotched at base, without pitted nectaries; stamens 6, hypogynous, shorter than perianth-segms.; filaments longer than anthers, attenuate or filiform; anthers dehiscing laterally; ovary sometimes narrowed at collar, rarely into a distinct style; stigmas adnate; seeds numerous, flat. Differs from Fritillaria in the absence of nectariferous pits and usually erect (never pendulous) fls., and from Erythronium in its erect broader perianth-segms., erect fls., and usually 1-fld. sts. Native of Siberia, Turkey, Asia Minor, China, Japan, and Medit. countries of Eu.; the species are particularly abundant in Cent. Asia, in the Bokhara region. The genus includes probably 100 species so usually defined but perhaps reducible to much fewer; the number in cult., outside the collections of special-ists and botanic gardens, is very few. For literature, see J. G. Baker, Journal Linnæan Society (1875), 275–96; also in Gardeners’ Chronicle, for 1883 (types 10 and 20); Levier, “Les Tulipes de l’Europe,” 1885; Solms-Laubach on the history of the garden tulips (see his “Weizen und Tulpe, und deren Ge-schichte,” Leipzig, 1899); Burbridge, The Garden, Sept. 22, 1900.

Tulips are flowers of rich and brilliant colors, and of great substance. The tulip is the most showy of spring flowers, and the habit and shape of the plant are so formal and definite that it is adapted to the vicinity of buildings, walks, and to parterres. They are also charming subjects for “spotting in” singly and in little clumps among shrubbery and along well-planted borders.

The range of season is great, from the early Duc Van Thol 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 Cottage tulips, comprising the main-season kinds that have been preserved by cottagers in the old countries since the collapse of the tulipomania of Holland. (3) The Darwin tulips are stately plants, mostly selfs or “breeders,” closing the tulip season, with very rich and deep colors in crimsons, reds and purples; there are

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, anthers are elongated into long, narrow segments, as shown in Fig. 3863 (adapted from Gardeners’ 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 state 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 parti-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 lilac or purple markings are “bybloemen” or “bybloems,” and those with yellow ground-color and red to brown over-color are “bizarres.” The terms “bybloem” and “bizarre” are also sometimes applied to selfs, or breeders, when the colors are prevailingly lilac or purple in the one case or prevailingly 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, flames, plumes, and patches; they are bybloemen 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 Thol 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 Cottage tulips, comprising the main-season kinds that have been preserved by cottagers in the old countries since the collapse of the tulipomania of Holland. (3) The Darwin tulips 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 Dwarins 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 Bizarre. These have a yellow ground flamed with red, very dark, almost black, and chestnut-brown. (2) Feathered Bizarre. 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 'breeders.' Bizzare. Yellow selfs. Bybloemens. Lilac and light to deepest purple selfs. Roses. Rose and scarlet selfs. They are termed 'breeders' 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 merely means that in 1753 Linnaeus grouped all the garden tulips he knew under the name of Tulipa Gesneriana. But the tulips 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 most one dare say is that the garden tulips 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 1707, 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 scapes. 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 Duc van Thol 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 Duc van Thol 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 1554 by Busbequius, the
Austrian ambassador before the Sultan of Turkey. Busbequius reported that he first saw the flowers in a garden near Constantinople, and that he had to pay dearly for them. After the introduction of seed to Vienna the tulip became rapidly disseminated over Europe, both by home-grown seed and by new introductions from Turkey. In 1559 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. 3806. 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. 3808). 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 varieties 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 nothing but the rarer forms represented (Solms-Laubach). All the early tulips of direct Turkish origin had acute more or less narrow and reflexed segments. Indeed, among all the old engravings, including those of Pena and Lobel (1570), Clusius (1576), Dodoens (1578), and Besler (1613), no round-petaled forms are found. Besler's work, "Hortus Eystettensis," contains magnificent copper plates, the first in any book on plants. In some copies the plates are beautifully colored by hand. The fifty-three figures of tulips in this great work show how widely diversified was this flower even at that early date. In this and in Parkinson's "Paradisus Terrestris" (1629), many are figured with inner segments rounded and outer acute, but none vice versa (so far as can be seen), although that form is mentioned in the descriptions. The hybrid, rounded, outer acute, inner acute forms were developed later, apparently first by the Dutch growers before the tulipomania and contemporaneously with it, and produced wholly by selection. This ideal has prevailed 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 to be monstrosities and were pictured as such. According to Solms-Laubach, no traces of them are to be found in the old Dutch books. They were evidently developed by the French, who did not disdain the yellow and red forms, to which these belong, to such an extent as did the Hollanders. At one time they were made a separate species, T. turcica, and were later said by one author to be hybrids, between T. acuminata and T. sylvestris (E. S. Rand, Jr., 1873), by another between T. Gesneriana and T. suaveolens (Mrs. Loudon, 1841). That the Parrot tulips are hybrids is perhaps true, but to state with certainty the parents seems impossible, for as early as 1613, among the figures in Hortus Eystettensis, there is one which shows laciniation of the petals to a marked degree, sufficiently so, in fact, to be
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. sylvestris" was known in 1701, and at the beginning of the nineteenth century a double form of T. sylves-

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 surface should be staked 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-

3867. A pan of Murillo tulips, one of the few double varieties that are really desirable. (X34)

3868. Round-petaled tulips in a 5-inch pot. (X34)
Though early or late, tulips are well brought into the house for a succession, if raised in living-rooms. Care is necessary, as the atmosphere of such a room is drier than that of a greenhouse. On cold nights the plants should be moved from exposed places where they are liable to freeze, and when the flowers appear they should not be allowed to stand in the sun shining through a window. Many of the handsomest flowers are thus easily burned and wilted. Practically all of the early single varieties are adapted to pot culture, especially the Duch van Thols when well root; otherwise they are extremely unsatisfactory. For a succession, pot every week or ten days from September to December, or pot early and bring into the house at fortnightly intervals. Avoid caking the soil beneath the bulbs. The single early tulips are best for forcing, although some of the Darwins give good results.

Many of the early single varieties are adapted to water-culture. For this purpose use ordinary "hyacinth glasses" and select only well-formed solid perfect bulbs of fair size. Put a little charcoal in the water to keep it pure. The bulbs must be placed so that the base is just in contact with the water—not immersed in it. Place them in a dark closet for ten days or a fortnight until the bulbs have become well rooted, then give them plenty of light and air.

Propagation is effected in various ways. Tulips may be increased by the side offsets, but these are not so 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 the 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" process, though perhaps slower to respond than the seedlings. Seed production is now practised 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 the product 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 Darwinium to do 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.

**3869. Three leafy bulb-scales from young tunic, inclosing the homology of leaves and bulb-scales (x34). At the right an old tulip bulb, showing formation of new bulb within the old, and flower-stem attached directly to root-crown.**

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**KEY TO THE GROUPS.**

It is a matter of regret that the key used below is based on technical botanical characters of no interest to the horticulturist, but it seems to be impossible to group the species primarily according to the color and shape of the flowers or other marked external features. It is difficult to determine the cultivated forms botanically. For the most part, the portraits cited in this treatment are under the names that accompany them; the authors can not vouch for all of them.

**Subgenus I. ORTHYTA. Style distinct by the attenuation of the ovary, bearing 3 small stigmas: dwarf, small-flowered, and fragile plants little known in culture.**

**Species 1.**

**Subgenus II. TULIPA proper. Style lacking, the stigma sessile on the ovary.**

**A. Outer coat or tunics of bulb glabrous or practically so inside.**

**AA. Outer bulb-coat or covering variously hairy on inside.**

**BB. Bulb-tunic always hairy at base inside around root-crown, and usually with a few scattering hairs above but sometimes without them.**

**Species 5-13**

**BBB. Bulb-tunic with scattered appressed hairs all over inside.**

**Species 24-38**

**AAA. Outer coat variously pubescent or woolly inside.**

**BB. Bulb-tunic pubescent inside, often densely so at apex.**

**Species 39-42**

**BBB. Bulb-tunic woolly at base inside.**

**Species 43-47**

**BBB. Bulb-tunic everywhere woolly inside.**

**Species 48-53**

**Subgenus I. ORTHYTA, small plants with a distinct style.**

I. dasystemon, Regel (Orthyta dasystemon, Regel). "Belongs to the Orthyta section of the genus, which
includes species that are nearly all of small stature and possess comparatively small flowers. It is a charming plant, growing about 6 in. high. The flowers have yellow segments, 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 with B.B.S. (broad-beaked, small) spadixum 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 as st. 1-fld. and not more than 3 or 4 in. long; lvs. 2, glaucous, lanceolate: perianth above 1 in. long, funnel-shaped, bright yellow inside, the outer segments obovate and green-tinged on outside. E. Turkestan.

Subgenus II. 

Tulipa proper, without distinct style.

A1. Outer bulb-tunic quite or nearly glabrous inside.

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, 1-1 ½ in. long, 3 in. across, slightly fragrant; segments all acute; filaments bearded at base; ovary slightly narrowed at collar; stigmas small. Algeria. Gn. 45:486. Allied to T. sylvestris, differing in position of the lvs. and segments uniformly wide.

3. Hageri, Heldr. Height 6 in.; lvs. 4-5, lorate acute, not undulate: fls. chiefly red, about 2 in. across; perianth broad-campanulate, 1½ in., nodorous; segments 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 Parsons 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 segments flushed with gray and bronze, black at base. Asia Minor. Gn. 63, p. 372.

4. præstans, Hoog (T. suaveolens var. sylvestris, Regel). Bulb about 1 in. diam., rounded, with leathery skin which is almost glabrous inside; scape about 18 in. white-hairy, 1- to several-fl.: fls. light scarlet-vermilion, the segments all uniform in shape, pointed: lvs. hairy, rather broad. Bokhara. B.M. 7929. G.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 Due van Thol forms.

A2. Outer bulb-tunic always hairy at base inside around root-crown, 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.

c. Leafy only at base of st. 6. stragulata

dd. Lvs. lanceolate: fl. yellow. 7. australis

d. Lvs. linear: fl. yellow. 8. primulina

ddd. Lvs. lorate-lanceolate: fl. greenish. 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 basal blotch, bordered with bright yellow. 11. macropelia

DDD. Perianth variable, but rarely with a bordered dark basal blotch. 12. Gesneriana 13. nitida

5. suaveolens, Roth. Duc van Thol Tulips. Height 3-6 in.; lvs. 3-4, mostly at base of st., lowest lorate-lanceolate and broad; perianth campanulate, 1-2½ in. long, erect, fragrant, bright red or yellow or variegated; segments all acute; filaments glaucous; anthers yellow; ovary prismatic; stigmas very large. S. Rusi-
TULIPA

blotch, which is usually yellow but may be dark or even blackish or mixed, sometimes white; segms. all obovate-oblong, obtuse, broadly rounded at apex, often with a small cusp in the center; filaments glabrous, flattened; ovary prismatic; stigmas large and usually crisped. Origin uncertain. Intro. from the Turkish gardens in 1554. Long since hybridized and cult. out of all semblance to any wild forms. Supposed original form (Baker) in B.M. 6439 (as T. Schrenkii). Darwin tulips (Fig. 3871) are a strain of long-stemmed late self-colored tulips. Var. Dracóntia, Baker. PARRÍT TULIP. Fig. 3870. Similar in habit; perianth usually yellow and red striped and spotted; segms. deeply cleft and keainitely dentate. F.S. 21:2211 (as T. tircica). Var. spathulata, Hort. (T. spathulata, 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. Strangewayssiana, Hort. Very large brilliant dark scarlet fls., with a handsome dark basal blotch. One of the naturalized tulips found without disposition to vary in fields near Florence, Italy. F. 1881:35. Var. fíbo-occílata, Krelage. Deep campanulate fl., with a slight sweetish muskweck odor, bright red, with a distinct white basal blotch; inner segms. obtuse, outer acute; filaments white. 13. nítida, 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 (2-3 in. high), glabrous: lvs. 3, linear-lanceolate, falcate and channeled; fl. bell-shaped, 1½ in. long, intense and very brilliant vermilion-scarlet with small well-defined black blotch at base of segms.; inner segms. obovate, outer segms. oval and shorter. Bokhara. G.C. III. 31:351. A3. Outer bulb-tunic with a few appressed hairs inside toward the top. B. St. pubescent. C. Lvs. blotched with linear chestnut-brown spots: filaments not bearded at base. .................. 14. Greigii Cc. Lvs. not blotched: filaments bearded at base. .................. 15. Eichleri Bb. St. glabrous (T. Kolpakowskiana sometimes obscurely pubescent). Cc. Lvs. ovate or broadly lanceolate. D. Filaments bearded at base. .................. 16. pulchella 17. violacea 18. carinata 19. vitellina Cc. Lvs. narrowly lanceolate to linear or linear-lanceolate. D. Filaments bearded at base. .................. 20. sylvestrís 21. Ostrowskiana 22. Kolpakow-skiana 23. Sprengeri 14. Greigii, Regel. Height 2-8 in.: lvs. usually 4, obscuresly downy, much unclade toward cartilaginous border: perianth campanulate, 3-3½ in. long, 5 in. across, spreading abruptly from about the middle, bright crimson with a large dark basal blotch margined with yellow; segms. uniform, obovate, cuspidate or emarginate; anthers yellow; filaments black, glabrous; ovary narrowed at collar; stigmas yellow, twice as broad as neck of ovary, reflexed. Turkestan. B.M. 6177. F.S. 21:2261. F. 1876:217. G.Z. 21:205.—Early-blooming. Var. álba, Hort., has segms. white-margined. 15. Eichleri, Regel. Height 6 in.: lvs. 12-15 in. long, lanceolate-acuminate, margins plane and smooth: perianth broadly campanulate, 2½-3½ in. across, deep scarlet with a broad-cuneate dark violet-blue basal blotch margined with yellow; segms. rounded at top with a muero; anthers violet-brown; filaments black; stigmas very thick, undulate, pale yellow. Georgia in Asia. B.M. 6191. F. 1877:196.—Allied to T. Greigii. 16. pulchélía, Fenzl. Height 4 in.: lvs. 2-3, crowded and spreading close to the surface of the ground, channeled, obscurely ciliate on edges; perianth funnel-form, erect, 1-1½ in. long, 2½ in. across, bright mauve-red above, passing downward into a slaty lilac without any dark-colored blotch, but bright yellow at base; segms. all acute, densely pileose at base; filaments linear; ovary clyvate; stigmas less than ovary-diam. Alpine regions of Cilician Taurus, 1877. B.M. 6304.—A dwarf species near to T. Hageri. 17. violáceà, Boiss. & Buhse. Less than 12 in. high: lvs. 3-5, crowded; perianth campanulate with a contracted base, 1½ in. long, 2 in. wide, fragrant, typically bright mauve-red or rosy crimson flushed with purple, varying to white with a slight flush of red outside, with a large brown or black basal blotch, usually bordered with white; segms. uniformly oblong, subacute; stamens black or purple, stigmas maroon. Intro. to cult. 1890. B.M. 7440. G.M. 39:390.—Allied to T. Hageri and T. pulchella. 18. carinatá, Hort. Krelage. Lvs. 3, not crowded, as long as fl.-stalk, 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; stamens yellow; ovary prismatic, stigmas white, not undulate. Habitat unknown. Vars. ríbra and violácéa, Hort., are offered. 19. vitellína, Hort. Lvs. 4, not crowded, as long as fl.-stalk, not undulate, 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; stigmas not undulate.—Said to be "hybrids of T. saúveolens and T. Geaneriána." It is one of the "Cottage Gar- den" 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. sylvéstrís, Lindl. Height 9-15 in.: lvs. usually 3, at base of scape, channeled, linear-lorate: peduncle somewhat 2-fld. in cult.; bud nodding; perianth funnel-form-campanulate, 1½-2 in. long, yellow; segms. all acute, inner narrower; ovary bladder-form (narrowed at collar); stigmas smaller than ovary-diam., yellow. Said to be native in Eng- land and widely so in Eu.—In cult. as T. florentína and T. florentína var. odoráta. 21. Ostrowskíana, Regel. Outer tunics of the bulb bluish, strigose-pilose at their apex inside: st. 3-flvd., glaucous, 1-fld. 8-10 in. high including the peduncle: lvs. glaucous, glabrous, immarginate, the lower nar-rowly lanceolate, strongly undulate, the upper linear-lanceolate to sublinear, shorter than the st.: peduncle glabrous: sepals more or less spreading, elliptic, per-
22. **Kolpakowskiana**, Regel. Tunics of the bulb fuscous, strigose-pilose toward the apex inside: sts. 3-lfd., 1-fld.; lvs. erect-spreading or spreading, undulate, obscurely carinagulose, margin smooth or sebarerous, lower lvs. narrowly lanceolate or linear-lanceolate, upper rather linear (sublinear); peduncle glabrous: perianth erect; sepals 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, base glabrous: stamens glabrous: Turkistan. B.M. 6635 and G.C. III. 27:390 (both as *T. Borszczowii*).—Nearly allied to *T. Gesneriana*, Linn., which differs in the 3-4-lfd. st., the broader immarginate lvs. and in the campanulate-connivent frequently obtuse segms. of the perianth.

23. **Spréngeri**, Baker. Late-flowering: height 10-18 in.; lvs. 4, close together, long, linear-lanceolate, stiff; peduncle wiry, covered with deep rose under fl.; pedanth open-campanulate (star-shaped), 2 in. long; bright scarlet with a somewhat dull brown basal blotch margined all around with dull orange-yellow, all blending into one another; segms. all oblong-ovate and cuspitate; filaments reddish brown; ovary reddish; stigmas equal to narrow collar. Hab.(?). Intro. by Dammann & Co., Naples, 1894. Gn. 56:438. Gt. 44:1411. G.M. 49:665. Said to be the latest tulip.

24. **élegans**, Hort. Height 12-18 in.; lvs. 3-4, below middle of st., lorate-lanceolate, finely ciliately upon upper face; perianth beautiful scarlet with yellow base, campanulate, 3-3½ in. long; segms. uniform, narrowed gradually to a very acute point; anthers violet; filaments glabrous; stigmas larger than ovary-diam., yellowish.—Known in gardens only. Krelage catalogs a variety as "*Cottage élegans picta*," which has larger lvs. and white fls. edged with rose, and without basal out. Probably a hybrid between *T. acuminata* and *T. suaveolens*, according to Baker.

25. **maculata**, Hort. Height 12-18 in.; lvs. 3-4, lorate-lanceolate: perianth fine scarlet, campanulate, 2-½ in.; segms. obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small.—"A well-marked garden race, with the habit of *T. Gesneriana*, from which it differs by its small stigmas, pubescent peduncle, and bright red fl.-segms., with a broad black basal blotch."—Baker.

26. **Micheliana**, Hoog. Bulb ovoid to about 1½ in. diam., the outer brown coats clothed inside with long buff-colored hairs; scape pubescent, about 1 ft. high; lvs. usually 4, very glaucous, often brown-striped, lanceolate and the upper ones linear-lanceolate, very undulate: fls. single, large, vermilion-scarlet inside and lilac-tinted outside; outer segms. oblong-ovate and cuspitate; inner segms. obovate, mucronate; all segms. with black glabrate botches at base. Steppes of Trans-Caspi. G.C. III. 31:353.


28. **íngens**, Hoog. Bulb ovoid and large, the outer scales covered on inside with long silky hairs especially toward the base and the apex of the bulb: st. or scape about 1 inch high, pubescent: lvs. 3, undulate, the lowest broad-lanceolate and the upper linear-lanceolate, very glaucous, and the upper surface white-hairy; fls. very large, to 4 in. long, funnelbellshaped, bright scarlet-vermilion with a prominent black blotch at base or covering entire claw; inner segms. obovate, mucronate; outer segms. oblong-ovate, mucronate, bearing outside a broad yellowish band; filaments subulate, glabrous. Bokhara. G.C. III. 32:14.


30. **Késselringii**, Regel. Lvs. 4-5, crowded at base of st., lorate-lanceolate, or linear channelled; peduncle sometimes obscurely puberulous; perianth campanulate, 1½-2 in. long, bright yellow, flushed with light orange-yellow, or green outside; inner segms. subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diam. Turkestan. B.M. 6754.

31. **platystigma**, Jord. Height 18 in.; st. slender, glabrous: lvs. 3-4, very much undulate: peduncle glabrous: perianth campanulate, 2 in. long, violet-magenta, magenta-red; filaments-obovate-oblong; claw blue tinted with a yellow spot in the middle; filaments not bearded; anthers violet-colored; ovary prismatic; stigmas very large and undulate. France.

32. **Korolkówi**, 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; stigmas small. Turkestan, 1875. Bokhara. 1875. Hort. W. Wallace. Described as having fls. about the size of those of *T. Clusiana* and of "extreme beauty in form and coloring; the buds are of a soft buff and yellow tone, and, when expanded, the segments display a scarlet blotch." Gn. 59, p. 275.

33. **Kaufmanniana**, Regel. Less than 12 in. high; lvs. 2-3; perianth subcampanulate, 2-3 in. long, 2½-4 in. across, bright yellow in original form, tinged with red outside, without basal blotch; in cult. very variable in color, often cream-white, and nearly always with a deep yellow basal blotch; anthers lemon-yellow, linear;
filaments bright orange, linear flattened; ovary pyramidal; stigmas small in cult. form, but described as large. Turkistan, 1877. B.M. 6857. G.C. III. 51:217.

37. Billietiææ, 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. 38:311.—One of the late tulips.

38. Didirî, Jord. Height 12-18 in.; lvs. 3-4, undulate, acuminated: perianth campanulate, 2-2½ in. long, 4½ in. across, bright crimson, with purple basal blotch margined with yellow, yellowish white or orange; stamens same color as basal blotch; ovary narrowed at collar; stigmas larger than collar-diam., white. Savoy, Italy, and Alps. B.M. 6639. Gn.W. 21:1067. Var. Mauríana, Baker. Lvs. narrower, slightly undulate: perianth brilliant red, with wide yellow blotch. Var. planifîsîa, Baker. St. slender; lvs. narrow, not undulate; perianth deep red, faintly marked with yellowish red or blackish blotch. Var. filâba, Krelage. Peduncle stiff, mottled with red; perianth light lemon-yellow, or white tinged green outside, basal blotch limited to a few dark striations; filaments same color as fl. Var. lutécens, 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. albîfûra, Hort., white-fl.d., is mentioned. G.W. 12, p. 378.

39. acuminata, Vahl. Fig. 3872. Height 12-18 in.; lvs. 4, lowest lanceolate, all undulated at margins; peduncule shining: perianth very open, light yellow spotted with red lines; segms. sometimes 1½ in. long, less than ½ in., wide, with edges rolled in; stamens yellow; filaments flattened, glabrous; ovary prismatic; stigmas very large, yellow, not undulated. Turkey (?) "This, the well-known Turkish tulip, is a most distinct type, of which the native country 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. Borsczowii, Regel (later spelled Borschovii). Pronounced Borschowî. Bulb ovate, fuscous, outer tunics pubescent within: plant glaucous, very glabrous; st. 12-18 in. high, white pruinose, lower third covered with lacerate scarious sheaths, 1½ 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-obovate, apex rounded to the noticeably abrupt cusp, red with an ovobate black blotch at base; stamens glabrous. Steppes of Kara-Kum on the Aral Sea. Gt. 33:1175.
42. Dâmmanni, Regel. Height 6 in.: lvs. 4, placed whorl-like at middle of st., linear-lanceolate, recurved, obscurely bristle, ciliate on margin, otherwise glabrous; peduncle glabrous; perianth spreading, star-shaped, purplish or reddish with an oblong-lanceolate black blotch without yellow border; segms. narrowly oblong; filaments filiform, glabrous; stigmas broader than ovary-diam. Mt. Lebanon, 1889. Gt. 38:1300.—Allied to T. linifolia and T. Maximowiczii.

A6. Outer bulb-tunic woolly at apex inside.

b. Filaments bearded at base. 43. Löwnei.

bb. Filaments not bearded.

c. Perianth bright or scarlet, with a distinct basal blotch. 44. linifolia. 45. Wilsoniana. 46. montana.

c. Perianth yellow, without basal blotch. 47. Batalinii.

43. Löwnei, Baker. Height 2-4 in.: st. glabrous, sometimes 2-headed: lvs. 2, lanceolate, acuminate, falctate, glabrous; 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; stamens yellow; ovary narrowed at collar; stigmas very small. Mountains of Syria and Palestine, 1874.

44. linifolia, Regal. Dwarf; bulb ovoid, 1½-3½ in. diam., the tunics bright yellow, and bearded inside; at the apex of the bulb are small hairs; st. somewhat shining, sometimes 2-headed: lvs. 6 or 7, linear and grass-like, spirally arranged, spreading, glabrous; perianth open-campanulate, small, bright crimson; basal blotch bluish black; inner segms. oblong-lanceolate, outer ovate and slightly wider; anthers pinkish; pollen gray; filaments bluish black; ovary pyramidal; stigmas very small, yellowish white. Bokhari, B.M. 7998. Gn.W. 21:707.

45. Wilsoniana, Hoog (T. Watsoniana, André). Diffs 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 margined with red and more upright-growing in the later stages of development, in the obovate inner segms., and in the longer ovary and broader filaments. Mountains of Trans-Caspi, south-west of Aschabad. 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-oblong, more or less ciliate at short 2-4 in. base.

46. montana, Lindl. Bulb large and ovoid, with demarcated pubescence; height 4-8 in.; lower lvs. oblanceolate, 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. Jalta. Koch. Dwarf, from Caucasus. Not more than 3-4 in. tall: fls. bright red, 1 in. or less long; all 6 segms. ovate and obtuse.


A7. Outer bulb-tunic everywhere woolly inside.

b. Filaments bearded at base.

c. The filaments flattened. 48. biflora.

c. The filaments cylindrical. 49. Clusiana.

48. biflora, Pall. Height 3-6 in.: st. glabrous or slightly pilose, usually 2- or 3-fl., rarely 4-, 5- or 6-fl.: lvs. often 2, sometimes 3, linear, long; perianth funnelform-campanulate, 1 in. long, 2 in. across, pale yellow or white inside, tinged with 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.M. 535. B.M. 6518. Var. turkestânica. 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 vary." Bulb small and densely pilose: height 12-18 in.: st. glabrous, slender; perianth rotund, or oblong-lanceolate, 4-5 in. across, purple or crimson; outer segms. obtuse, ciliate 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 filaments. Base of stamens black; claw hirsute on edge; stamens yellow; filaments cylindric, densely bearded at base; ovary pyramidal; stigmas small, tinged with red. Portugal, through Medit. region to Greece and Persia. B.M. 1390. Gn. 77, p. 171. Gn.W. 22:329.

50. stellâta, Hook. Close ally of T. Clusiana, with similar lvs. and habit, according to Baker, but the bulbs more obtuse, and the fls. without the distinct purple eye, the fl. very wide open in sunlight. Himalaya. B.M. 2762.—Bright yellow variations are mentioned.

51. Biebersteinianâ, Schult. f. Height 6 in.: st. slender, glabrous: lvs. 2-4, crowded together, long, channelled, glabrous, slightly ciliate on edge; bud slightly nodding; perianth open-campanulate, 2½ in. long; perianth black and yellow, acute, sparsely ciliate and sometimes green outside; at base a brownish yellow discoloration; inner segms. obtuse, outer acute; anthers gray; pollen yellow; filaments yellow; ovary prismatic; stigmas yellow, undulated. Asia Minor.

52. Òculus-solis, St. Amans. Tall, 12-18 in.: st. slender, glabrous: lvs. 3-5, lorate-lanceolate, acute, glabrous; perianth funnelform-campanulate, 2½-3 in. long, 4½ in. across, scentless, erect; segms. bright red, with a large long black yellow-borderd 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. Lortéfii, Baker. A slight variety, the basal spot oblongate and black. Marseilles. Baker. St. 6-8 in. long: lvs. crowded: perianth-segms. all acute, inner oblongate-oblong; apex subdeltoid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. Var. aléppica, Baker. A form with fls. considerably smaller than W. European type, with a smaller black basal blotch. Asia Minor, Syria, and Palestine.

53. præcox, Ten. Height, 12-18 in.: st. slender, glabrous: lvs. 3-5, lorate-lanceolate, acute, undulate 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, outer6 slightly longer, acute, puberulent at apex; inner shorter, obtuse; filaments pubescent; flowers yellow, dark purple, glabrous; ovary prismatic; stigmas pubescent, reddish. Italy and S. France; also Algeria,
CXIV. Tulip varieties of the Tulipa Gesneriana type
Greece, Syria, Palestine, and Persia. Very closely allied to last, and figured as such in B.R. 204, 1143, 1419; 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. flos, Hort.**, is "often confused with vitellina in gardens, the stems more robust, tall, and at least a fortnight later in blooming. Vitellina is almost white when old."—Imperfectly known—T. Rosendal, Hort. Fls. very large, rich intense glowing crimson with a darker blotch at the base of the segments; lvs. very broad, many-nerved; of robust habit and easily grown. Bokhara, II: 30, 323.—T. goldstica, Trev. Tunus silvery hirsute within; st. glabrous; lvs. linear-lanceolate, acuminate; fls. yellow; outer segms. elliptic to oblong-elliptic; inner ovate, pubescent. A pretty dwarf for the greenhouse. Bokhara. "T. Leichtlinii," Regel. Bulbaceous glabrous inside; height 9-18 in.; st. glabrous; lower lvs. lanceolate-linear; fl. erect; perianth between campanulate and funnel-form; outer segms. narrow and acute, the outer bright purple with broad white margin, the inner much shorter and obtuse at apex and yellowish white. Kashmir. Gn. 40: 174.

**T. robusta, Hort**.

**T. hoary-tomentose**, B.M. 1143, 12-14 in.; short, erect, simple; st. and petioles 3 in. long, bearing nodding or almost pendulous spikes, 3-4 in. long; fls. about 1½ in. across, dull reddish purple inside, at first white. With perianth reflexed, usually robust, lanceolate-linear, acuminate: Fls. white, and easily grown in England. Bokhara. "T. Leichtlinii," Regel. Bulbaceous glabrous inside; height 9-18 in.; st. glabrous; lower lvs. lanceolate-linear; fl. erect; perianth between campanulate and funnel-form; outer segms. narrow and acute, the outer bright purple with broad white margin, the inner much shorter and obtuse at apex and yellowish white. Kashmir. Gn. 40: 174.

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**T. robusta, Hort**.

**T. hoary-tomentose**, B.M. 1143, 12-14 in.; short, erect, simple; st. and petioles 3 in. long, bearing nodding or almost pendulous spikes, 3-4 in. long; fls. about 1½ in. across, dull reddish purple inside, at first white. With perianth reflexed, usually robust, lanceolate-linear, acuminate: Fls. white, and easily grown in England. Bokhara. "T. Leichtlinii," Regel. Bulbaceous glabrous inside; height 9-18 in.; st. glabrous; lower lvs. lanceolate-linear; fl. erect; perianth between campanulate and funnel-form; outer segms. narrow and acute, the outer bright purple with broad white margin, the inner much shorter and obtuse at apex and yellowish white. Kashmir. Gn. 40: 174.
**TURNIP**

*campestris* var. *Napo-Brassica*. Whether these two species exist separately in wild nature is not positively known, but they appear to be well defined under cultivation. Both species tend to run wild in old fields and to lose their thickened roots. They are then sometimes, though erroneously, known as charlock. (The real charlock is *Brassica* [Sinapis] of the mustards). The nativity of these species is unknown, but they are almost certainly European or Asian in origin. Characteristic tubers of these two plants are contrasted in Figs. 3573 and 3574. The former is commonly known here as "flat turnip" and the latter as rutabaga or merely "baga." According to Vilmarin, the plant that we know as rutabaga is known to the French as chou-Navet and in England as Swedish turnip and turnip-rooted cabbage.

The culture of turnips and rutabagas is very similar, except that the rutabaga requires a longer season. The rutabaga is nearly always grown as a main-season crop, whereas the turnip may be sown very late for winter use or very early for late spring or summer use. Usually the flat turnip is not grown in the hot weather of summer. In the northern states it is sown from the middle of July to the middle of August for late crop, or on the first approach of spring in order that tubers may be had for the early vegetable market. The late or winter crop is ordinarily used for storing in cellars and also for feeding, whereas the early crop is often sold in bunched in the open market, and later by the basket or bushel.

The turnips and rutabagas are hardy; that is, the young plants can withstand some frost. They are cold-weather plants and demand loose moist soil. Usually the seeds are sown in drills that stand from 10 to 20 inches apart. In the drills the plants are thinned until they stand from 6 to 10 inches apart, depending on the variety. For general field operations, the rows are sometimes placed as far as 30 inches apart, to allow horse tillage. Sometimes the late or winter crop is raised from seed sown broadcast, but this method involves good results only when the soil is well supplied with moisture, very thoroughly tilled beforehand and is free from weeds, since subsequent tillage is impossible.

The seeds of turnips and rutabagas are of similar size, two or three pounds being required to the acre for broadcasting. When sown in drills, one-half or one-third this amount may be sufficient. The yields will sometimes reach 1,000 bushels to the acre, although the average is much less than this.

The turnip needs no special care as to cultivation.

**TURRAEA**

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 bisulphide 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 infected 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 landplaster (one part by bulk of paris green to fifty of plaster).

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 or last 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 salsify and parsnips the roots will not be left in the ground to freeze if they are to be used.

**TURNIP, INDIAN**: *Arista triphylla*.

**TURPINIA** (named for Turpin, French fl-painter, died 1840 in Paris). *Staphyleacese*. 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.

**pomifera**, DC. Glabrous tree: lvs. odd-pinnate, 5-20 in. long; lfts. 3-9, elliptic-oblong or ovate, acuminate, crenate-serrate, 3-5 in. long: fls. yellowish, 1/2 in. long, in large terminal panicles, 6-10 in. long; frs. green, turning red, yellow, or greenish, 1-2 in. across. Himalayas. The closely allied *T. nepalensis*, Wall., with smaller fls. and much smaller fr. is probably only a variety of this species. S.I.F. 2:40 (as *T. pomifera*).


**TURRREA** (named for Giorgio della Torre or Turra, 1607-1688, botanist of Padua, Italy). *Melaceae*. Trees or shrubs, sometimes grown in the greenhouse in the North; in the South used as outdoor ornamentals.

Leaves alternate, pinnate, entire or cut into lobes: 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, 5-10-20-celled; ovules 2, superposed in each cell: caps. 5- to many-celled, loculecily 5- to many-valved. About 75 species, Trop. and S. Afr., Trop. Asia, and Austral.

*Fls. solitary or in pairs, axillary.*

**heterophylla**, Smith. Smth, not Sond. Lvs. more or less obovate-cuneate, 3-lobed above, varying to subentire: fls. 1/2-3/4 in. long. Upper Guinea. B.R. 30:4 (as *T.*
lobata).—This name is in the Fla. trade, but it seems open to doubt whether the plant is this species.

AA. Fls. clustered at ends of branches.

floribundâ, Hochst. (T. heterophylla, Sond.). Shrubs: foliage falls away before flowering season; lvs. ovate, acute or produced into a short obtuse point, undivided or 3-lobed; fls. clustered at ends of branches: peduncles and calices silky tomentose. Natal.

F. TRACY HUBBARD.

TUSSILÂGO (Latin, tussis, cough, and ogo, referring to the medicinal use of the lvs.). Compositae. Here belongs the Colt’s foot, the flowers of which look much like the dandelion; the leaves are large and make an attractive low covering for rough banks. Acaulescent perennial herb more or less white-tomentose: fls. in a dense head on a scaly scape, before the lvs. of the season; tubular and ray-fls. about in equal numbers, the rays pistillate and fertile and in several rows; disk-florets sterile; receptacle flat; involucres campanulate or cylindrical, the scales in a single series: achene narrow, with soft capillary pappus.—One species.

Fârfara, Linn. Compositae. Resembles the dandelion in having scapes bearing solitary yellow fl.-heads composed of rays, but the scapes are scaly and the heads are smaller, lighter colored and borne in early spring before the main crop of dandelions. After the fls. have lost their beauty they appear; they are heart-shaped and rounded at first, but as they grow they become more and more angled. They are covered with a soft cottony matting which diminishes toward the end of the season. It grows naturally in moist places and thrives on steep raw banks in the stiffest clay. Spreads rapidly by underground stts. Flowers in March. Native to Eu., India, and N. W. Asia. Naturalized in Amer. Gn. 23, p. 113.

Var. variegate, Hort., has lvs. margined and more or less blotched with white or yellow. Gn. 37, p. 435. Lowe 56.—More commonly cult. than the type.

T. frigida = Petroxites.

WILHELM MILLER.

TUJTHERIA (after W. J. Tutcher, assistant superintendent of the Botanical and Forest Dept. of Hong-Kong). Ternstroemiâceae. Two species of evergreen trees in S. E. China, with alternate, ovate-lanceolate lvs. and axillary, showy, white fls.: sepals imbricate in 2-3 series, silky outside, the inner ones becoming petaloid; petals 5, large; stamens many, connate at the base and adnate to the petals; ovary 4-6-celled; styles united nearly to the apex; caps. globose, woody, dehiscent with 3-6 valves; seeds angular, 2-5 in each cell. The following species has been recently intro. into England; to be recommended for its showy white fls. Hardiness and cult. probably like camellia. T. spectabilis, Dunn (Camélia spectabilis, Champ.). Small tree: lvs. short-petioled, ovate-lanceolate, acuminate, cuneate at the base, slightly crenate, lustrous above, 5-6 in. long; fls. short-stalked, white, cup-shaped, about 3 in. across, slightly fragrant; petals broadly obovate, emarginate, 1½-2 in. long; caps. globose, 2-3 in. across. Seemann, Bot. Herald, 78.

ALFRED REHDER.

TWAYBLADE: Lepilotis lilifolia.

TWEÉDIEA: Oxypetalum.


TWISTED STALK: Streptopus.

TYDÆA is now considered a synonym of Isoloma; by some authorities called Kohleria (see Isoloma). T. ocellata, Regel = Isoloma ocellatum. Gt. 4:180. Other species which may have been cult., but probably are no longer in trade are T. venosa, Hort. (H.F. II. 3:248), and T. Warscewiczii, Regel (Gt. 3:72).

TYPHÔN (ancient name). Typhaceæ. 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, creeping: sts. erect, simple, base often under water: radical lvs. linear-elongated, rather thick, spongy, with or without ribs; caluine lvs. few and shorter: peduncles erect, terete, strict and not divided: spadices, male and female similar, superposed: fls. monoeccious, densely clustered in the cylindrical spadix; perianth consisting of slender hairs: fr. minute, sub sessile. —About 17 species, temperate and tropical regions. Monographed by Graebner in Engler'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, 1.5-2 mm. long.

latifolia, Linn. Fig. 3875. Plant stout, 4-8 ft. high: lvs. usually broad, linear, 3½-1 in. broad, exceeding the flowering culm: male and female spikes contiguous, rarely remote. N. Amer., Eu., Asia. R.B. 20, p. 196. V. 2:197. J.III. 65:325. Var. elongatus, Graebn. (T. elongatus, Bor.), has narrow lvs. and shorter contiguous or slightly remote spikes. Eu.

CC. Pedicels short or elongate-conoid, 1-1.5 mm. long.

Shuttleworthii, Koch & Sond. Plant stout, 3-4½ ft. high: lvs. linear, 2-6 lines broad, longer than the flowering culm: spikes cylindrical: pistillate spikes thick and longer than the staminate. Eu.

BB. Plant slender, rarely over 3 ft. high: lvs. semi-cylindrical or rather flat.

Lâxmannia, 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 axils of bracts.

B. Plant stout, 3-12 ft. high: axis of male spike hairy.

angustifolia, 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.

TYPHÔNIUM (an old name of some plant of the family, named for Typhon, a mythological giant). Arîeæ. Perennial tuberous herbs, occasionally grown in the greenhouse. Lvs. appearing with the fls., sagittate or hastate, 3-5-lobed or -serrate or pedately cut; petioles elongated: peduncle usually short: spathes persistent, throat constricted, blade ovate or lanceolate; spadix sessile or stipitate, included; male infl. cylindrical, female short: fls. in an appendiculate monocious spadix, male and female elements remote; perianth none; stamens in the male fl. 1-3; ovary in female fl. ovoid or oblong-ovoid. 1-celled; berry ovoid, 1-2-seeded.—About 20 species, Trop. Asia, Austral., and islands of the Pacific.

gigântem, Engl. Tuberous herb of large size: lvs. with petioles 2 ft. long, the lower 8 in., wing-sheathed; blades 1 ft. or more long, hastate, the lobes large, apex acute: spathe-tube oblong, 1¼ in. long, blade acum-
TYPHONIUM

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.

TYPHONIODORUM (Greek, stormy wind and gift). Aráceae. Robust herb, with a stout caudex 4-10 ft. high: lvs. thick, petioled, triangular-ovate or hastate, acuminate: spathe with oblong tubes attenuate at both ends, blade 3 times longer than the tube, oblong-lanceolate, caudate-acuminate; spadix erect, 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, 1 1/4-3 1/2 ft. long, 7 in. to 2 ft. across; petiole terete, 2-4 ft. long: spathe 1 1/4-2 ft. long, tube 3-5 in. long, oblong, green, blade 13-19 in. long, 3-5 in. across, lanceolate, convolute below, yellow: seeds 1 1/4-2 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 Dc), 1915.
UDO, a spring blanched vegetable introduced in 1903 by Latthrop and Fairchild from Japan; it is *Aralia cordata*, 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 ¼ 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 2½ inches 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 has obviated 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 *Montana bipinnatifida*, K. Koch, the name Montana 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: lvs. mostly scale-like, only vigorous shoots near the ground bearing fully developed lvs.: fls. papilionaceous, axillary at the end of the branchlets; calyx 2-lipped, divided nearly to the base; standard ovate, wings and keel obtuse; stamens alternating 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 Cytisus 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 sandbinders for covering dry sandy banks and are also well suited for seaside planting. On account of their dark green leaves 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 greenhouse 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. europaeus.*

*europeaus,* 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, 1–5, crowded at the end of the branches and forming racemes; corolla bright yellow, about ½ in. long, fragrant; calyx yellow, hairy; pod oblong, over ½ 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 Isl. S. E. B. 3:233. R. F. G. 22:2068, 3. G. W. 17, p. 283.—There is a variety with double fls., var. *plenus,* Schneid. (var. *flora-plena,* 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.

*nanus,* Forst. Dwarf shrub of dense habit, similar to the preceding species, but smaller in every part, less rigid, leaves 6 mm. long; fls. about ½ in. Varies, with the wings straight and shorter than the keel; calyx slightly downy, not hairy; pod ½ in. long, nearly inclosed in the calyx. Autumn. W. Eu., Eng. to Spain. S. I. F. 3:325. R. F. G. 22:2068, 3. ALFRED REHDER.

**ULLUCUS** (native name). *Chenopodiaceae; Volken in Engler’s Pfianzenfamilien places this in Basellaceae.* Fleshy perennial herbs, decumbent and climbing, grown in Peru and Chile for the tubers: rhizomes

produced near the base of the plant underground, are much eaten in S. Amer. Sometimes the plant is cult. in northern countries, but only as a curiosity. It is prop. by the tubers, as are potatoes.

**ULMÁRIA**: *Filipendula.*

**ULMUS** (ancient Latin name of the elm). *Ulmaceæ.* 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; fls. short-petioled, usually unequal at the base, with caducous 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 muclaginous 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 as a shade tree for dwelling houses. It is especially useful as 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 usually at 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. *U. fulva,* *U. racemosa,* and the European *U. campestris,* *U. hollandica,* and *U. foliacea.* Of *U. hollandica,* the vars. *bicolor, 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. *fasciata* and *U. foliacea* var. *monumentalis,* with narrow columnar head; *U. glabra* var. *pendula,* with horizontal limbs forming wide-spread tiers; *U. glabra* var. *Camperdovii* with long pendulous branches. *U. foliacea* var. *umbraulifera,* 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 corky wings. The foliage of most species turns pale green 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 cloth 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. 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 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. Increased also by layers, which are usually put down in autumn and are left to be removed in the spring. 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 slightly or not at all is larger and more abundant. Dwarf forms of *U. foliacea* and also *U. parvifolia* and *U. pumila* may be raised from greenwood cuttings under glass, the cuttings growing most readily if taken 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 greenhouse. *U. americana*, *U. campestris*, *U. foliacea*, and *U. glabra* are used for stocks.

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**KEY TO THE SPECIES.**

**A. Blooming in the axils of this branch in spring, before the leaves:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elf, frosted</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**B. Flower slender pedicels, drooping:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fr. ciliate</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**C. Fr. glabrous except the ciliate margin of the branches not cory; margins of leaves ciliate:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lvs. widest above the middle, densely pubescent beneath; buds ovoid, obtusish or acute</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**D. Lvs. widest below the middle, more or less pubescent beneath; buds ovoid, obtusish or acute:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>levis</em></td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**CC. Fr. pubescent; branches usually more or less cory:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Margin of lvs. not ciliate; lvs. about 3 in. long, without axillary tufts beneath; buds pubescent...</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**DD. Margin of lvs. minutely ciliate; lvs. about 6 in. long, with axillary tufts beneath; buds glabrous... | *U. americana* |

**BB. Fls. short-pedicelled, in dense clypeiflorous corymb:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. Buds covered with rusty hairs; obtuse; branchlets scabrous with minute tubercles; lvs. ciliate; fr. pubescent in the middle...</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**CC. Buds pale pubescent or glabrous; branchlets smooth; lvs. not ciliate; fr. glabrous... | *U. americana* |

**D. Lvs. doubly serrate, unequal at the base, 2–7 in. long:**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Latin Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Young branchlets pubescent; lvs. scabrous above...</td>
<td><em>U. americana</em></td>
</tr>
</tbody>
</table>

**F. Fr. with the seed in the center, about 3⁄4 in. broad; petals short, about 3⁄4 in. long... | *U. americana* |

**G. Mature branchlets reddish brown, hairy while young; lvs. only occasionally 3–lobed... | *U. americana* |

**GG. Mature branchlets pale yellowish or grayish brown, glabrous or nearly so while young; lvs. usually 3–lobed at the apex... | *U. americana* |

**FF. Fr. with the seed near the apex, 3⁄4 in. broad or less; petals 5⁄8–3⁄4 in. long... | *U. americana* |

**G. Lvs. broadly oval or ovate, 2–3 in. long; branchlets not cory... | *U. americana* |

**GG. Lvs. ovate or elliptic, 3–4 in. long; branchlets often with cory-like wings... | *U. americana* |

**EE. Young branchlets glabrous or with few scattered hairs; lvs. smooth or nearly so above; fr. with the seed above the middle... | *U. americana* |

**F. Lvs. of 3–5 in.; petals 3⁄4–3⁄4 in. long;... | *U. americana* |

**FF. Fr. of lvs. 5–8 in.; petals 5⁄8–3⁄4 in. long... | *U. americana* |

**DD. Lvs. simply serrate, nearly equal at the base, 1–2 in. long... | *U. americana* |

**AA. Blooming in the axils of this branch in summer or autumn; calyx divided below the middle... | *U. americana* |

**B. Lvs. simply serrate, small; fr. glabrous... | *U. americana* |

**BB. Doubly serrate; fr. pubescent... | *U. americana* |

**CC. Racemes 3–5-ft.; lvs. 1–2 in. long; obtuse or acute... | *U. americana* |

**CC. Racemes many-ft.; long, acuminate... | *U. americana* |

**1. *levis*, Pall. (U. pedunculata, Fouq. *U. effusa*, Willd. *U. ciliata*, Ehrh. *U. racemosa*, Borkh., not Thomas). Tree, attaining 100 ft., with spreading branches, forming a broad open head; branchlets pubescent, usually until the second year; buds glabrous, acute; lvs. oval or obovate, very unequal at base, acuminate, sharply doubly serrate, usually glabrous above, pubescent beneath, 2–4 in. long; frs. slender-pedicelled; calyx with 6–8 exerted stamens; fr. ovate, notched, the incision not reaching the calyx... | *U. americana* |

Tall and wide-spreading tree, attaining to 120 ft., usually with light gray trunk, limbs gradually outward-curving with pendulous branches; branchlets pubescent when young, glabrous in fall; buds acutish, 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, 3–6 in. long; fls. in many-fld. clusters; stamens 7–8, exerted: fr. oval or elliptic, veined, 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, 1½–2⅓ in. long: fls. in short, few-fld. racemes; stamens usually 5: fr. elliptic-ovate, with narrow base, pubescent and acuminate at the apex, villous, ½ in. across. Va. to Fla., west to Ill. and Texas. S.S. 7:313.—Handsome round-headed tree, sometimes used as an avenue tree in the southern states; not hardy N.

5. fulva, Michx. (U. ribra, Michx. U. elliptica, Hort., not Koch. U. Hejderi, Spetha. U. sibirica, 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. ovate 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, ½ in. across. Que. to Fla., west to Dakota and Texas. S.S. 7:314. Em. 2:334.—The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding.


3875. Ulmus americana. (×4)
horizontal branches, stunted leaves, and small Ivts., forming a hemispherical bush. Forms of U. glabra are frequently planted in the East.

7. Laciníata, Mayr (U. montana var. laciníata, Trautv. U. major var. heterophylla, Maxim.). Tree, usually not exceeding 30 ft., but occasionally taller: branchlets sparingly hairy or glabrous, finally pale yellowish brown or grayish brown, older branchlets brown: lvs. obovate or obovate-oblong, on the broad apex usually with 3, sometimes with 5 lobes, very unequal and semi-cordate at the base, doubly serrate, rough above, pubescent beneath at least on the veins, 3-7 in. long; petioles pubescent, very short, about 3/8 in. long; fls. in clusters, short-stalked: fr. elliptic, glabrous, ¾ in. broad, with the seed in the middle. Manchuria, N. China, Japan. S.I.F. 2:15.—This species has been sometimes confused with U. glabra var. grandifolia, but is easily distinguished by the pale color of the mature branchlets glabrous or slightly pubescent while young and by the presence of 3-lobed 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-lobed lvs. appear chiefly on vigorous shoots.

U. campéstris, Linn. (U. proceras, Salish: U. sativa, Mill., according to Henry, U. terebro, Smith. U. surculosa var. latifolia, Stokes). ENGLISH ELM. Tall tree, to 130 ft. high, with a straight st. and spreading or ascending branches forming an oval head; usually suckering abundantly; bark deep fissured: young branchlets pubescent: buds ovoid, minutely pubescent: lvs. broadly oval or ovate, short-acuminate, very oblique at the base, dark green and scabrous above, soft-pubescent beneath and with axillary tufts of hairs, 2-3 in. long; pairs of veins about 12; petioles 3/8 in. long, pubescent: fls. short-stalked with 3-5 stamens: fr. nearly orbicular, 3/8 in. across, with a short closed notch at the apex, seed touching the base of the notch. England, W. and S. Eu. F.S. 1:149, 1877. S.E. 8:1285, Em. 2:336. M.D.G.1900:577.—This is the most stately of the European elms and much planted in England; the famous “Long Walk” in Windsor Park consists of this elm. This tree is sometimes planted as an avenue tree in this country; it succeeds very well and fine old trees may be seen occasionally in the northeastern states. The foliage remains green several weeks longer than that of the American elm. The form of S. Eu. has been distinguished as var. australis, Henry. Pyramidal tree: lvs. thicker and firmer; more cupulate-acuminate, with the veins more prominent beneath: fr. more obovate. There are also several garden forms. Var. variegata, Dipp. (var. argenteo-variegata, Charles). Var. purpurea, Kirkn. Lvs. tinged purple, 2-2 1/2 in. long. Var. purpurascens, Schneid. (var. myrtifolia purpurea, L. de Smel). Lvs. tinged purplish, about 1 in. long. Var. Van Houttei, Schneid. (var. Louis Van Houitte). Lvs. tinged with yellow. Var. Borárdi, Simon-Louis. Bushy tree or shrub with slender upright branches: lvs. obovate, with few coarse teeth, nearly glabrous, 3-5 in. long. Var. viminalis, Loud. (U. antáctica, Kirchn. U. stricta, Hort.). Tree with as

3879. A feathered elm.—Ulmus americana.


3880. Fruit of slippery elm.—Ulmus fulva. (×1 1/2)

nata, Kirchn. (var. viminalis variegata, Nichols.). Like var. viminalis, but lvs. variegated with white. Var. Wentworthii, Schelle (U. Wentworthii pérdula, Hort.). A form with pendulous branches.

9. japónica, Sarg. (U. campéstris var. japónica, 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, oblique 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 ¾-3/4 in. long, densely pubescent: fr. nearly sessile, tetramerous: fr. obovate-oblong, about ¾ 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. hollándica, Mill. (U. Dippétdiana, Schneid. U. glabra x 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. hollándica. Var. major, Rehd. (U. major, Smith. U. scabra var. major, Gürke). U. campéstris var. major, Planch.). DUTCH ELM. Tree, to 100 ft. or more, with a short trunk and wide-spread 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 ¾ in. or slightly longer: fls. mostly 4-merous: fr. oval-obovate, ¾-1 in. long; seed touching the base of the notch. R.F.G. 12:693. Var. végea, Rehd. (U. végea, Lindl. U. glabra var. végea, Loud. U. Héntingdonii, Hort.). WESTWOOD 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
ULMUS

3882. Ulmus glabra var. Camperdownii. (×34)


3881. Camperdown elm—Ulmus glabra var. Camperdownii. pendulous branchlets; suckering: bark gray, deeply fissured: young branchlets glabrous or nearly so: buds minutely pubescent: Ivs. 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,
UMBELLULARIA

3413


13. parvifolia, Jacq. (U. chinensis, Pers.). CHINESE Elm. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obovate or oblong, very short-petioled and little unequal at base, acute or obtuse, subcoriaceous, simply serrate, glabrous and glossy above, pubescent beneath when young, usually glabrous at length, ¾-2 in. long: fls. short-peduncled, in clusters; stamens 4-5, much exserted: fr. oval to elliptic, notched at the apex, with the seed in the middle of the lobe, ⅜-3 in. long. July–Sept. N. China, Japan. S.I.F. 1:37. R.H. 1909, pp. 308, 309. —Has proved hardy near Boston. The recently described U. Sieboldii, Daveau, and U. Shirasawina, Daveau, are probably only forms of this species; they are said to differ in their smaller sizes and in a more branching form by the persistent deeply fissured bark, exfoliating 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. crassifolia, 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-petioled, subcoriaceous: lvs. short-petioled, 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 exserted: fr. oval-elliptic, pubescent, notched, ⅜ in. long. Aug. Miss. to Ark. and Texas. S.S. 7:915. —Tender N.

15. serótina, 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 1-1½-in.-long pendulous racemes; calyx 5-6-parted to the base: fr. elliptic, deeply notched, densely ciliate, ⅜ in. long. Sept. Tenn. to Ga.; sometimes planted in avenues in Ga. (S.S. 14:718); has proved hardy at the Arnold Arboretum, Boston.

U. arborea, Wolf (U. glabra X U. pumila), Shrubby tree: lvs. elliptic to elliptic-oblong, doubly serrate, nearly equal at the base, ¾-4 in. long, on shoots to 6 in. long. Originated in St. Petersburg.


ALFRED REHDER

UMBELLULARIA (from Latin umbella, a sunshade; referring to form of florescence). Lauraceae. CALIFORNIA LAUREL. Tall unbranched tree, glabrous, used as a shade-tree in California and similar regions.

Leaves alternate, evergreen, petioled, slightly coriaceous: fls. small, greenish, in simple pedunculate umbels, which in the bud are surrounded by an involucre of 6 caducous bracts; perianth-tube very short; limb with 6 segments; stamens 5, 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.

California, Nutt. (Oreodaphne californica, Nee). Fig. 3883. Handsome evergreen tree, 20-30 or even 80-90 ft. high, with erect or suberect slender branches, conical outline and dense foliage: lvs. containing a highly aromatic and volatile essential oil, and burning vigorously in the campfire, even while green: fls. fragrant: drupes at first yellowish green, becoming purple when ripe. Dec. to Nov.—One of the most abundant and characteristic of Californian trees, common in moist

3883. California laurel—

Umbellularia californica. (X¼)
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 surmounts 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 jowls, 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 awaylice. The lvs. are used for flavoring soups and blan- cemanges but are too strong to give as agreeable flavor as those of Laurus nobilis or Prunus Laurocerasus. The tree is sometimes cultivated 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.

UNGNAÍA (named for Baron Ungnad, who in 1576 introduced the common horse-chestnut to western Europe by sending seeds to Clusius at Vienna). Sapindáceae. Mexican Bucksley. 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; lfts. 3-7 pairs, serrate, terminal long-petioled: fls. polygamous, irregular, aggregated in lateral fascicle or corymbose; calyx subequal, campanulate, 4-5-parted, lobes imbricate; petals 4-5, subequal, clawed, apex connate-crissate; 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.

UNIOLA (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-fld., some of the lower lemmae empty; glumes and lemmae keeled, nerved, pointed, but awnless.—Species 5, all American. Cult. for the ornamental panicles, which are suitable for dry bouquets.

latifolia, 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 Kans., 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 narrower, 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. Agrost., 7:271.

U. Palmieri, Vasey, a dissecurous perennial with extensive root-stocks, growing in sand-flats along rivers of N. Mex., is har vested by the Pueblo Indians who use the grain for food. G.F. 2:403.

A. S. Hitchcock.

UNONA (imitation of Anona). Annonáceae. 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 Deemos, of which it becomes a synonym. U. dis color, Vahl, cult. in tropical gardens for its sweet-scented fls., is identical with the
URCEOCHARIS

3415

brous, mottled with brown: flowing st. reddish, nearly 1 ft. high, bearing numerous small, ovate, appressed lvs.: inf. about 6-fld., in a raceme: sepals green, ovate, acute; corolla somewhat urn-shaped, pinkish outside, pale yellow inside, petals acute. S. Mex.

F. TRACY HUBBARD.

URCEOCHARIS (from the genera Urecolina and Eucharis). *Amaryllidaceae*. A hybrid between *Urecolina pendula* and *Eucharis grandiflora*, or in gardener's language *Urecolina 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-lobed fls. a dozen or so in an umbel, and each 2 in. across. The hybrid gets its white color from Eucharis, the fls. of Urecolina 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 Urecolina is the urn-shaped portion of the fl., the spreading tips being very short. The perianth of Eucharis is funneliform, the spreading portion being large and showy. The perianth-tube and ovary of the

UPAS TREE: *Antiaris*

URARIA (Greek *oura*, tail, referring to bracts). *Leguminosae*. Subshrubby perennials, adapted to the warmhouse; 1 species has been tried in S. Fls. Lvs. pinnate, 3- or 5-fld.; racemes, rarely 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 elongated, sometimes dense and spike-like; calyx-lobes subulate acuminate, 2 upper teeth short, 3 lower usually elongated; standard broad; wings adhering to the obtuse keel; stamens dissepiments; ovary sessile or stipitate, few-ovuled: pod of 2-6 small, turgid, 1-seeded indescent joints, often placed face to face.—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. pinnate, 3-7 lobed, its 3- and pedicels clothed with long bristles: lfts. 4-6 x 1½-2 in.: racemes dense, 1 ft. long, 1-½ 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 Timor Laut, but not Austral. and not indigenous in Ceylon. B. M. 7377.—Sometimes the raceme has 200 or more fls., each of which is ½ in. long.

F. TRACY HUBBARD.†

URBÍNIA (named for Dr. Manuel Urbina). *Crassulaceae*. Perennial succulent herbs, caulescent or acaulescent: lvs. closely imbricated, thick and rigid: infl. rather few-flld., 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; stamens 10, borne on the corolla; carpels 5. Three or 4 species, Mex. See also Cotelodan, 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: fl.-sts. thickish, with many narrow lvs.; infl. a 2-branched raceme; fls. about 10; calyx-teeth lanceolate; corolla about ½ in. long, bright rose below, lobes slightly spreading, yellow. Habitat unknown. *U. Purpusii*, Rose. Acaulescent: lvs. forming a very compact rosette, broadly ovate, acuminate, 1¼ in. long and nearly as broad at the base, gla

previously described *Desmos chinensis*, Lour.; *U. Diemos*, Dunal, is *D. cochinchinensis*, Lour. (see *Desmos*, in Vol. II). Belonging to other genera are Dunal’s *U. uncinate*, which is the fragrant *Artobotrys odoratissimus* of the Orient; *U. violacea*, which is undoubtedly a species of carrion fls., Sapranthus, closely allied to *Sapranthus nicaraguensis*; *U. penduliflora*, which is the aromatic ear-flower, or xochinacaztli, of the Aztecs (*Cymbopetalum penduliflorum*, Baill.), and his *U. acutiflora* and *U. xylopimdes* are both synonyms of the spicy *Xylopia grandiflora*, St. Hil. B. L. Robinson’s *U. bicracteata*, the fragrant “flor de guino,” which ranges from Nicaragua to Panama, and his *U. panamensis* have been set apart by the writer under the generic name of Desmopis. The latter has recently been rediscovered by Henry Pittier at its type locality in the Canal Zone. Both of the latter species are figured by the writer in the Bull. Torr. Bot. Club, vol. 43, pp. 152-38 (1916). See also W. E. Safford, Bull. Torr. Bot. Club 39:501-8 (1912).

W. E. SAFFORD.
URCEOLINA (Latin, small pitcher, alluding to the pitcher- or urn-shaped flowers). *Amaryllidaceae*. Bulbous herbs, used both in the greenhouse and for summer and autumn blooming out-of-doors.

Scape solid: lvs. flat, ovate, oblong or narrow, contracted to the petiole: lvs. in an umbel, numerous, rather long-peduncled; involucral bracts 2, scariosum; 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 5-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 the growth begins when the temperature begins water freely. In the fall when the leaves turn yellow, water sparingly and finally withhold water altogether. The flower-scapes appear a few weeks after the leaves disappear. (Robert Cameron.)

**A.** *Fls. red.*


**AA.** *Fls. yellow.*


F. W. BARCLAY.
F. TRACY HUBBARD.†

**URECHITES** (tied Echites, alluding to the appendages of the corolla). *Apocynaceae*. Prostrate plants or twining vines, allied to Dipladenia and having similar color and类似的叶。Stems covered with small, opposite, the blades entire: lvs. often showy, in axillary or terminal cymes or racemes, or sometimes 2 together; calyx-lobes 5, long and narrow; corolla funnel-shaped, rather large, abruptly widened into a throat, 5-lobed, the lobes sometimes elongated and twisted; stamens inserted at top of the corolla-tube and included in the throat, the anthers sagittate; disk cup-shaped, 5-lobed or nearly entire: fr. comprised of 2 long spreading follicles. Species about 10, in Trop. Amer. and extending into Fls. *U. sub erecta*, Muell. Arg., of Colombia, is sometimes grown in the greenhouse: somewhat woody and partially erect: lvs. ovate to elliptic: fls. large and few, in axillary terminal peduncled, cymose. B.M. 1064 (as *Echites sub erecta*), and 4702 (as *Dipladenia flavo*).

**URÉNA** (from *Urena*, the Malabar name). *Malvaceae*. Herbs or subshrubs of little horticultural interest; plants more or less covered with rigid stellate hairs: lvs. angled or lobed: lvs. clustered; calyx 5-crested; petals 5, often tomentose at the back, free above, connate below: staminal tube truncate or minutely toothed, anthers nearly sessile; ovary 5-celled, petals 1-ovuled: ripe carpels covered with hooked bristles or smooth, indehiscent.—About 8 or 9 species, natives of the tropics and sub-tropics. *U. lobata*, Linn. Herbaceous, more or less hairy: lvs. rounded, angled, not divided beyond the middle, corolla, 5-7-lobed, lobes acute or obtuse, about 1-2 x 2-3 in.: fls. pink: carpels densely pubescent, spiny. Tropics of both hemispheres. Very variable. *U. stellata*, Lem. Shrubby with a few elongated, fleshy-pilose branches: lvs. distant, rather short-petioled, unequally ovate-lanceolate, base somewhat cordate, stellate, hairy, coarsely crenulate-dentate: fls. rather large, 1½ in. across, white, in axillary clusters; calyx-segments lanceolate, acute; petals spatulate. Brazil. J.F. 3: 325.

**URÉRA** (derivation not obvious, possibly from *uro*, to burn, alluding to the stinging hairs). *Urética*. 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-veined or 3-5-nerved; stipules small or leafless: fls. on axillary racemes, usually numerous, cymose or irregularly racemose, unisexual: fls. dioecious or rarely monocious; perianth of male fls. 4-5-parted, segments ovate, stamens 4-5, ovary rudimentary; perianth-segments or lobes of female fls. 4, subequal or outer smaller, ovary straight or oblique: achene 3-valved, grooved or compressed or ventricose.


*alectofila*, Gaud. (*Uricta 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. Trop. Amer. F. TRACY HUBBARD.†

**URGINEA** (from the name of an Arabian tribe in Algeria). *Liliaceae*. 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 grooved or not: lvs. 10-15 in. long: florets numerous, rather small or medium-sized, whitish, or rarely pale yellowish or rose, color more intense in the center of the segments; bracts small, scariosum; perianth finally deciduous, segments 6, distinct, campanulate-convex or spreading after anthesis; stamens 6; ovary sessile, 3-angled, usually 3-cornered: caps. compressed, grooved or not: B.M. 3246. 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 pyramidal* 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 cavaulum*. There is considerable difference of opinion as to when the sea-onion begins to bloom: if 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 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 is a popular group medicine. The bulb, as it appears in the wholesale drug market, has been deprived of its outer scales and cut into thin slices, the central portions being rejected.

Solla, Steinh. (U. maritima, Baker). SEA-ONION. SQUILL. Height 1-3 ft.: bulb 4-6 in. thick: lvs. appearing after the fls., lanceolate, somewhat byssal and glaucous, glabrous, 1-½ ft. long, 2-½ in. wide above middle: racemes 1-½ ft. long, ½ in. wide, 50-100-ft.: fls. ½ in. across, whitish, with the old segms. keeled, greenish purple. Autumn. Canaries to Syria, S. Afr. B.M. 918 (as Ornithogalum squilla)._In Italy it is said to be seen often blooming in many houses on top of shelves or cupboards, the bulbs producing their long spikes of fls., which last in perfection for weeks, without earth or water.

WILHELM MILLER.

F. TRACY HUBBARD,†

UROSTIGMA: Ficus. The following species now in cult. abroad was not included under Ficus in Vol. III, p. 1220. Ficus subtripinéria, Mart. (Urostigma subtripinérium, Miq.). Large tree: lvs. chartaceous, ovate- or lanceolate-elliptic or oblong, 1-2 x ½ in.: fls. in axillary pairs, very short-peduncled, dioecious. Brazil.

URSINIA (John Ursinus, of Regensburg, 1608-1666; author of "Arboretum Bibliicum"). Compositae. 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; involucres hemispherical or broadly campanulate; achenes often 10-ribbed.—A genus of about 60 species, all native to S. Afr. One species, U. annua, is also found in Abyssinia. In Flora Capensis, vol. 3 (1864-65), Sphenogynae and Ursinia are treated as separate genera, the distinctions being as follows: the achene is cylindrical in Sphenogynae, but obovate or pear-shaped in Ursina, 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 Sphenogynae included in Ursinia.

pulchra, N. E. Br. (Sphenogyne speciosa, Knowles & Weste.). Fig. 3587. Annual, 1-2 ft. high, with lvs. bipinnately dissected into linear lobes and yellow or orange fl.-heads 2 in. across: rays about 22, 3-toothed, spotted purple-brown at base; st. glabrous, bracted: lvs. alternate: scapes nearly leafless, about 5 times as long as lvs.: involucre 4-rows: scales increasing in size from the base, outer rows with a brown scarios border, inner with a white scarios border. F.C. 2:77. P.M. 6:77. G. C. III. 4:350. Gn. 44, p. 217. R.H. 1843:445. G. 16:352. J. H. III. 54:83.—Both yellow and orangecolored fls. are sometimes found on the same plant. When well managed it blooms all summer. It is a native of the Cape region of S. Afr. It has been in cult. since 1836 but was not correctly described until 1887. It is much praised by connoisseurs, though it is not known to the general public. It seems to have enjoyed a longer continuous period of cult. than many other showy composites, in which the Cape is wonderfully rich.

WILHELM MILLER.

URTICA (classical name, alluding to the burning hairs). Urticaceæ. 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.: lvs. small, greenish and inconspicuous, racemose, spicate or clustered in the axils, monocious or dioecious, sometimes hermaphrodite; sterile fls. with 4 sepals and 4 stamens; fertile fls. with 2 pairs of sepals and a single erect ovary: lvs. simple, opposite, strongly nervet, 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.

URTIÇÁ (bear the name of Capt. Dumont D'Urville, French botanist and naval officer). Sapindáceæ. 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; disk 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.

URTICLÁRIA (Latin, a little bag or skin, referring to the bladders). Lentíbuláceæ. 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 herbs, 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 2-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 stagnate 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 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 minute ponds supplied by the If-axes of Vriesea 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 bladderwort.

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. Endressii, and U. longifolia, each of which represents a different color. Well-grown baskets of these plants have numerous scapes a foot or so long, each bearing 20 flowers. Perhaps the most desirable 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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a. Habit aquatic.
b. Foliage dissected into numerous thread-like segms.; lvs. floating.

1. vulgaris, Linn. Hardy aquatic: st's. a few inches to 3 ft. long, with crowded 2–3 pinnately divided floating lvs. 1/2–1 in. long, provided with numerous bladders and yellow fls. 1/2 in. long or more, borne in few-fl. racemes: scapes 6–8 in. high: corolla closed, with reflexed sides and a conical blunt spur. Eurasia, in ponds and channels. G. 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. americanana, 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 st's., 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 fl-shoots twining above the water; lvs. (often disappeared at flowering-time) linear-lanceolate to ligulate, obtuse, sometimes nearly 1 in. long, narrowed into a slender petiole: bladders numerous on the lvs. and rhizoids, with a mouth near the stalk, nearly or quite globose, almost 1/2 in. in diameter: fls. yellow, 1–4 in. long, corolla broadly oblong-spatulate; palate erect, crested; spur straight and acute, descending, 1/2 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.

b. Color of fls. white, with a yellow palate.


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, 1/2 in. long, 5–8 in a raceme: pedicels drooping in fr.; scape about 6 in. or less high. India, Malay, China, Japan, Philippines. B.M. 6689.
BBB. Color of fls. purple, violet, or lilac, with a yellow palate.

c. Lvs. broader than long.

d. Shape of lvs. reniform.

5. Íanthina, Hook. f. Epiphytic Brazilian species growing in the fl.-axils of a bromeliad (Vriesea), with kidney-shaped lvs. and beautiful pale blue or lilac fls. 1½ in. across, ornamented by 2 vertical yellow lines on the palate edged with dark violet: lvs. with stalks 4-6 in. long and blades 2-4 in. across: scape about 6-fl.d.: upper lip hemispherical, arching; lower lip transversely oblong, entire. B.M. 7466.—Intro. by Sander, 1892. "Janthina" is the same as "ianthina," meaning violet-colored.

6. reniformis, St. Hil. Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 2 darker lines on the palate: upper lip truncate, emarginate; lower lip 3-lobed, the lateral lobes broad, the midlobe much shorter and scarcely produced. Brazil.—Once advertised in this country, but probably lost to cult. Very large for the genus, the lvs. ½-1 ft. long and scapes 1½-2 ft. high.

DD. Shape of lvs. obcordate.


cc. Lvs. long and narrow, linear, oblong or lanceolate.


9. longifolia, Gardn. Fig. 3888. A Brazilian species, perennial and densely tufted: lvs. lorate or linear-lanceolate, narrowed into a petiole, to 12 in. long; scape slender, reaching 2 ft., with fls. 10 or less. U. Forgetiana, Hort., intro. by Sander, is said to be a form of this species and the same as the plant figured in Gn. 52:142 (adapted from Fig. 3888) under the erroneous title of U. latifolia. It has beautiful violet-purple fls. nearly 2 in. across, with an orange palate. B.M. 8516. G.C. III. 13:713. The lvs. are singularly variable or plastic. Under favorable conditions, according to Prain, they may grow out into bladder-bearing stolons and may produce from their tips tufts of leaves and stolons and rhizoids. The species thrives under conditions suitable for nepenthes.

WILHELM MILLER.

U. h. B.†

UVARIA (Latin, uva, grape, on account of the grape-like clusters of the fruit). Annondácea. 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.

Plants either solitary or in few-fl. clusters, either terminal or fl.-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 Desmos), often connate at the base; stamens numerous, short, cuneate or nearly truncate, with parallel yellow-sacks on the back, very much as in Asimina, but with the connective either truncate or terminating in a fl.-like crest: gynaeicum formed of a cluster of carpels projecting from the center of the mass of stamens, and developing into a cluster of pedicelled fleshy berries somewhat like those of Artabotrys or Canangium, 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. of Science, Section Botany, 10, pt. 30 (1915). The following species is the only one occurring about Manila.

ruitA, Blume (U. purpurea, Blanco). SUSON-CALBAO. CARBAO'S TREES. 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 fl.-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, acidulous 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 (1913) for further information.

W. E. SAFFORD.

UVULÁRIA (Latin, uvula, palate, referring to the hanging flowers). Liliáceae. BELLWORT. "Wild Oats" in some parts. Graceful woodland hardy perennial herbs, useful in the wild border or in heavy shade; not showy, and little planted.

Stem erect and stout, from a creeping or horizontal short rootstock, naked or scaly at base, forking above: lvs. oblong, perfoliate, flat and membranaceous: fls. yellow, drooping, in spring, solitary on terminal peduncles; perianth narrowly campanulate, deciduous, segms. 6, spatulate-lanceolate, acuminate, obtusely gibbous at base, with a deep honey-bearing groove within bordered on each side by a callus-like ridge: caps. truncate, coriaceous, 3-lobed, loculicidal at summit.—About 4 species, N. Amer. Another species sometimes kept in this genus is treated under Oakesia.

Uvularias grow 1-1½ feet high, with a number of clustered slender stems which are forked and leaf-bearing mainly above. The foliage is of a delicate green, which with the terminal narrow bell-shaped drooping flowers make the plants elegant though not showy. The species are perfectly hardy and easy of cultivation in any light rich soil and a shady situation. They do well north of a wall in a well-prepared border and in such a position they far exceed the plants of the woods in luxuriance. Strong roots may be slowly forced for spring flowering. For distinction from Oakesia, see that genus, to which some of the plants commonly known as uvularias are referred.
**UVULARIA**

*A. Lvs. pubescent beneath.*

**grandiflora**, Smith. Sts. 1–1 1/2 ft. high, with 1 or 2 lvs. below the fork; lvs. oblong, oval or ovate, somewhat acuminate; fls. pale yellow, 1–1 1/2 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.
V

Vaccinium (ancient Latin name of the blueberry). *Eriococce.* Blueberries, Bilberries, Dewberries, 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; 3s., solitary, axillary or terminal or in racemes; sepals 4–5 or obsolete; corolla gamopetalous, urceolate, cylindrical, campylanulate, 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 often used indiscriminately for plants of this genus and for *Vaccinium* species. In the central states the term 'huckleberry' is usually applied to *V. corymbosum,* while 'blueberry' is given to the low-growing species, like *V. canadensis* and *V. pennsylvanicum.* In New England, 'huckleberry' is reserved for species of *Vaccinium* while 'blueberry' is applied to the lower-growing species as above, and 'high-bush blueberry' to *V. corymbosum.* The red-berried species are, in general, referred to as 'cranberries.'"

Among the plants that lend tone to the landscape in October and November by reason of their bright foliage, many of the species of Vaccinium may be included—the brilliant red, crimson, and orange colors 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 the 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. pennsylvanicum* also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an undershrub. The same is true of *V. canadensis,* which is in many respects 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. arboreum* forms an irregular shrub too diffuse and straggling to be of value except when planted in masses at the South. *V. hirsutum* is as beautiful in its autumn coloring as *V. corymbosum* and, like that species, retains its foliage late in the season. *V. Vitis-Idaea* 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, *Vaccinium* species 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.

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Quoted statements in the specific descriptions in the following treatment are from the original article on this genus by the late W. M. Munson in the "Cyclopedia of American Horticulture;" that article also gives an interesting account of the native production of the fruit.

KEY TO THE SECTIONS (No. 25 doubtful).

A. Corolla campanulate to urceolate or cylindrical.

B. The corolla 5-lobed, open-campanulate; anthers awned on the back.

Section I. Batodendron

BB. The corolla 4-5-toothed, urceolate, cylindrical, or campanulate-oblong.

(3421)
VACCINIUM

11. berries corolla pubescent beneath, obovate to oval, acute or obtuse, entire or obscurely denticulate: 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 straggling to be of use except in masses, for which purpose it is useful at the South."

2. staminatum, Linn. DEERBERRY. SQUAW HUCKLEBERRY. Fig. 3891. 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, acute, entire, pale, glaucous and pubescent beneath: fls. very numerous in large leafy-bracted racemes, showy, joined with the slender spreading or pendulous peduncle, small, white, filaments somewhat long, black, style exerted: fr. large, 3⁄4–1 in. long, globose or pyriform, greenish or yellowish, glaucous, few-seeded, almost or quite inedible. Dry woods and thickets, E.

N. Amer. R.H. 1907, p. 94.—Corolla peculiar in not being closed in the bud.

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.
nearly cylindrical, ⅔–3/4 in. long, white or pink, bracts small, deciduous; berries dark blue-black, or nearly 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, 1½–3 in. long, ovate-oblong to elliptical, acute, glabrous, half grown at flowering time: corolla long-cylindrical, ⅔–⅓ in. long, white; berries blue-black, of excellent flavor. Moist woods or bogs, N. E. N. Amer. Em. 2:454. Amer. flor. 13. July. A 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.


8. *atrooccum*, Heller (*V. corymbosum* var. *atrooccum*, 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.—Apparantly 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 branchlets very downy: lvs. entire, dark green, ¾–1¾ in. long, oblong-lanceolate or elliptical, acute, downy on both sides; corolla short-cylindrical, greenish white, tinged with red; berries medium or small, late, blue with much bloom. Low woods and bogs, New England, mountains of Pa., northward and northwestward. 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 brily pointed teeth, shining and green on both sides, redder and hairy beneath: fls. in short pedicels; corolla short-cylindrical, 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. *angustifolium*, Gray. A dwarf form with more decidedly lanceolate lvs. Newfoundland, mountains of New England and northwest. Var. *nigrum*, Wood (*V. nigrum*, Brit.). Foliage very glaucose: 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. paniculatum*.- "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 erect shoots produce, the following year, a long spike-like mass 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.'"
rather dense clusters generally on the leafless summits of twigs; calyx reddish; corolla short-cylindraceous, greenish white, often tinged with red; berries large, with much bloom, of excellent flavor, ripening late with *V. canadense*. Dry sandy or rocky places, N. E. N. Amer. "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; sts. green, grooved, obscurely 4-angled; branchlets hirsute with spreading white hairs; lvs. oblong-elliptic to ovate, acute or cuspidate, ¾–1¾ 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, ovate, campanulate, pale or reddish; berries purplish black, glanular-hirsute. Shaded mountain slopes, N. C. to Tenn. and Ga. G.F. 2: 365 (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 *Gaylusaccia 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. Eu Vaccinium. 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, included: 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
b. Branchlets not angled. 14. cespitosum

bB. Branchlets angled.

Cc. Shrubs low (1½ ft. or less)....15. Myrtillus

Cc. Shrubs tall (5–6 ft.).

CcD. Lvs. serrate; berries blackish, without bloom. 16. membranaceum

CcE. Lvs. entire or nearly so. (cecum)

EE. Berry blue with bloom: lvs. 1½ in. long. 17. ovalifolium

EE. Berry red: lvs. ¾–3¼ in. long. 18. parvifolium

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; fls. 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 Asia. B.B. 2: 576.—"The plant is useful for the shrubbery 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. ¾–1½ 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, slightly 5 (rarely 4) -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.

15. Myrtillus, Linn. Whortleberry. Bilberry. Low glabrous shrub with sharply angled branches: lvs. ¾–2½ in. long, ovate or oval, serrate, conspicuously reticulate-veined, glabrous, thin and shining: corolla globular ovate; calyx- limb almost entire: berries black, nodding. Mountainous regions, Eu., Asia, possibly N. Amer.—"Generally used as an article of diet and in making of drinks, particularly in the Old World. It is from this species that the common name whortleberry is derived. It is not of much economic importance in Amer." The red-fruited form of the Rocky Mts., and the N. W. has been separated as *V. scoparium*, Leiberg, and is so recognized by Piper and by Coulter & Nelson. Its occurrence in the trade is doubtful.

16. membranaceum, Douglas (V. myrtilloides, Hook., not Michx.). An erect branching shrub, mostly glabrous throughout: the twigs slightly angled: lvs. 1–2 in. long, oval, oblong or ovate, acute or obtuse, finely serrate, membranous, reticulate-veined, green above, paler beneath, not shining: calyx- limb entire; corolla depressed-globose, yellowish green or purplish: berries large, oblate, black or purplish black, rather acid. Lake Superior, N. Wyo., westward and northwestward.

3895. Mountain cranberry.—Vaccinium Vitis-Idaeæ. (X about ½)

17. ovalifolium, Smith. A slender straggling shrub, 3–12 ft. high, with slender, more or less angled branches: lvs. 1–2 in. long, oval to oblong, glabrous, thin, mostly rounded at both ends, entire or nearly so, pale green above, glaucous beneath: fls. solitary, on short recurved pedicels; calyx minutely 10-toothed; corolla ovoid or globose, urceolate; berries ½–3 in. diam., large, bluish purple with bloom, acid but very good. Moist woods, Que. to Ore. and Alaska.—"This species is very abundant in the N. W., forming a large part of the undergrowth along the southern coast of Alaska. The berries, rather larger than peas, are collected in great quantities by the Indians, who use them fresh and dry them for winter. The exceptionally large berries and vigorous habit of this species suggest its value for cult., and particularly for crossing with the low-growing species."

18. parvifolium, Smith. Shrub, 6–12 ft. high, straggling, with slender green sharply angled branches: lvs. ¾–3¼ in. long, oblong or oval, obtuse, entire, dull or pale: pedicels short, nodding in fr.: sepals 5; corolla globular, nearly white: berries bright red, acid, but fine for table use. N. Calif. to Alaska.—Not common in cult.
Section IV. Vitis-Idæa. Corolla from ovate to glozbar and more or less urceolate, 4-5-toothed, rose-color or nearly white; filaments hairy; anthers awnless on the back: ovary and berry 4-5-celled, with no false pistil, coriaceous and persistent; fls. in short racemes or clusters from separate buds, bactrace and 2-bracteolate.

19. ovatum, Pursh. An erect, rigid, evergreen shrub, 2-8 ft. high, with pubescent branchlets: lvs. ½–1 in. long, thick and firm, very numerous, shining, ovate to oblong-lanceolate, acute, minutely and acutely serrulate, glabrous or nearly so, bright green both sides: fls. in short and close axillary clusters; deciduous bracts usually red; corolla campanulate, ⅜ in. long, rose-color or nearly white; calyx-lobes acute, red: berries black, acid, with or without bloom. Moist woods, Vancouver to Monterey, Calif. B.R. 1354. J.F. 4:424. —"A distinctly western species, and one of California's most beautiful hedge-plants, but not well known. It is very tenacious of life and bears pruning well. It is prop. from suckers, cuttings, and seeds, which last it bears freely."

20. crassifolium, Andr. Slender trailing shrub: sts. 2-3 ft. long: twigs pubescent: lvs. small, ⅜–½ in. long, leathery and shining, oval to narrowly oblong or ovate or obovate, obtuse, sparsely serrulate or entire: fls. few, almost sessile, in small axillary clusters; corolla globose-campanulate, ⅜ in. long, rose-red, rarely whitish: berries black. Sandy moist pine lands, N. C. to Ga. B.M. 1152. —"Useful for the shurbbery border South."

21. Vitis-Idæa, Linn. (Vitis-Idæa Vitis-Idæa, Brit.), Mountain Cranberry. Cowberry. Partridge Berry in the N. Foxberry. Fig. 3896. Plants low, 6–10 in. long, creeping, glabrous: lvs. coriaceous, evergreen, oblong or oval, ⅜–⅜ in. long, obtuse, dark green and shining above, with blackish bristly points beneath: lvs. in small 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. 7:616 (as var. major); 11:1023 (as var. minor). —The frs., which are rather larger than currants, acid and somewhat bitter when uncooked, are largely used in the more northern regions for tarts, jellies, and preserves, or as a substitute for the common cranberry. According to Macoun, the fishermen's families along the Gaspé coast and the north shore of the Gulf of St. Lawrence gather the fr. of this species in large quantities for their own use and for sale, calling it 'low-bush cranberry.' Throughout the whole of N. Canada, hunters and trappers, as well as the native Indians, have frequently to depend upon it for food. It is valuable for the shurbbery border, where the strong contrast of the dark green foliage and the bright colored persistent fr. is very striking."

Section V. Oxyccoccus. Corolla deeply 4-cleft or 4-parted: the lobes linear or lanceolate-oblong and reflexed: anthers exerted, awnless on the back, with very long terminal tubes; ovary and berry 4-celled, destitute of false partitions: fls. axillary and terminal, nodding on long filiform pedicels, appearing in early summer: fr. maturing in autumn.


23. Oxyccoccus, Linn. (Oxyccoccus Oxyccoccus, MeC.M.). Small Cranberry. Cranberry of the Old World. Slender creeping plants with short filiform stns., 4–10 in. long: lvs. ovate, acute, ⅜–⅜ in. long, with strongly revolute margins, coriaceous, evergreen, dark green and glossy above, white beneath, with yellowish 5-lobed, or rarely 4-toothed, bracts. Terminal: fls. 1–4, terminal: pedicels one-half length of anthers: berry red, ⅜–⅜ in. diam. Sphagnum swarms in arctic and alpine regions of Old and New Worlds.—"Though smaller, its fr. is by many considered superior to that of the next."

24. macrocarpon, Ait. (Oxyccoccus macrocarpus, Pers.). Larger American Cranberry. Sts. slender, creeping, elongated, 1–4 ft. long, somewhat pubescent: fr. larger than in the last, the fl-branches ascending: lvs. oblong or oval, obtuse or retuse, ⅜–⅜ 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, ⅛–1 in. long: in. N. N. Amer. B.M. 2586. Em. 2:456. See Cranberry.

Section VI (Position of this species doubtful)

Anther muticus: branches red. —25. erythrum

25. erythrum, Hook. An erect, glabrous, evergreen shrub, with bright red twigs: lvs. ovate, obtuse, coriaceous, entire: fls. in long, 1-sided, terminal racemes; globose, 4-cleft, 5-lobed, or rarely 4-cleft, white or rose-colored, with yellowish or orange bracts, or without terminal tubes. Mountains of Java. B.M. 4686. J.H. III. 34:39; III. 51:593. J.F. 4:364. —"Sent to England in 1852, and since grown by various nurseriesmen as a greenhouse plant. It is a strong plant, furnishing an abundance of bloom in Dec. and Jan. Not remarkable, but worthy of a place in the greenhouse. A very好奇 bright." The position of this species is doubtful. The absence of anther-tubes suggests that it may not belong to the genus Vaccinium. —K. M. Wiegand.

VAGÁRIA (derivation obscure). Amaryllidææ. Large tubiculous 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, erect-spreadling; stamens affixed to the throat, slightly shorter than the perianth; ovary ovoid-globose, 3-celled: caps. membranaceous, somewhat valvately dehiscent.—One species, Syria.


VALERIANA (Latin valeo, to be strong, in allusion to medicinal uses). Valerianææ. Valerian. Glabrous or rarely pubescent or villous perennial herbs, subshrubs, or shrubs, which are erect or sebondant, most of them hardy and showy garden plants. Roots strong-smelling: lvs., especially the radical ones, entire or dentate, or the cuneal or all pinnatifid or once-, twice-, or thrice-pinnatisect; cymes sometimes dense, few-flid, and terminal, or clustered in dense or interrupted spikes, sometimes laxly corymbosely or variously panicked: fls. small, white or rose; calyx- limb
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 achenial with the rear face 1-nerved, the front face 3-nerved.—About 365 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 perennials 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 often grown from seeds. V. alba and V. rubra of the trade are no doubt Centranthus ruber.

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### A. Rootstock perpendicular, branching below.

1. *edulis*, Nutt. Perennial, 2–4 ft. high, glabrous or nearly so: rootstock perpendicular, fusiform, branching below: lvs. thiekest, not serrate, slightly pubescent; radical oblancculate to spatulate, entire or some sparingly laciniate-pinnatifid, tapering into a margined petiole; cauleine rarely none, commonly 1–3 pairs, sessile and pinnately parted into 3–7 linear or lanceolate divisions, the terminal one spatulate: fls. polygamous-diclinous, yellowish white, in an elongated panicle. Ohio to Ariz. and Brit. Col. in wet or moist lands.—The roots are eaten by Indians.


### VALERIANA


### VALERIANA

**AAA. Rootstock horizontal or ascending, with small fibrous roots.**

2. *St.-hes. 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, subcordate, rather long-petioled; cauleine lvs. triangular-oblong, acute or acuminate; uppermost linear-lanceolate: coriaceous terminal, compound or simple: fls. bright rose, dioecious. Eu. and Caucasus. L.B.C. 4:317.

**BB. St.-hes. (at least the lower ones) pinnate or pinnately lobed.**

**c. Fls. dioecious or polygamous.**


**CC. Fls. hermaphrodite.**

5. *officinalis*, Linn. Common Valerian. Garden Heliotrope. Cat’s Valerian. St. George’s Herb. Fig. 3896. Perennial, glabrous or more or less pubescent below, 2–5 ft. high: rhizome slender, stoloniferous: st. 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, acuminate: coriaceous broadly pinnatisect, long-branched: fls. numerous, whitish, pinkish or lavender, very fragrant. Eu. and N. Asia. G.W. 12, p. 472.—Variable. The medicinal valerian is obtained mostly from the roots of this species. Var. alba, Hort., is a white-fl. form. Var. rubra, Hort., is a red-fl. form.


7. *sitchensis*, Bong. Perennial, 1 ft. or less high: rootstock ascending, thick: radical lvs. ovate or oblong, simple or somewhat lobed; cauleine lvs. short-petioled, 3–5-foliolate, divisions or lfts. orbicular to oblong-ovate or in the upper ones ovate-lanceolate: fls. white, very fragrant, in contracted cymes: corolla funnelform, about ½ in. long. Rocky Mts. to Alaska. G.F. 9:515. A very early bloomer.

8. **DD. Radical lvs. entire or merely dentate.**


10. *Phl., 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.

**3896. Garden heliotrope.—Valeriana officinalis. (X½)***
VALLISNERIA

incised-lobed; cauline pinnately parted into 3-4 pairs of obovate, acute, entire, decurrent segms.; cymbs dichotomous; fls. whiteish to somewhat flesh-colored. Caulus region. Var. aurea, Hort., has young shoots golden yellow.

12. pyrenaca, Linn. Perennial, 2-4 ft. high, pubescent; rhizome large, stalks none: st. erect, sulcate; lvs. glabrous, radical large, long-petioled, cordate, coarsely and unequally toothed; cauline auriculate.

VALLISNERIELLA

3-cut, segms. dentate, terminal larger and ovate-cordate, lateral 2 (rarely 4 or 0) obliquely elliptic: cyme large, corymbose: fls. pale rose: fr. glabrous, linear-oblong. Pyrenees.

V. delta, Mass., is Centranthus ruber var. albuis.—V. cocinea, Hort., is offered (Centranthus) — V. cocinea delta, Hort., is offered in the trade.—V. Cornucopia, Linn., is Pedia Cornucopia.—V. macrocephus, Vilm., is Centranthus macrocephus.—V. rubra, Hort., is offered in the trade.—V. rubra, Linn., is Centranthus ruber.

F. Tracy Hubbard.

VALERIANELLA

(diminutive of Valeriana). Valeriana. 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, or rarely incise-pinnatifid: cymes sometimes corymbose, paniculate fastigate, sometimes densely globose at the ends of the branches: fls. white, pale bluish, or rose; corolla-tube short or rarely elongate, limb 5-cleft, spreading; stamens 3: fr. 3-celled, 2 of which are empty.—About 58 species, Eu., N. Afr., W. Asia, and N. Amer., mostly in the Medit. region.

Corn salad is both a salad plant and a pot-herb, chiefly the former. The name "corn salad" is probably derived from the fact that the plant grows spontaneously in the grain-fields of Europe, large quantities of it being gathered in early spring. It is rather tasteless compared with lettuce, and is little known in America. Abroad it is prized as a fall and winter salad. It is a cool-season crop, grown like lettuce and matures in six to eight weeks. Plants should stand about 6 inches apart in the row. An ounce of seed should give 2,000 to 3,000 plants. The following description of the varieties is derived from Vilmorin's "Vegetable Garden." See Vol. II, p. 551.

olitoria, Moench. CORN SALAD. LAMB'S LETTUCE. FETTICUS. Fig. 3897. An "autumnal annual" herb, the seed of which ripens in April or May, soon falls to the ground, and germinates in Aug. The plant makes its growth in the fall and flowers the following spring. In cult. the seed is generally sown in early spring or late summer. The plant forms a dense rosette of spoon-shaped lvs. which grow in a deccussate fashion, and has an angular forked st. bearing small bluish white fls. in terminal clusters. Eu., Orient.—The Round-leaved variety has much shorter lvs. than the common type and they are half-erect instead of spreading, and less prominently veined. This kind is the one grown almost exclusively for the Paris market. The Large-seeded variety is more robust than the common type and the seed is nearly twice as large; lvs. marked with numerous secondary veins, much grown in Holland and Germany. The Etampes variety has very dark-colored lvs., which are often undulate or folded back at the margins; lvs. narrow, prominently veined, thicker and more fleshy than the other kinds and specially suited to cold weather and long-distance shipment. The Etampes variety differs from the others in forming a heart or head of fine flavor. Unfortunately it is the least productive type, but it bears shipment well if properly grown.

ERIOCARPA, Desv. ITALIAN CORN SALAD. Distinguished from the common species by the lighter color of the lvs., which are slightly hairy and somewhat toothed on the edges toward the base. The plant is native to the south of Eu., where it is highly esteemed because it does not run to seed so quickly in a warm climate. It is undesirable for northern climates.

WILHELM MILLER.

VALLARIS (perhaps from the Latin vallo, to inclose; the plants are said to be used in Java for fences). Apocynaceae. Twining shrubs, suitable only for the greenhouse in the N., but hardy outdoors in the extreme S. where used as an ornamental. Lvs. opposite, minutely dished: fls. white, in axillary, subaxillary, or superaxillary dichotomous cymes; calyx 5-parted, glandular or not within, segms. narrow; corolla salver-shaped, lobes broad, overlapping to the right; disk various; carpels 2, at first connate, many-ovuled.—About 5 or 6 species, Trop. Asia and Malayia.

Héney, Spreng. (V. dichotoma, Wall.). Tall climbing shrub; bark pale; lvs. elliptic or oblong or linear-oblong, 1½-4 x ¾-1½ in., glabrous or pubescent, acuminate: cymes pubescent, 3-10-fl., sessile or peduncled, dichotomous; fls. pure white, ½ in. across; fragrant; sepals ovate-oblong, obtuse; disk ciliate; follicles 6 x 2 in., straight, tapering from a rounded base to a stiff point. Himalaya to Burma and Ceylon.

—Intro. into Fls.

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. ½-6 ft. long, depending on the depth of the water. The lvs. originate 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 emerge to the surface, as shown in Fig. 3898. The staminate fls. are borne on very short stalks near the bottom of the water. At the proper time the staminate 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.

3897. Valerianella olitoria.—Corn salad.

3898. Eel-grass.—Vallisneria spiralis. (Reduced)
Both kinds of fls. are very small, and they are borne on separate plants. Eel-grass is readily collected, 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.

VALLISNERIA


Wm. Thicker.
Wilhelm Miller.

VALLOTA (named for Pierre Vallot, French botanist). Amaryllidaceae. SCARBOROUGH LILY. Greenhouse tufted bulb; scape robust, hollow; fls. large, in many umbels, sessile or shortly pedicelled; perianth funnel-shaped, straight, erect, tube short, throat large, lobes oblance-ovate; stamens affixed at the base of the lobes and shorter than them; ovaries 3-celled: caps. oblance-ovate, dehiscnt 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 undoubtedly related to Cyrtanthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus C. sanguineus is in the trade (p. 945). The best form of Vallota seems to be the variety magnifica.

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 vallota shouId never be dried 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 four years. Drainage should be 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 adequate and perfect. It is essential that the potting soil be of a strong permanent nature and rich in plant-food. A good compost consists of turfy loam, fibrous peat and old cow-manure in equal parts. Add a little sand and charcoal. Avoid repotting until it is strictly necessary, and do so only when it is required to increase the number of plants or when there is danger of the roots breaking the pot. For amateurs the best time to repot the plants is directly after the flowering period. Use the 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. Vallota 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 use 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 a century. Its popular name is supposed to have been derived in the same way as the Guernsey lily,—a Dutch workman being 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-bogs, 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, dying down in autumn; petals yellow or brown, slightly 2-edged, 2-3 ft. long: fls. scarlet. G.1:36; 3:479; 9:331; 10:77; 37:89. Gn. 30, p. 245; 42, p. 273; 59, p. 44; 88, p. 385; 71, p. 544. G.Z. 15:32. J.H. III. 45:453. R. H. 1878:50 (as V. grandiflora). A. F. 9:211. Gng. 2:361. A. G. 14:81,—The typical form has the scapes about 1½ ft. high and blood-red fls. 2½ in. across. Var. álba, Hort., is a white-flld. form. G.C. III. 36:150. Var. mágjar, 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 type in all parts. B.R. 552 (as Amaryllis purpurea var. minor). Var. eximia, Bull., has fls. 4 in. across, with whitish, feather-like blotches on the base of the perianth-segms. Var. magnifica, Hort., is probably the best and most robust form: fls. and in. across, with a white eye 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 is a bulbous plant with large red funnel-shaped 6-lobed fls., blooming in Sept. and later. A pair of well-grown specimens in large pots are handsome ornamemts for the porch. Plants have been grown with over 50 fl.-trusses, each truss bearing an umbel of 4-9 fls., the individual fls. being 3-4 in. or more across. Vallota 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 the tube of Hippeastrum and at the base of each perianth-segm. is a cushion-shaped callus somewhat different from the minute scales or distinct neck that is often found at the

3899. Scarborough lily.—Vallota purpurea.
(From a specimen 2 feet high.)
VANDA

3429

thorax of a Hippeastrum. The plant deserves to be better known among amateurs and gardeners.

**Hybrida**, Hort. Bull., is a hybrid between *Vallota purpurea* and *Cyrtanthus sanguineus*, which is intermediate in character between the two parents, both in foliage and fls., the latter being borne in umbels and a uniform bright orange-vermilion in color.

WILLIAM MILLER.

F. TRACY HUBBARD.

**VANCOUVERIA** (after Capt. George Vancouver, commander of the Discovery in the voyage to the north-west coast in 1791–1795). Berseridaceae. Low hardy perennial herbs, grown in the garden border. May–June flowering. Fls. white, 2–3-fornately compound: scape leafless, racemose or somewhat panicleately at the summit: sepal 6, in 2 rows, obovate, petal-like, reflexed; petals 6, ligulate; stamens 6; fr. a follicle, dehiscent 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.


**Chrysanthia**, Greene (V. hexandra var. aerea, Rattan). About 1 ft. high: lfts. evergreen, rather 3-lobed, usually whitened and pubescent beneath: infl. subracemose; fls. somewhat larger than in *V. hexandra*. Ore.

**Parviflora**, Greene, Inside-out Flower. From 8–20 in. high: lvs. glabrous or with rusty hairs, persisting through winter; lfts. thickish, roundish in outline, broadly cordate at base, obscurely or evidently 3-lobed with a notch at summit of each lobe: panicle bearing 25–55 white or lavender-tinted fls. Coniferous woods, Calif.

F. TRACY HUBBARD.

**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 lvs.; species like *V. tenuifolia* with a labellum half as long as the fls. or channelled and keeled or terete, sometimes fleshy and deeply channelled; apex 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 exposure 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 ventilation is 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 live sphagnum moss freely interspersed with large 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 aeral 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. Amesiania*, *V. carpeletii*, and *V. Kimballiana*, with one or two other alpine species, require about 10° cooler temperature, but otherwise similar treatment to 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 basketing them in the usual manner. These new plants 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 speming the plants with a 20 per cent solution of alcohol. (Robt. M. Grey.)

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B. *Lvs. flat, or channelled and keeled, toothed or lobed at the apex."

C. *Racemes long: labelium with lateral lobes.*

D. *Fls. 1–1½ in. across.*

E. *Color.*

EE. *Color yellow.*

EEE. *Color white or pale yellow, but streaked and shaded with brown.*

F. *Middle lobe of the labelium dilated, reniform.*

**KEY TO THE SPECIES.**

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2. *parviflora*, Lindl. St. 4–6 in. high: lvs. strap-shaped, 4–8 in. long, unequally obtusely 2-lobed: racemes erect, many-flowered: fls. small, yellow; sepals and petals obvolute-spatulate; labellum shorter than the sepals, middle lobe obvolute, dilated, truncate, and 2-lobed at the apex, yellow below, white above, spotted and dashed with purple and having thick fleshy ridges. Himalayas. B.M. 5138 (as *Aérids Wightianum*).

3. *spathulata*, Spreng. St. 2 ft. high: lvs. 2–4 in. long, obtusely 2-lobed: peduncle robust, 12–18 in. tall, few-flowered: fls. 1½ in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum as long as the sepals, clavate, side lobes very small, broadly ovate, middle lobe suborbicular, obscurely 3-lobed. Ceylon, India.

4. *lamélata*, Lindl. Lvs. channelled, leathery, obliquely and acutely bifid at the apex: fls. pale yellow, stained with red; sepals and petals obvolute, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the labellum obnubilate, retuse, auriculate, having a pair of red elevated plates and 2 red tubercles just below the apex. Aug.–Nov. Philippines.


10. *tricolor*, Lindl. St. branched, tall, erect and leafy: lvs. strap-shaped, 10–12 in. long, channelled; 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 tessellated, bordered with golden yellow, white suffused with lilac outside; middle lobe of the labellum oblong-pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6173.

13. *Parrishii*, Reichb. f. St. very short: lvs. few, 8–10 in. long, 2–3 in. wide, obtusely 2-lobed; raceme drooping, 6–8-ft., 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 fialbelliform. Summer. Moulemein, India. C.O. 11. Var. *Mariotiiana*, 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.


16. *Kimballiana*, Reichb. f. Fig. 3902. St. 6 in. high, probably climbing to a great height; lvs. 6–10 in. long, terete, with a deep, narrow furrow: peduncle slender, probably climbing to a great height; lvs. 6–10 in. long, terete, with a deep, narrow furrow: peduncle slender,

VANDÓPSIS (like Vanda). Orchidaceae. Includes two or three species of orchids which formerly have been united with Vanda or with Stauropogon. They are distinguished from allied genera by the labellum, which is firmly united with the column, the spur cut off, and 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.


3003. Vanda teres. (Detached flower X 4).
pyrenes 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 vangs 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 ¾ 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 pyrenes. 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. I. Bidwell, of Orlando, Florida. In 1887, the late H. E. Van Deman reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It grows readily from imported seeds.


Infausta, Burch. Shrub, 4-10 ft. high, tawny-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, ¾ in. 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. velutina).—Fr. said by some to be edible. Intro. into S. Calif. 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 1896 by R. A. Rolfe in Journ. Linn. Soc., vol. 32.

The most important species is V. planifolia, the vanilla of commerce. It is 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 feet, 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 the plants 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, and blotched with yellow, white, red, and 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 albim is sometimes used, especially when the plants are largely marked with white or yellow, as in Abutilon Sellowianum, Pelargonium zonale, and variegated forms of Eryngium japonica, Hydrangea hortensis, Hedera helix, Polyscias Guijofeii var. Victoris, and others.

Among the dracenas, 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 coloration in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (S. thyraflora and S. zeilantica), Alocasia 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 sansevieria and begonia. In some begonias, many varieties of calathea (as C. ornata and C. zebrata), the epidermal cells develop decided and definite color variations, though the changes 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, as in C. Veluchii 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, bleaching, 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 limits. In variegations the colored 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 the case of chlorosis due to the lack of iron, or yellowing due to the lack of light, a leaf will quickly develop its normal color if given the proper conditions. This is not the case, however, in variegated leaves. While the intensity of whatever color the chromatophores may have can be varied by light and food, a variegated cell can never be changed by these means to a normal cell. The chromatophores of plants which have lost entirely, in many cases, the power to make starch and sugar from the carbonic acid gas in the air, and in other cases this power is very greatly reduced. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and 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 become limited in the power of making chlorophyll. These albicient 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 starvation and disappearance of the albient parts. In other cases, as in codieums, modified chlorophyll is made. Large yellowish oil-like drops occur in the substance of the chromatophores, and these changes that are undergone, as the leaf becomes older, produce the remarkable and beautiful colorations of this group of plants. The coloration here, as in dracenas 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 fermentations of the leaves, 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 than and smaller than the 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 seed is not obtained 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 dracenas, caladiums, and codiciums. 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 variegations 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 different, the 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 characteristic 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 chlorophyll 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 chlorophyll 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 calathia, caladium, codicium, 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 chroomogen, or color contents of the leaves, especially the chlorophyll and anthocyanin, causes many of the brilliant colors of autumn foliage (p. 431).

ALBERT F. WOODS.

VARNISH TREE: Kalanchoe paniculata, Kalanchoe blossfeldiana, Kalanchoe pinnata, 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, flower-bud, partially developed seed-receptacle, mature seed-receptacle, or seeds (either immature or mature), may constitute the edible part. Many vegetables are edible only after being cooked, others (such as cabbage), 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 all of the other diverse 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.
coördinate with pomology (fruit-growing) and floriculture. However, certain vegetables, such as potatoes, when grown in large areas in rotation with general farmlands, sometimes looked on as agricultural rather than horticultural subjects.

Some of the 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 selling 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 on large areas for stock-feeding.

Vegetable-gardening may be divided into two great categories: the division that is made of the products; namely, commercial gardening (see page 1997, 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 different types: truck-gardening, fieldtruck-gardening or truck-farming, forcing (see Vol. III, page 1254), and the growing of vegetables for canning or pickling factories.

Market-gardening proper involves intensive methods of culture, and is most highly developed near large cities. Truck-farming involves the growing of one or a few special vegetables, a crop, or group of crops, in an adjacent district, or 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; Kalamazoo, Michigan, for celery; Rocky Ford, Colorado, and the Imperial Valley, California, for muskmelons; certain areas in Georgia for watermelons; southern Texas for the Bermuda 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 lettuces 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 choice 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 usually placed on a few crops, whereas in home-gardening it is placed on a great variety of products.

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 1735). 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 advisable that even these raised beds be dispensed with as much as possible. Some of the very 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 underground drainage and the incorporation of humus and by judicious tillage. See Tillage and MacIntosh place in the home-garden on the farm particularly it is desirable that the rows be long and far enough apart to allow of tillage with horse-tools.

Vegetable-gardeners are usually large users of stable-manure. Near the large cities the manure is bought in earload 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 garden land in the ordinary sense. The vegetable matter, therefore, has to be supplied 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. Vegetable-gardeners, especially in the East and South, generally use largely, also, of concentrated fertilizers.

In intensive vegetable-gardening it is important to start many of the crops under glass and to transplant the young plants to the open as soon as settled weather comes. See Transplanting. This is particularly true of lettuce, radishes, peas, beans, cucumbers, tomatoes, beans, peppers, the early crops of celery, cabbage, and cauliflower. In the northern states muskmelons and sometimes watermelons and cucumbers are started under glass, being grown in pots, venued "dirt bands," or upon inverted sods, whereby they are transferred to the open without disturbing the roots. Formerly the plants were started under hotbed or coldframe 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 prosecuted in 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 Hotbeds, Greenhouse, Forcing.

The seed and variety problem is most complex. A mistake in the selection of seed may prove an 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, some varieties crowd out the Earlsana 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.
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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. Experimental stations are taking a more definite basis for a science 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 of vegetables, for remedies. The spraying, in addition to being a necessary adjunct to any efficient vegetable-garden, has 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 so far as possible 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 consists of crops that need the high-priced land for ordinary farming. Land that demands rent on a valuation of $1,000 an acre is often used for vegetable-gardens; and higher-priced land, held for other uses later, may be used temporarily. There is also intense competition near the large cities. These circumstances force the gardener to utilize his land to the utmost. Therefore, he must keep the land under crop every day in the year when it is possible for plants to live or grow. This results in various systems of succession-cropping and companion-cropping, whereby two or more crops are grown on the land the same season or even at the same time. (For examples of companion-cropping, see Market-Gardening.) Market-gardening is usually a business that demands enterprise, close attention to details, and much physical labor. If, with his knowledge of vegetable-growing, the gardener combines good business and executive ability, and an intimate knowledge of market conditions, he should be able, however, to make it a profitable and attractive business. Although the outlook is likely to be large, the returns are direct and quick.

Extent and growth of the industry.

The most recent published statistics of vegetable-gardening in the United States are those of the Thirteenth Census, 1910. According to the report of this census, crops of 1909, the acreage devoted to vegetable production in the United States was 7,073,379 acres, including 3,668,555 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, 4,909,540, 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 and make them an important part of their business, 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, Illinois, 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 botanical products, including vegetables, is $152,000,000 to $273,000,000.

A map showing centers of vegetable production in the United States would show changes no 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 it has ever been, and the factors that were 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 market-gardening centers, has brought about a marked development in the production of vegetables in northern 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 it is not now the most 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 for supply of 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 uses the products from a comparatively large acreage for commercial canning on a 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 vegetables for the kitchen-garden for home use.

The insistence of the population on a supply 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.

Market-gardening 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 reapp
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ing returns from improvements which are far more costly than in other lines of agriculture.

The past ten years has seen the beginning of organization among vegetable producers. Cooperative selling is becoming a larger factor in the selling of produce on distributing vegetables. The co-operative selling and other cooperative methods of marketing are finding material advantage in 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 observing and securing assistance through the central agency for solving such 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 have been conducted as incidental matters by some member of the staff whose principal energies were demanded by other horticultural interests. At the present time much more attention than 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 undergraduate research. Provision is also made for 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 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, 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, Henderson, Rawson, Landreth, Bailey, Watts, Lloyd, and Corbett. For California one should consult Wickson's "California Vegetables in Garden and Field," and for the Atlantic South, Rolfs' "Vegetable-Growing in the South for Northern Markets," Oemler's "Truck-Farming at the South," and Rolfs' "Subtropical Vegetables of the Garden." There are many books devoted to special topics, and there are many others with special reference to the time of which they were written. Only one American work has been devoted to descriptions of varieties of vegetables, as the works of Downing, Thomas, and others have to varieties of fruits. This work is Fearing Burr'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 Vilmorin'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 Curieur," Paris, 3d ed. 1899.

L. H. B.

JOHN W. LLOYD.

PAUL WORK.

VEGETABLE-GARDENING

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 immigration of acreage product and of prices secured were almost incredible because 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 living 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 into disrepute and largely retains such disadvantage at present. The result is that the American largely avoids market-gardening, while Asiaties 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 ceadents, which would be cheaper and inexpensively 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 which clothed the plant-cultures 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>Carloads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichokes (Globe)</td>
<td>1,450</td>
</tr>
<tr>
<td>Asparagus</td>
<td>350</td>
</tr>
<tr>
<td>Celery</td>
<td>2,500</td>
</tr>
<tr>
<td>Cabbageflower</td>
<td>1,000</td>
</tr>
<tr>
<td>Cabbage</td>
<td>1,000</td>
</tr>
<tr>
<td>Potatoes</td>
<td>10,000</td>
</tr>
<tr>
<td>Mixed Vegetables</td>
<td>2,000</td>
</tr>
<tr>
<td>Cabbage</td>
<td>1,000</td>
</tr>
</tbody>
</table>

The canned-vegetable output of 1914 was 2,373,182 cases (each containing twenty-four 2/5-pound tins)
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VELLOZIA

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divided as follows: asparagus, 800,380; string beans, 81,905; peas, 188,667; tomatoes, 1,188,705; other vegetables, 119,525.

In addition to the foregoing there is the dry-bean product, which reached a total of 3,670,000 bags of 80 pounds each in 1915, and of sugar beets which was 203,200 tons in 1915.

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 for vegetables. The vegetable grower, however, who one lacks knowledge and the power 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 garden-making 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 hardier vegetables are sown in succession from September until February or March, there will be continuous production through the winter and into the early summer. The chief shipments of vegetables from California at the late fall and winter are beans 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 means of land or by irrigation.

There are a few localities, however, where tomatoes will 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 opening of the rainy season in September, growing the hardier vegetables, the moisture is ample even on the lands during the late fall and winter, and keeping the lower lands well plowed 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 lima-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 the water stored in the soil by cultivation. If winter growth is made by rainfall, summer growth can be had on the same land by irrigation. In this way irrigation becomes eminently desirable in securing all-year growth, which cannot be had by rainfall. With good soil and abundant irrigation, however, it is possible 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 the counties from which they are shipped in the Colorado River region of southeastern California; asparagus and tomatoes from Alameda County and other vegetables from San Mateo County; beans and tomatoes from Santa Barbara and San Joaquin counties; the cabbage comes largely from San Mateo County; asparagus and tomatoes from Alameda County and other vegetables not the same in all the 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 ocean traffic 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 pinnate palms native to the Fiji Islands and New Hebrides. The genus belongs to that section of the Areca tribe characterized by a parietal ovule which is more or less pendulous and sp. dispersed in the branches of the spadix, and is distinguished from Hedysepe and allied genera by the following characters: segments of the male fls. chartaceous, connate at base; female fls. much larger than the male. It is doubtful whether any species is now in the trade. V. Jodnndis, H. Wendel., was cult. early in 1880-90. If.-segms. 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 tinge. Kentia is like Vettozi, but the leaves fall off when large and the plants are conserved by keeping them in a moist shade; red, dark red scales: fr. 2½ x 1½ in., ovoid-ellipsoid, orange, with a red base. G.C. II: 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 1895 by American dealers may be a species of Veitchia. The genus is imperfectly known and of minor importance horticulturally.

VELLOZIA (Velloz, a Portuguese naturalist). Velloziaceae; or Amaryllidaceae. Usually shrubs, sometimes arborescent, adapted to the warmhouse. Sts. fibrous, woody, usually dichotomously branched. Ivs. linear, rigid, tufted at the ends of the branches: peduncle 1-fl.: fls. usually white; perianth funnel-shaped; segments subequal; ovate-lanceolate; ovary clavate, 3-celled; ovules many, superposed: caps. coriaceous, dehiscent at the apex.—About 65 species, Trop. and S. Afr., Madagascar and Brazil. Vellozia is closely related to Barbacenia but distinguished by having more than 6 stamens, whereas Barbacenia has only 6. V. trichopilioides, Hemsl. (V. equinodiales, W. Wats., not Barbacenia). V. enora inindo is closely associated with lanceolate, having a thick caudex, 1 ft. or more diam. and short thick primary branches: Ivs. numerous, grass-like, scarcely stiff, 3-9 in. long in cult. species (often 1-2 ft. long and more rigid in wild specimens), about ½ in. wide: peduncles usually in 3’s, 1-fl.: fls. reddish lilac, very fragrant; lanceolate, acute, 1-1½ in. long. E. Trop. Afr. B.M. 7962. C.C. III: 428. Very little known in cult.
VELTHEIMIA (named for the Count of Veltheim, 1741–1801). Lilyaceae. Greenhouse and hardy tunicate 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. membranous-scarious, the 3 angles strongly dilated and wing-like, loculicidally 3-valved.—Three species, S. Afr. They are easy of cult. and are but little known in Amer.

A. Lvs. green, 2–6 in. broad.

viridiflora, Jacq. Lvs. oblong-lorate, 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.

VERATRUM, Less. Diffuse canescent perennial, 1–2 ft. long: lvs. mostly lyrate, the terminal lobe ovate or roundish, minutely lobed or repand, at first papery, afterward naked and pubescent above, white-tomentose beneath; petiole 2–2½ in. long, amply eared 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:

Var. calendulaceum, Harvey (V. calendulaceum, Less.), differs in having the pektides not eared at the base or with only a small ear. R.H. 1857, p. 123. G. 21, p. 405. G. 5:345.—Opinions differ as to its merits, and it is variable in quality. Some consider it coarse and woody; 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). Lilyaceae. False Hellebore. Hardy perennial herbs grown in the border.

Rhizome stout: sta. erect, stout, leafy base thickened but not truly bulbous: lvs. usually broad, plicate-veined, contracted to a broad sheath: fls. purplish, greenish, or whitish, numerous in a terminal panicle, polygamous; perianth persistent, broadly campanulate or expanlate, segms. connate at the base especially in the female fls.; stamens 6; ovary ovoid, apex very shortly 3-lobed: caps. septically splitting into 3 carpels. —About 18 species, Eu., Asia, Russia, and N. Amer.

Veratrum species are striking habit plants, of easy culture in moist shady positions. In the open sunlight or in dry ground the foliage is liable to burn and decay prematurely. They may be propagated by division or seeds:

A. Fls. whitish or greenish.

B. Perianth-segms. crisped-dentate.


B. Perianth-segms. serrulate or entire.

VIRIDE, Linn. AMERICAN WHITE HELLEBORE. INDIAN POKE. Fig. 3008. A hardy perennial, 2–7 ft. tall: rootstock 2–3 in. long: lvs. plicate, acute, the lower oval, about 1 ft. long, the upper gradually smaller: fls. yellowish green; segms. oblong or oblanceolate, ciliate, serrulate; pedicels 1–3 lines long. July. N. Amer.
VERATRUM


californicum, Durand. St. very stout, 3-7 ft. high; lvs. ovate-acute, the upper ones lanceolate but rarely acuminate; perianth-petals, broader than segments, ovate, obtuse, with a whiter green base. Colo. and Wyo. to N. Calif. and Ore. G.C. III. 46:395. Gn. 62, p. 411.—Intro. 1883. The long panicle of whithes, bell-shaped, drooping fls. is followed by ornamental frs. or caps.

AA. Fls. blackish purple.


VERBASCUM (old Latin name of the mullein used by Pliny). Serophulariaceae. MULLEIN. Hardy bien- nially, 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, entire, crenulate, sinuate-dentate or pinnatifid: racemes or spikes terminal, simple or branched: fls. yellow, purple, or red, rarely in V., rarely deeply 5-crenate or parted, rarely shortly 5-toothed: corolla-tube about none, expanlate-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- sown 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 contrast- ing with looser, more open-growing plants such as larkspur, wild asters, and goldenrods. Another feature of the mulleins which makes them valuable in border planting is the generally predominating gray-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. phaniciacum, V. Chaiixii, V. nigrum, V. phlomoides, V. pannosum, 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. phaniciacum, do better in partial shade as the flowers do not open well in strong sunlight.

INdEX.


VERBASCUM

KEY TO THE SPECIES.

A. Anthers of the lower and longer stamens adnate-dentate. (Subsection 1. Thapsus.)

B. Fls. clustered. (Subsection 1. Eupathus.)

C. Anthers very short-dentate; corolla columnate at the throat

1. Thapsus

CC. Anthers longer adnate-dentate; corolla flattened out.

D. The fls. subsepalis.

E. Cauline lvs. long-dentated... 2. thapsiforme

EE. Cauline lvs. short-dentate... 3. phlomoides

DD. The fls. pedicelled, pedicels about as long or longer than the calyx

E. Les. 1.5–2 ft. long... 4. longifolium

EE. Les. 8–9 in. long... 5. crassifolium

BB. Fls. solitary or nearly so.

C. Pedicels shorter than the calyx or nearly so.

D. Inf. simple or few-branched. (Subsection 1. Thapsoidae.)

E. Fls. solitary... 6. ovatiflorum

EE. Filaments yellowish or white-bearded.

G. Base of blade cordate-subauriculate... 12. glematium

GG. Base of blade attenuate. 13. simplex

DD. Inf. many-branched.

E. Fls. clustered; calyx deeply 5-parted. (Subsection 2. Glomerata.)

FF. Filaments white-bearded... 14. mucronatum

FF. Filaments purple-bearded... 15. sinuatum

EE. Fls. solitary or in clusters; calyx 5-toothed. (Subsection 3. Pyramidalae.) 16. pyramidalum

CC. Pedicels as long or longer than the calyx. (Subsection 4. Lychnidales.)

D. Beards of the filaments purple (sometimes white in No. 19).

E. Infl. simple or nearly so... 17. nigrum

EE. Infl. many-branched.

F. Corolla-labes nearly round. 18. Chaiixii

FF. Corolla-labes obato... 19. pyramidalum

DD. Beards of the filaments white (often purple in No. 10).

E. Upper surface of l. glabrous. 20. Lychnitis

EE. Upper as well as lower surface of l. tomentose.

GG. Margins of lvs. crenate... 19. pyramidalum

FF. Margins of lvs. entire or nearly so.

G. Lvs. oblong or elliptic, broader towards the middle... 21. pulverulentum (tum)

GG. Lvs. more or less lanceolate, broader towards the base.

H. Calyx-segms. lanceolate... 22. songaricum

HH. Calyx-segms. narrowed-linear-lanceolate. 23. olympicum

BB. Parts of the infl. glabrous or nearly so, the rest of the plant woolly.

C. Corolla-labes: fls. clustered. (Subsection 5. Leiantha.) 24. leianthus

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Section I. THAPSIUS.

1. Thapsus, Linn. (V. Blattaria, J. A. Schmidt, not Linn. V. giganteum, Willk. V. Schræderi, Mey.).

Common Mullein. Fig. 3909. Biennial, 2-6 ft. high, densely yellowish tomentose: radical lvs. oblong, crenulate, attenuate to the petiole; cauline lvs. narrowly decurrent from lf. to lf.: fls. yellow, fascicles forming spike; calyx tomentose, lobes lanceolate; corolla rotate, rather flat. Eu. and Cent. Russia. Var. macrurum, Benth. (V. macrurum, Ten.), is white-tomentose and the cauline lvs. are more broadly decurrent. Italy.

2. thapsiforme, Schrad. (V. densiflorum, Bertol.). Biennial, about 2-5 ft. high, densely yellowish tomentose: radical lvs. oblong-elliptic or elliptic-lanceolate, crenulate, attenuate to the petiole; cauline lvs. narrowly decurrent from lf. to lf.: fls. in fascicles forming spike, large, yellow; calyx tomentose, segms. lanceolate; corolla rotate, rather flat. Eu. and Cent. Russia. Var. rubiginosum, Soul. (V. rubiginosum, Pers.). Biennial, 1½-3½ ft. high, whole plant green, somewhat viscid-hispid or nearly glabrous: lvs. glabrous or glandular-hispid, especially beneath, oblong; lower petioled, dentate or sinuate-pinnatifid; upper sessile, cordate-clasping or shortly decurrent: raceme glandular-hispid; pedicels in 2's or 3's, rarely solitary: fls. yellowish to violet; caps. globose, longer than the calyx. Eu., N. Asia.—Distinguished from V. virgatum, which it resembles, by the solitary pedicels.
14. *muronatum*, Lam. Biennial, several feet high, densely white, ragged-tomentose: st. erect, crowded, leafy, large-panicled: lvs. thick; radical oblong, crenate, sometimes somewhat lobed and somewhat dentate; cauline lvs. oblong, rather long-decurrent; uppermost small, oblanceolate, tomentose. This species, resembling *V.* longiflora, is much branched above, and has very large flowers, nearly all large-panicled: fls. bright yellow; calyx densely floccose, segments linear-lanceolate; corolla small; filaments white-woolly. Eu. Gn. 73, p. 422.

21. *verulentum*, 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 branched fascicles; calyx densely floccose, segments linear-lanceolate; corolla small; filaments white-woolly. Eu. Gn. 73, p. 422.


23. *olympicum*, Boiss. Biennial, 3–5 ft. or more high, densely white-tomentose: lower lvs. usually 6 in. long, oblong-lanceolate or oblong, base long-narrowed, double and obtusely lobed; upper lvs. sessile, ovate, auriculate-cordate, long-acuminate; panicle pyramidal, sometimes 2 ft. long, canescent; branches finally rather lax: fls. yellow, solitary or in pairs; calyx tomentose, segments oblong or ovate; corolla large; filaments purple-woolly. Caucasus.

Subsection 5. *Leiantha.*


25. *rubiginosum*, Waldst. & Kit. Biennial, about 2–3 ft. high; st. glabrous or pubescent above: lvs. green, pubescent beneath, crenate; lower petioled; upper segments or cordate, elliptic, base clasping: racemes usually from somewhat paniculate; pedicles in 2s or 3s, rarely solitary, twice or many times as long as the calyx: fls. reddish purple; calyx-segments linear-lanceolate; filaments purple-woolly. S. E. Eu. and Caucasus.—Boissier Flora Orientalis suggest that this is a hybrid between *V. phoeniceum* and *V. nigrum*. *Var. ferrugineum*, Benth. (V. ferrugineum, Mill.), has a long simple raceme and slightly larger and longer-pedicelled 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-elliptic, attenuate to the short petiole, obtuse, obtusely crenate or repand; cauline lvs. few, sessile, oblong or lanceolate, acute; fls. purple or red, in a simple slender raceme; calyx glabrous; obtuse segments elliptical; corolla glabrous; filaments purple-woolly. S. E. Eu., Caucasus, and Persia. G. 15:158. Gn. 22, p. 377; 27, p. 173; 41, p. 566. A.G. 13:630. L. B. C. 7:837.—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 damp weather, consequently the locality should be one where only the morning and evening sun strike the

*VERBASCUM cauline* Biennial, several feet high, densely white, ragged-tomentose: st. erect, crowded, leafy, large-panicled: lvs. thick; radical oblong, crenate, sometimes somewhat lobed and somewhat dentate; cauline lvs. oblong, rather long-decurrent; uppermost small, oblanceolate, tomentose. This species, resembling *V.* longiflora, is much branched above, and has very large flowers, nearly all large-panicled: fls. bright yellow; calyx densely floccose, segments linear-lanceolate; corolla small; filaments white-woolly. Eu. Gn. 73, p. 422.
VERBÊNA (ancient Latin name of the common European vervain, V. officinalis). Verbenacea. Annual or perennial herb or subshrubs, which are diffuse or sometimes creeping, some of them common flower-garden plants and sometimes grown in the greenhouse.

Leaves opposite or rarely ternately whorled or alternate, dentate or usually incised or dissected, rarely entire; spikes terminal, sometimes densely imbricated, sometimes elongated, slender and remotely fild., sometimes broadly corymbose or paniculate on an erect st., rarely axillary; fls. small or medium-sized, sessile; calyx tubular, 5-ribbed, 5-toothed; corolla-tube straight or slightly curved; corolla with 2-lips, the lower, 5, oblong or broad, obute or retuse; stamens 4, in pairs; ovary entire or very shortly 4-lobed at apex, 4-celled, cells 1-ovulata, fr. separating into 4 narrow pyrenes or nutlets.—About 80-100 species, chiefly natives in Trop. and extra-Trop. Amer. Some of them are unholiday weedy plants in fields and waste grounds in the U. S. and Canada. For the lemon verbena (V. citriodora), see Lippia citriodora.

Verbenas rank high among plants grown as garden annuals. Their clusters of many and often fragrant flowers are borne in constant succession from June till frost. They vary from white through lilac and rose to purple and dark purplish blue, with shades of pink and pale yellow. The clusters are about 2 inches across and contain a dozen or more flowers each 1/4 to 3/4 inch across. The plants are grown with ease in any usual garden soil and condition. For general purposes, the plants should be grown from seeds. The plants are set about 1 foot apart each way, although a strong plant in good soil may spread 3 feet or so in the course of the season. Usually the seeds are started indoors, but if sown in the open as soon as the season is settled and warm, flowering plants should be secured in July or early in August. The verbena of gardens is a semi-trailer, the flower-stems not rising more than about a foot or so. It is sometimes used as a ground-cover under gladiolus, lilies, and other tall plants, and in the margins of shrubbery plantations. It also makes an excellent window-box subject.

When special colors or named varieties are desired it is necessary to propagate verbenas by cuttings. To propagate a particularly choice variety by cuttings, shorten back the plants about September 1, keep them well watered, and by the end of the month there will be plenty of quick tender growth suitable for cutting. Put the cuttings in the propagating-house or even in flats with soil in bottom and sand on surface. Place the flats in a coldframe, and keep them moist and shaded until the cuttings are rooted. When rooted, transfer to flats in a cool light house until after New Year's. Then pot them, using 2 1/2-inch pots, and allow a temperature of 50° F., which will soon give plenty of material for additional cuttings. Verbenas increased from cuttings tend to flower early, and those propagated in February or March will require at least one pinching. When propagating-out for summer bloom, keep the plant over nearly to the horizontal, so that the new growth will spread along the surface of the soil. These shoots will take root quickly, thereby covering the ground. The old method was to peg the plants down.

In propagating general stock, sow the seed in February and pot into 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 hothood for young verbenas. About April 15, place the pots in a few inches of soil in a mild hothed, lift them from now and then and rub off the roots with a brush 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 hybrida.—V. chamadryfolia, V. phlogiflora, V. incesa, and V. teucrioides. These species are shown 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) Sells, or one-colored varieties; (2) Ouletas, 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) Compactas, 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 the garden or hybrid race of verbenas, such as compacta, coccinea, grandiflora, monstrosa, cerasula, candissimissima, italica, auriculiflora, striata.

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A. Connective of the upper anthers not appressed.  
B. Clusters not panicked. Prototypes of the garden verbenas (V. hybrida, Hort. Fig. 3911).

C. Fls. scarlet.

1. Chamadryfolia, Juss. Fig. 3910. Characterized by red fls. in flatish clusters, oblong, coarsely scalloped, nearly sessile lvs. and rather stiff pubescence; sts. slender, forking, creeping at base, hisurate: branches somewhat ascending; lvs. oblong or ovate, base broadly cuneate, contracted into the short petiole, crenate or subincisely serrate, serrations often unequal, strigose above, below hairy, especially on nerves: peduncles elongated, ascending; spikes solitary, capitate: bracts lanceolate-subulate, ciliate: calyx hisurate-canescens, sparingly glandular, more than twice as long as the bracts; corolla crimson, limb irregular.—Occurs in two rather distinct forms: var. Melindres, Hort, has oblong to lanceolate-lvs., which are unequally incised-severed. This form is less hisurate and is more graceful and vigorous. It was the form first intro. to cult. Var. melindres, Hort., has shorter, broader lvs. and is more hairy. Different forms occur over S. Brazil, Uruguay, Paraguay, and the whole of the Pampas. B.R. 1184.  
L.B.C. 16:1514.  
P.M. 3:333.  
P. M. 1:173.  
B. 3:129.

D. Fl.-clusters oval to oblong; lvs. saw-toothed.

2. Phlogiflora, Cham. (V. Tweediana, Niven). Fig. 3910. Characterized by rosy or purple fls. in oblong or

DD. Fl.-clusters flat or convex: lvs. more deeply and sharply cut.

3. incisa, Hook. Fig. 3910. Rosy or purple-fld. species with lvs. more deeply cut than in the two preceding: whole plant hairy-pubescent; sts. ascending; branches erect: lvs. oblong-triangular, base cuneately truncate or subordinately attenuate into the evident petiole, pinnatifid lobed or deeply serrated and incised, upper lvs. sublanceolate, sessile, incisedly pinnatifid: spikes terminal, pedunculate, subternate, flat or convex: bracts ovate: calyx 4 times as long as bracts, short-haired, 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. 3023.

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, veinly-rugose, glandular-pubescent above, submentosely hispidulous on veins below: spikes terminal, solitary, glandular, hairy, lax. 5–9 in. long: bracts subulate-lanceolate, ciliate: calyx nerved, twice as long as bracts; corolla yellowish white or pinkish, long exerted, twisting in age, fragrant. S. Brazil, Uruguay, Argentina, Chile, and Peru. P.M. 5:243. B.M. 3694.

bb. Fls. panicled.

5. venosa, Gill. & Hook. Differs from all other cult. kinds by panicled infl. and tuberous roots: herbaceous perennial, 1 ft. high: sts. simple, rhizomatous, creeping at base, ascending, 4-angled, hairy: lvs. rigid, oblong to oblong-lanceolate, the subacute base entire and half-clasping, acute at apex, unequally subincised dentate, the teeth openly acuminate, nerves prominent, hirsute below: spikes in a close terminal panicle, subternate, lateral ones pedunculate, fastigate and finally cylindrical: bracts subulate, ciliate, often purplish, exceeding the hairy calyx: corolla lilac or bluish purple to nearly sky-blue, very thinly villous without; tubes slender, thrice as long as calyx: fr. 1 line long, copiously fuscous outside, dorsal ridges 5. S. Brazil and Argentina.

3910. Four prototypes of the garden verbas, drawn from early colored plates. From left to right: V. chamädryfolia, supposed chief parent of the reds; V. phlogiflora and V. incisa, the originals of the rosy and purple colors; and (right) V. teucrioides, a white flower which is probably chiefly, if not wholly, responsible for the fragrance of the hybrid verbas.

AA. Connective of the upper anthers furnished with a glandular appendage.

b. Fls. violet or rosy purple.

c. Bracts half as long as calyx: plant a subshrub.

6. ténera, Spreng. (V. pulchella, Sw., not Hort.). Herbaceous perennial; sts. cespitose, decumbent, rooting; branches slender, 4-angled, ascending, sparingly hairy: lvs. decurrent 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 patelliform glands, twice as long as bracts; corolla rose-violet; anther appendages barely exerted, clavicate, sub-curved. S. Brazil and LaPlata 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-
VERBENA

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. erinoides, Lam. (V. multifida, Ruiz & Pav. V. pulchella, Hort., in part). Moss VERBENA. Annual or perennial: st. strigose hairy or somewhat hirsute, 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, strigose especially on nerves: spikes terminal, solitary, pedunculate, soon elongating and relaxing, canescent hairy: bracts lanceolate, acuminate, spreading, one-half as long to as long or longer than the calyx: corolla rather small, shortly exserted, lilac, bearded within; other appendages exserted, rather short.—Said by Dr. Gillies to be "one of the commonest plants on the Alp's of Chile and Mendoza . . . varying extremely in color of flowers, in stature and in degree in which the leaves are cut." In some individuals the lvs. are said to be scarlet, in others blue or purple. Forms assignable to this species occur also in the southern states of Brazil. The species is probably a composite one as now recognized. B.R. 1766 (as V. multifida var. contracta).

3911. The common garden verbena.—Sometimes known as V. hybrida. (X1)

Variable species characterized by distinct finely cut foliage and rosy lilac to deep purple lvs., but the clusters and individual lvs. are too small to make it popular.

BB. Fls. lilac: plants annual.

c. Lvs. twice pinnatifid.

8. bipinnatifida, Nutt. (V. pulchella of some seedmen. V. montana, Hort., in part). Perennial, prostrate and rooting at base; stem stout, upright, branched, 6-18 in. high: lvs. rather thick, 1-2½ in. long, scabrous above, ovate in outline, pinnately parted 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 cleft, mass or 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. (Buchh. canadensis, Linn. V. Aubletia, Jacq. V. Aubletia var. Drummontii, Lindl. V. Drummontii, Hort. V. Lambierti, Sims. V. montana, Hort., in part). Fig. 3912. Perennial, pubescent, with rather stiff hairs or glabrate: branches slender and ascending from a sometimes creeping rooting base, 6-8 in. high: lvs. ovate or ovate-oblong in outline, 1-3 in. long, truncate, broadly cuneate or subulate at base and the petiole more or less margined, incised lobed and toothed, often deeply 3-cleft: 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-pubescent: 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 oblanceolate, 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 barely exserted. Colo. and Mex. eastward across the continent. B.M. 308; 2200. B.R. 294; 1925. Reported as producing many garden and spontaneous hybrids. Garden hybrids are of stouter habit, less inclined to root at base: lvs. larger, dark shiny green above, more conspicuously veiny, clusters and individual fls. larger, and the color variation more striking. Many forms have a rich spicy fragrance quite different from that of the hybrid verbenas. On account of the robust healthy nature of V. canadensis, it has been frequently recommended in horticultural literature as desirable for hybridizing with the hybrid verbenas 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 procentum rooting sta., glabrous divided lvs. with ultimate segms. very narrow, and lilac-colored fragrant fls. in short head-like spikes. J. H. COWEN.

L. H. B.†

VERBENA, LEMON: Lippia. V., Sand: Abronia.

VERBESINA (probably a meaningless alteration of Verbenas). Compositae. 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;
VERBESINA

pappus of 2 (1–3) awns, sometimes with 2 or 3 intermediate scales.—About 50 species, American. About a half dozen hardly perennial verbensas have slight rank as garden plants, but the competition among yellow-N. and goldenrod is so great that verbensas have little chance. They make acceptable wild-garden and back-border subjects.

occidentalis, Walt. (V. Siegesbeckii, Michx. Phaethusa occidentalis, Brit.). Hardy perennial herb, 4–8 ft. high; lvs. ovate (uppermost oblong-lanceolate), acuminate, pinnately 4–5 lobed, with yellow rays, and yellow achenes; grows in flatish clusters. Verbenas canadensis; formerly known as V. Anabasis. (X3)

serrate, the larger ones 8 in. long, contrasted into a marginal petiole; rays stlyferous and usually fertile: awns of pappus not hooked. Dry hillsides, E. U. S.—A robust and rather coarse plant, growing 4–8 ft. high, and suitable only for the wild-gardens and the back row of the hardy border. It is doubtless of the easiest cult. It blooms from Aug. to Oct., and has numerous yellow fls. ½–1 in. across in flatish clusters.

crocata, Less. A much-branched, hairy perennial with a fleshy 4-winged st.; lvs. opposite, decurrent, irregularly pinnately lobed, the lobes usually ovate and much toothed: fls. in solitary, peduncled heads, not very showy: achenes quite glabrous. Mex.—Offered by Montarioso Nursery at Santa Barbara, otherwise little known. Perhaps not hardy north of Washington.

V. Purpurea, T. S. Brandege. Dwarf; lvs. in a rosette, elliptic, 4–5 in. long; heads 2–4 in. across; ray-florets deep golden. Mex.—V. virginica, Linn. (Phaethusa virginica, Brit.) Virginia Crownbeard. A hairy-stemmed perennial with winged branches and white corymbose-paniculate heads has been offered. It is a wild-garden subject that would be good to naturalize. E. N. Amer. Cl. 47, p. 132.

N. TAYLOR;†

VERNONIA (after Wm. Vernon, an English botanist who traveled in North America). Composite. 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 cyms: heads not glomerate, several to many exclusively tubular-fl.: involucre of dry or partly herbaceous, much-imbricated bracts; corolla regularly 5-cleft into narrow lobes; achenes 8–10-ribbed, with a blunt apex and a cartilaginous, callous base; pappus double (at least in American species).—About 500 species widely scattered about the world, but is possibly most plentiful in S. Amer. The latest monograph is that by H. A. Gleason in Bull. N. Y. Bot. Gard. 4:144–243, 1906. The following species are native of the U. S., and are hardy perennial herbs of attractive appearance, with rather large heads of purple fls. in terminal clusters in late summer or early fall. Vernonias are of easy cult. in any good, rich border, being easily prop. by division. Very satisfactory groupings can be made with vernonias and native asters and goldenrods.

a. Heads 50–70-fl.

cinita, Raf. (V. arakensia, DC.). St. 8–10 ft. high; lvs. linear-lanceolate, 4–12 in. long, alternate-acuminate, glabrous or somewhat pubescent: peduncles not branched; involucre green, the filiform tips often reddish and the pappus purplish. Plains, Mo., Kans. to Texas. July–Sept. Var. aiba, Horta., has white fls.


c. Plant about 1 ft. high.


cc. Plant 2–4 ft. high.

Littermanii, Engelm. St. fastigiately 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-heads numerous, ½–1 in. long, 10–14-fl. July–Sept. Sandy soil, Ark.

BB. Lvs. not narrowly linear.

c. Bracts of involucre tipped with slender awns.

novboracensis, Willd. Fig. 3913. St. 3–6 ft.: lvs. oblong to oblong-lanceolate, 3–6 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.

Baldwinii, 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.

e. 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. 2–3 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-fl.: bracts obtuse or some of them mucronate-acute, closely appressed. July–Sept. Ohio and Ky. to the Dakotas and south to Texas. Grows on prairies and in moist soil; variable southward.

 Вербена канаденская; прежде известна как В. Anabasis. (X3)

3912. Verbena canadensis; formerly known as V. Anabasis. (X3)

У вербен, ланцетовидные или линейно-ланцетовидные; верхние листья овальные (наиболее приблизительно овально-ланцетовидные), острые, с выступающими перемычками. Родина — Северная Америка. Крона. Железобулатник. Переносные травы или в тропических странах кустарники и деревья.

VERNONIA

V. Arencheriana, André. Glabrous shrub, 3-6 ft. high; lvs. sessile; flowers: calyx-lobes deep reddish violet.
—V. gigantea, Hort. Robust: 8-heads in panicles, carmine or violet-rose.
F. W. BARCLAY.
N. TAYLOR.

VERÓNICA (named in honor of St. Veronica). Serophaludicae. SPEEDWELL. Annual and perennial shrubs, shrubs, or rarely trees, one group of which, mainly European and American species, are hardy in the North, the others native to 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; calamine lvs. very rarely alternate; floral lvs. always alternate: fls. disposed in terminal or axillary bracteate racemes, or rarely solitary in the axis of alternate leaves, usually flesh-colored, or white, never yellow; calyx 4-5-parted, very rarely 3-parted; corolla-tube short, usually very short, limb spreading, 4-5-cleft; stamens 2: caps. compressed or turgid, 2-grooved, loculicidally dehiscent, usually oblong 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: 458-491 (1846), 185 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 lower-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 ever blooming, 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. hybridia 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 hardier race will probably be secured by using V. T. versii and its allies, which have been introduced more recently. Some of these are V. Colensoi, V. anomala, V. monticola, and V. pentelioides,—all unknown to the American trade. A third and stillhardier group of the New Zealand speedwells is the truly alpine group known as whorped veronicas. These should be hardy in any northern rockeries. They are unknown in America now. The best of the group is said to be a form of V. cupreosoides, known to English trade as V. salicinioides. Others in cultivation are V. Hectorii, V. Armstrongii, and V. lycopodioides. (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 manuscript contributed by him.

VERONICA

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 bedded 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 the size and form of flowers, and others shrubs, which latter are erect or prostrate, compact and ball-like or wide-spreading, densely leafy or

3014. Veronica longifolia var. subsessilis (×1/2). No. 6.
hybrids due to crossing the more hardy alpine species. So far as American gardens are concerned the following, not yet introduced or rare in cultivation (some of them not here detailed), would be desirable novelties: *V. Dieffenbachii, V. gigantea, V. Barkeri, V. Lewisii, V. monticola, V. Armstrongii, V. propinqua, V. loganioides, V. Lavandiana, and V. Roaulti.* Those desiring more information about the shrubby veronicas should consult Cheese-man’s "Manual of the New Zealand Flora," Wellington, 1906, and the subsequent volumes of the "Transactions of the New Zealand Institute."

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**KEY TO THE SECTIONS.**

A. **Inf. terminal.** (See also No. 32.)

B. *Lvs. bearing fili-shoots alternate (annuals).*

C. *Corolla-tube short or very short.*

D. *Caps. ovate or oblong.*

E. *Caps. suborbicular.*

A. **Inf. axillary.**

B. *Plants shrubs, or trees, rarely herbs: caps. turigid.*

C. *Caps. only slightly compressed.*

D. *Caps. strongly compressed and transversely broad.*

**Section VI. Chamaedrys.** Species 22-40.

**Section I. Ped erot e.**

A. *Lower lvs. orbicular.*

AA. *Lower lvs. lanceolate.*

**VERONICA**

1. **Bonarota, Linn.** (V. chamaedryfolia, Wetst. *Pederota Bonarota, Linn. P. chamaedryfolia, Brigt.)* Perennial, pilose: stts. 4-6 in. high: lower lvs. orbicular, scarcely 1 in. long; upper lvs. ovate or lanceolate, serrate or incised: spike globose or oblong, compact, 1-2 in. long, usually 4-5 mm. in diameter: calyx-segments linear-subulate. Italian Alps and Tyrol.

2. **virginica,** Linn. (Leptandra virginica, Nutt. V. verticillata, Hoft.), CULVER'S ROOT. Erect, simple, somewhat pubescent herb 2-6 ft. tall: lvs. in whorls of 4-6, lanceolate, 2-4 in. long, smooth above, pubescent below, acutely serrate, short-petioled: racemes terminal, erect, long, dense: fls. many, white or pale blue, short-petioled: calyx oblong, pointed, twice exceeding the calyx. Aug.-Sept. Eastern states. Gnm. 79, p. 250. - Free-growing herb. Likes rich soil and much sun. While still coarse and erect, 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 shorter than the calyx.

**Section II. Pseudolysimachia.**

A. **Foliation and at. white-pubescent or white-woolly.**

B. *Base of lvs. cordate.*

BB. *Base of lvs. attenuate.*

AA. **Foliation and at. white-woolly.**

BB. *Lower lvs. pinnatisect.*

BBB. *Lower lvs. merely serrate or crenate.*

CC. *Racemes panicled.*

DD. *Lvs. lanceolate.*

DD. *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 pinnate with spreading segms., the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fl.d., elongated: fls. blue, June, July, Open mountain lands, Russia.


5. **spuria,** Linn. (V. paniculata, Linn. V. augustinfolia, Fisch., not Bernh. V. incisa, Soland. V. amethystina, Wild.). BASTARD SPEEDWELL. Upright, slender, densely pubescent, up to 32 in. tall: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrat-crenate toward the apex, entire below, smooth, narrowed at the base, thickish: racemes numerous, panicled, long, densely many-fl.d.: fls. blue, pedicelled: caps. nearly round, thick, exceeding the sepals. May, June. G.W. 7, p. 457. 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. *carnéa,* Hort., a form growing 1 ft. high and having spikes of rich pink fls. and the variegated form as V. *elegans* var. *carnéa* variegáta.

6. **longifolia,** Linn. (V. martimina, Linn. V. *hybrida,* Georgi, not Linn. V. persicifolia, Schott. V. breacteata, Opiz, not Willd.). Strong, leafy, upright, densely growing species 2½ ft. high, with usually a smooth st.: lvs. lanceolate or oblong-acuminate, sharply serrate, lower

7. spicata, Linn. (V. crassifolia, Wierzb. V. hibrida, Linn.). Ascending or erect, slender sts. 2-4 ft. high, growing from a short creeping, almost woody rootstock: lvs. lanceolate, lance-oblong or the lower ovate, opposite or verticillate, pinate, downy, 1½-3 in. long, thick: racemes long, upright, densely many-fl.: fls. pedicelled, clear blue or sometimes pale pink; stamens very long, purple: caps. longer than broad, notched, thick, exceeding the broad hairy sepals. June–Aug. Hilly pastures, Eu. and N. Asia. Gn. 68, p. 55; 78, p. 157. J.H. III. 47:15.—Thrifts in an open soil away from shade. Regarded as one of the better border speedwells. Var. alba, Hort. (V. crassifolia alba, Hort.), is said to grow 6–18 in. high and have white fls. Var. corymbosa, Hort., is offered in the trade as a form growing 1½ ft. high: fls. pale blue. Var. nana, Hort., is offered as a form 6–9 in. high: fls. blue. Var. rosea, Hort., grows 15–18 in. high: fls. purplish pink, showy. July and early Aug. Var. alba, Hort., is offered in the trade as growing 2 ft. high and having long spikes of violet fls. Var. variegata, Hort., is offered as a form growing 1½ ft. high, with variegated foliage and blue fls.

8. incana, Linn. (V. candida, Hort. V. neglecta, Vahl). Strong, upright or ascending, white-woolly plant 12–18 in. high, with many sterile matted branches and fewer fertile erect branches: lvs. opposite, acute, lower oblong, upper lanceolate, 1–3 in. long, white-tomentose: racemes erect, solitary to several, 3-6 in. long: fls. many, blue, short-pedicelled: caps. longer than broad, thick, exceeding the woolly calyx. July–Sept. Fields and mountain regions. N. Asia, and S. W. Eu. – Resembles V. spicata in habit. Has a good appearance both in and out of the rockery; useful as border, or geometrical garden. Var. candidissima, Hort., has lvs. larger and not so hoary as the type: fls. pale blue. Var. glauca, Hort., is offered as a form with silvery foliage and deep blue fls.

Section III. VERONICAstrum.

A. Duration annual: floral lvs. usually about like the lower cauline lvs.

Subsection 4. Annuus.

B. Cauline lvs. sessile

17. syriaca

18. glauca

AA. Duration perennial, base usually somewhat woody; floral lvs. usually much smaller than the lower cauline lvs.

B. Habit erect or ascending: raceme usually somewhat elongated. (Subsection 3. Alpina.)

C. Plants 2–6 in. high.

D. Fls. blue or violet

16. alpina

DD. Fls. rose or white

16. repens

CC. Plants 2½–4 ft. high (seldom less than 6 or 10 in.)

D. Lvs. 1–3 in. or more long

13. gentianoides

DD. Lvs. ½–1½ in. long

15. serpyllifolia

BB. Habit diffuse, low and much branched: raceme usually much shortened.

C. Infl. capitate, several-fl.: (Subsection 1. Diffusae.)

D. Blades linear-spicate, or oblong-spicate

10. cespitosa

E. Surface of lvs. glabrous...

9. Nummularia

EE. Surface of lvs. tomentose...

11. bombycina

CC. Infl. a very short (in fr. elongated) raceme, few-fl.: (Subsection 2. Fruticosae.)

12. fruticulosa

Subsection 1. Diffusae.

9. Nummularia, Gouan. Perennial: sts. slender, creeping, becoming somewhat woody, diffusely branched: lowest lvs. scale-like, the others clustered, ovate-ornicular, obtuse, entire, about 2 lines long, rather thick, glabrous: racemes somewhat capitate, peduncled: fls. blue or violet; corolla with the lowest segms. much larger than the others: caps. small, broad, rather glabrous. Pyrenees.


11. bombycina, Boiss. & Kotschyi. Perennial, low, cespitose, forming cushions, appressed white-silky: lvs. very small, about 2 lines long, sessile, ovate or oblong-spicate: lvs. 1–5, terminal, reddish; calyx-teeth oblong, obtuse; corolla more than twice as long as calyx: caps. small, orbicular, tomentose. July. Syria.

In the trade abroad this species is described as having pale lavender fls.

Subsection 2. Fruticosae.

12. fruticulosa, Linn. (V. saxatilis, Scop.). Perennial or shrubby: sts. diffusely branched, 2–6 in. high, woody at base: lvs. ½–2½ in. long, oblong or obovate, entire or suberenate: raceme lax, short, few-fl., pubescent: fls. blue or flesh-colored: caps. ovate. July. Mountains of Eu. and Greenland. There is a white-fl. form horticulturally known as V. saxatilis alb, and also a form known in the trade as V. saxatilis Grév. – Possibly not all material known as V. saxatilis belongs here.

Subsection 3. Alpina.

13. gentianoides, Vahl (V. globér, Hort.). Erect, slender, tufted species 6–24 in. high, from creeping roots: lvs. obovate or oblong, some lanceolate or linear, thickish, entire or small crenate, smooth, 1–5 in. long; root-lvs. more or less in rosettes; upper lvs. bract-like, smaller and narrower: raceme elongated, leafy, many-fl., hairy: fls. pale blue, with darker stamens, 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 necessary for blooming, 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-fl. form. Var. fœliis variegátis, Hort.,
VERONICA

see var. variegata. Var. pâlida, 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. pâlida. Var. stenophylla, Hort., is a narrow-leafed form. Var. variegata, Hort., is sold 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, sub lanceolate, elliptic or oblong, entire or dentate, about ½-1 in. long, of varying size, the branches having short papillose, dense hair: fls. small, blue or violet: caps. ¼-½ in. long, oblong, longer than broad, hairy, exceeding the calyx. Mountains of Eu., Cent. and N. Asia, and alpine and arctic regions in Amer. B.M. 2975.—Adapted to the rock-garden. It blackens when dried.

15. serryfíolia, Linn. (V. alpêstris, 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 oblong, crenate, ¼-½ in. long, smooth, variable: racemes loose, with conspicuous bracts: fls. pedicelled, whitish or pale blue with deeper stripes: caps. wider than long, obtusely or acute, exceeding or equal to the sepals. May-July. Roadsides and fields, Asia, Eu., N. Afr., and S. Amer.

16. rëpenis, DC. Prostrate, slender, compact plant growing in dense masses: lvs. ¼-½ in. long, ovate, slightly crenate, shiny green and moss-like: racemes slender, few-fld.: fls. rose or nearly white, with a trace of blue: caps. broader than long, deeply notched, exceeding the sepals. May. Corseca.—Hardy in Mass. and intro. in Calif. Allied to V. serryfíolia but dwarfer and more prostrate. Growers in the sun. Will cover the ground where grass does not grow, forming a sod in a short time; prefers moist corners but thrives on a moderately dry soil. Var. álba, Hort., is a white-flld. form.

Subsection 4. Annulée.

17. syriaca, Roem. & Schult. (V. pedunculâta, Lábîll., not Vaill). Assembling, diffusely branched pubescent annual, 6-12 in. high: lvs. ovate or ovate-lanceolate, incised or dentate, smooth; lower petiolate, upper sub sessile, ½ in. long: raceme terminal, slender, 4-6 in. long: fls. blue, with thread-like pedicels ½ in. long: caps. broader than long, notched, two-thirds of its length, exceeding the sepals. June. S. W. Asia. R.H. 1897, p. 311. F.S. 12:1259. Var. flôr-albo, Hort., is a white-flld. form.


Section IV. Omphalospora.


Subsection Agrestes.

19. Tournêfortii, C. C. Gmel. (V. Bûzbaumii, Tenore). Prostrate annual, with elongated slender pubescent sts., the lower branching and often rooting: lvs. ovate, subcordate, coarsely crenate-serrate, pubescent, shortly petiolate, ¾ in. long, the lower opposite, the upper alternate and similar: racemes axillary: fls. small, blue, scattering on long pedicels, of long duration: caps. broader than long, very widely notched, exceeded by the sepals. April-Sept. Fields, Cent. and S. Eu., Asia and naturalized in N. Amer. F. 1846, p. 112.


Section V. Beccabunga.

21. Michælizii, Lam. Perennial, 4-5 ft. tall, everywhere pubescent: sts. erect, or ascending from rooting base: lvs. ovate, crenate-dentate, lower and those of the sterile branches, the others clasping: racemes few, rather dense, from the upper axis: fls. pale blue (drying reddish); calyx-segms. oblong, acute: caps. ovate or orbicular, turgid and glandular. Persia.

Section VI. Chamédryx.

a. Calyx 5-parted. (See also No. 40.) The species of this group are closely allied and often hard to distinguish. (Subsection 1. Pentasepalea.)

b. Lvs. bippinnatifid. c. Base of caps. cuneate. — 27. filifolia

c. Lvs. at most lobed, pinnatisect or even pinnatifid. c. Caps. cuneate at base. d. Blade pinnatifid. — 22. multifida

d. Lvs. at most incised-dentate. — 25. austriaca

e. Lvs. not lobed or pinnatifid, crenate to broadly lanceolate. — 24. Teucrium

2a. Calyx 4-parted (occasionally 5-parted in No. 40). b. Racemes free-fld.: pedicels twice to many times longer than the calyx. (Subsection 5. Petraea.)

1. Raceme small. c. Fls. solitary. — 40. canescens

d. Calyx white. e. Lvs. ovate-oblong, long, crenate dentate. — 38. Lyciellis

e. Lvs. ovate, long, 1-2 teeth on each side. — 39. Bidwillii

e. Color of fls. blue. f. Lvs. ovate-oblong, long, pubescent. — 35. Baumgartenui

g. Lvs. ovate-oblong. f. Calyx-segms. elliptic oblong. — 37. telephifolia

h. Racemes many-flld.: pedicels shorter or only slightly longer than the calyx. i. Infl. strict, almost spike-like. (Subsection 2. Strictiflora.)

1. The racemes alternate. — 30. Allioni

d. Racemes opposite. e. Calyx lvs. ovate, obtuse, rather narrow, often pinnatifid, ¼-½ in. long, hairy. — 28. pectinata

e. Calyx lvs. elliptic-oblong, rather broad, never pinnatifid, usually about 1 in. or more long. — 29. officinalis


c. Caps. broader than long. (Subsection 4. Scutellata.) e. Raceme solitary (said to be terminal). — 32. pirolefformis

e. Racemes several. f. Lvs. broadly ovate. — 33. montana

e. Lvs. linear-lanceolate. — 34. scutellata
Subsection 1. Pentapetalae.

22. orientalis, Mill. Perennial, shortly and crisply pubescent, rarely glabrate: sts. from woody rhizomes, decumbent or prostrate: lvs. sessile, short, lower cuneate, terminal lobes dentate, rarely entire; upper usually narrower, lanceolate: racemes 2-4, from the upper axis, secund: fls. flesh-colored or pale blue; calyx-segms. 4 or 5, linear-lanceolate, very unequal: caps. glandular-pubescent, obturate or truncate. July. Asia Minor and Persia. L.B.C. 5:419. Var. tenuifolia, Boiss. (V. stricta, Willd.), has narrowly linear lvs., with the flowers densely pubescent, rarely glabrate, rarely acutely few-toothed. S. Armenia and Persia. L.B.C. 10:911.

23. latifolia, Linn. (V. urticifolia, Linn.), Perennial, sparingly and crisply hirsute: sts. erect: lvs. sessile, ovate, sharply serrate, base often cordate; upper long-acuminate: racemes opposite, laxly paniculate: fls. light blue or reddish; calyx-segms. minute, lanceolate, rather acute: caps. orbicular, base rotundate. Eu.—Horticultural material under this name is apt to be a broad-leaved form of V. Teuerium.

24. Tecuchium, Linn. (V. dentata, F. W. Schmidt. V. nitida, Hort., ex Poir., not Ehrl.). Perennial, pubescent: sts. numerous, ascending, up to 20 in. high: lvs. ovate or linear-lanceolate, nearly entire, crenate to each nearly dentate-incident, mostly sessile: racemes opposite, elongated; lvs. large: fls. rare: or white; calyx-segms. oblong-linear to lanceolate: caps. obovate, base rotundate. Cent. and S. Eu. and Cent. Asia.—Variable. Var. latifolia, Hort. (V. latifolia, Hort., not Linn.), has broader lvs. Range of the type. Var. prosstrata, Hort. (var. dubbia, Hort. V. prosstrata, Linn.), has erect habit, only the tips of its segms. oblong-linear: upright. Minor forms of this variety are known in the trade as V. prosstrata var. alba, Hort., with white fls.; V. prosstrata var. pygmaea, Hort., is a small form. G.W. 8, p. 2. V. prosstrata var. saturejiforma, Hort. (V. saturejiforma, Poit. & Turp.), has light blue fls. B.M. 3696. V. ruppestris, Hort., is quite possibly referable to V. prosstrata.

25. austria, Linn. (V. multifida, Jacq., not Linn. V. orientalis, Willd., not Mill. V. pringia, G. Beck). Perennial, 1-2 ft. high, pubescent: sts. erect, rarely ascending: lvs. sessile, ovate in outline, pinnatisect, segms. oblong with their base narrowed or linear, entire or incised: racemes 2-4, from the upper axis, elongated, many-fld.: fls. large: blue; calyx-teeth 5, rarely 4, linear, strongly unequal: caps. obovate-oblong: S. Eu. and Asia Minor. Var. angustifolia, Benth. (V. angustifolia, Bernh.), is a form with linear-subulate ifl-segms. Caucasus region.—Material offered in the trade as V. angustifolia should be compared with V. spuria and V. scutiellata.

26. multifida, Linn. Perennial, shortly and crisply pubescent: sts. decumbent and indurate at base or diffuse: lvs. sessile, pinnatisect in linear, entire or dentate segms.: racemes 2-4, axillary: fls. flesh-colored or pale blue; calyx-segms. strongly unequal: caps. glandular 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, crisply pubescent: lvs. sessile, bipinnatifid, divisions long, slender almost filiform: racemes 4-8, opposite, lax-fld.: fls. white, blue-veined, large; calyx-lobes 4, almost equal, nearly linear, acute: caps. shorter than the calyx, strongly flattened, obturate, transversely broader. Caucasus. Near V. multifida.

Subsection 2. Stigmatiflore.

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, crenate, narrow at the base, sessile, pubescent, 1-3 in. long: racemes elongated, many-fld.: lower bracts like lvs.: fls. deep blue with a white center: caps. large, longer than broad, notched, pubescent, 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. Alliomi, F. W. Schmidt, not Vill.). COMMON SPEEDWELL. FLUELLEN. GROUND-HELE. Prostrate, leafy native with a pubescent st. 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-fld.: 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. Multiflore.

31. Chamaedrys, Linn. (V. pedunculata, Vahl. V. pulchella, Salisb.). GERMANER SPEEDWELL. Angel’s EYES. BURP’s EYES. Perennial, sparingly branched, 12-18 in. high, densely ascending from a creeping base: lvs. broadly ovate, sometimes narrower, sub-sessile, crenate or incised, rounded or cordate at base, hairy, thick, 1½ in. long: racemes 3-6 in. long: fls. large, blue, long-pedicelled: caps. longer than broad, widely notched, exceeded by the sepals. May, June. Woods and roadsides, N. and Cent. Eu. in Canaaceus, Syria, and Canaries. Adventive in this country.—A good border plant.

Subsection 4. Scutellate.

32. pirolaeformis, Franch. Perennial: sts. short, pilose below: lvs. nearly all clustered, petiolate, very broadly ovate, ovate or spatulate, crenate: ray-like terminal, solitary, laxly many-fld.: fls. rose or pale violet; calyx lobes glandular, ovate-oblong, obtuse: caps. rhomboid, broader than long. China.

33. montana, Linn. MOUNTAIN SPEEDWELL. Slender, trailing, hairy plant, 12-18 in. long, rooting from the st.: lvs. ovate, petiolate, coarsely crenate, hairy, sparse: racemes slender, few-fld.: fls. white, striped with purple-blue, on long pedicels: caps. large, broader than long, slightly notched, exceeding the hairy sepals. May, June. Moist woods, Temp. Eu.

34. scutiellata, 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-fld.: fls. whitish, bluish or flesh-colored: calyx-segms. 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. Petreae.

35. Baumgärteni, Roem. & Schult. (V. petra, Baumg., not Stev.). Perennial, 3-5 in. high, possibly more, glabrous or minutely white-puberulent: sts.
slender, ascending: lowest lvs. minute; middle 6 lines long, ovate or oblong, somewhat dentate; upper lanceolate, narrowed at base: fls. blue; calyx-segms. broadly lanceolate: caps. emarginate, glabrous. S. Hungary.—The material offered in the trade as V. petraea may belong here.

36. petraea, Stev. Perennial, cespitose, 4-5 in. high, minutely and crisply pubescent: sts. dwarf, diffuse and ascending: lvs. 6-10 lines long, oblong or elliptic from a cuneate, subobovate base, few-toothed; upper lvs. sometimes entire: racemes axillary, solitary; peduncles rather long: fls. large and blue; calyx-segms. broad-oblong: caps. glandular-biretuse, 2-lobed, transversely broader, base rotund, apex retuse. Caucas.—The material offered in the trade under this name may be V. Baumgartenii.

37. telephifila, Vahl. Perennial, creeping or tufted, glabrous, glaucous: branches diffuse, filiform but rather hard and fragile, rooting: lvs. fleshy, bluish green, small, 2-3 lines long, obovate-spatulate 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 caps. small, broadly oblong, slightly compressed. Late-flowering. New Zeal.

3915. Veronica Andersonii (X34). No. 41.

38. Ljallii, Hook. f. Perennial: sts. slender, prostrate and rooting, 3-18 in. long, diffusely branched; branches tetere, usually pubescent: lvs. short-petioled, ¼-½ in. long, broadly ovate, almost orbicular or oblong-ovate, obtuse or subacute, with 2-3 coarse blunt serratures to a side, thick and coriaceous: racemes several, few or many-fl., near the ends of the branches, sometimes lateral: fls. white with pink veins, ½ in. across; calyx deeply 4-parted, segms. ovate-oblong, ciliate: caps. broadly obovate-oblong, turgid, 2-lobed. New Zeal.

39. Biddwillii, Hook. 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 ¼ 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-segms. ovate or oblong, obtuse: caps. broadly oblong. June. New Zeal.

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, ovate, pointed: cauline leaves oblong-elliptical, hispid, glabrous, basal leaves oblanceolate, sometimes reniform, entire: fls. white, 1 in. across, nearly sessile; pedicel 1 line long, pubescent; calyx-segms. linear-oblong, pointed: capsules 1 in. long, slender, hispid: seeds. New Zeal.

Section VII. Hebe.

A. Lvs. strictly scale-like, cuppet and appressed. (See also No. 54 which has somewhat scalelike but recurved spreading lvs.)

B. The lvs. densely imbricated 

C. Margin of lvs. coarse-serrate: 

D. Margin of lvs. entire or minutely incised: 

E. Fls. 4-5 parted: 

F. Fls. 2-3 parted: 

G. Fls. short-petioled: 

H. Fls. long-petioled: 

I. Fls. ovate-oblong: 

J. Fls. ovate or elliptic: 

K. Fls. elliptic or rotundate: 

L. Fls. oblong or lanceolate: 

M. Fls. oblong: 

N. Fls. ovate: 

O. Fls. elliptic: 

P. Fls. linear: 

Q. Fls. linear-oblong: 

R. Fls. oblanceolate: 

S. Fls. oblanceolate: 

T. Fls. oblong: 

U. Fls. ovate: 

V. Fls. linear: 

W. Fls. linear-oblong: 

X. Fls. oblanceolate: 

Y. Fls. oblong: 

Z. Fls. ovate: 

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, obovate or obovate-oblong, subobovate, dark green, thick, smooth, glossy, entire, rounded at apex: racemes axillary and opposite near tips of branches, stout, dense-fl.: fls. large, ½ in. diam., purple-crimson: caps. more than twice as long as the calyx. Summer. New Zeal. B.M. 4057. F.S. 1:19. R.H. 1844:60. H.U. 6, p. 349. Var. corymbifera, Hort., is offered in the trade as growing 2 ft. high with rosy fls. Var. rubra, Hort., is offered in the trade. Var. variegata, 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, Boncharit), seems to be merely a garden name for the true species. F.S. 22:
2317. *V. speciosa* hybridizes freely and there are several garden hybrids of which the best known is *V. Andersonii*, Lindl. & Paxt. (*V. salicifolia* × *V. speciosa*). *V. speciosa* var. *Andersonii*, Hort. *V. Hendersoni*, Hort.). Fig. 3015, is grown in the greenhouse and is also used as a bedding plant. It grows 18 in. high; lvs. oblong, sessile, entire, thickish; racemes axillary; lvs. bluish purple, with F.S. 7.25-685. *J.F. 1:103*. G.W. 5, p. 20. Var. variegata. Holts.; has the foliage variegated with creamy white. G.L. 18:77. Gn. W. 23:829.

42. *macrora*, Hook. f. Shrub, 1–5 ft. high, much branched, glabrous: lvs. sessile or nearly so, 1–3 in., usually more than 2 in. long, obovate-oblong to obovate-lanceolate or linear-oblong, acute, hardly coriaceous, glabrous or nearly so; racemes 2–4 in. long, longer than the lvs., very densely many-fld.: lfs. small, white or pale bluish white; calyx deeply 4-parted, segments narrowly oblong, finely pubescent, ciliolate: caps. densely crowded, usually pendulous, small, ovate, compressed. New Zeal. G. 37:307.

43. *salicifolia*, Forst. f. A collective species containing many distinct varieties. The most common form is a moderately hardy much-branched shrub attaining at the most 5 ft. high; lvs. lanceolate, 2–6 in. long, acute, entire or slightly toothed near apex, rather thin, pale green, glabrous: racemes slender, many-fld., 3–10 in. long: lfs. small, numerous, frequently tinged lilac, sweet-scented: caps. almost twice as large as calyx. Midsummer. New Zeal. B.R. 32:2. Gn. 26, p. 107; 28, p. 293; 34, p. 349. G. 37:308. G.M. 52:283. Gt. 57, p. 189. Var. Kirkii, Cheesem. (*V. Kirkii*, J. B. Armstg.), 6–12 ft. high; branches stout, dark brown: lvs. smaller, 3/4–1 1/4 in. long, oblanceolate or oblong lanceolate, leathery: racemes 4–8 in. long: lfs. white, 1/2 in. across: caps. broadly ovate, acute, hoary-pubescent. New Zeal. *V. gigantea*, Cockayne, confined to the Chatham Isls., a tree 40 ft. high, is closely related to *V. salicifolia* but is less hardy. *V. rotundata*, T. Kirk, another allied species, has much broader lvs. and handsome violet-purple fls. There is a fine variegated form of *V. salicifolia* one brought into cult. in New Zeal. *V. salicifolia* readily hybridizes with its allies and various hybrids exist but there is no uniformity in their names. *V. cărnea*, J. B. Armstg., with rose-colored fls. has probably the above species as a parent.


51. *buxifolia*, Benth. Under this name are included many most distinct plants, but all possess green, glossy, acute, thick, petiolar lvs., truncate at the base and keeled beneath, which in one form are golden variegated when young, somewhat flaccid: spikes 1/2–2 in. long and I.-like bracts as long or longer than the calyx. Var. odora, T. Kirk (var. pătens, 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. Armstg., distinguished from *V. buxifolia* var. odora by its sometimes 3-lobed corolla and its narrower lvs. with purplish tips is nevertheless a most distinct and handsome plant. B.M. 7360.

52. *glaucohýlia*, Cockayne (C. Colénsoi var. glauca, Hort.). Closely related to *V. Traversii*, but at once distinguished by the small, narrow, not keeled, glaucous lvs., slender tapering racemes on many small spikes, 1–2 ft. high, corolla-tube hairy and pubescent ovary. Summer. Dry montane and subalpine stations, New Zeal.
53. **chathamica**, Buch. A rather tender polymorphic species, the forms of which are distinguished by the trailing habit, flexible branches, elliptic or elliptic-oblong, rather fleshy, pale green, often more or less pubescent lvs. and short, dense, obtuse racemes of violet fls. Late summer. Chatham Isls. G.C. III. 26: 354.

54. **epacridea**, Hook. f. Prostrate, almost hardy shrub of straggling habit: lvs. closely quadrifid or imbricated, opposite pairs united at bases spreading, recurved, ½ - ¾ in. long, broadly obovate-oblong, leathery, concave, glabrous, keeled, rounded or sub-acute at apex: fls. small, white, in dense terminal ovoid heads. Early summer. Mountains, New Zealand. V. Haastii, 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. **loganioides**, J. B. Armstrong. Dwarf shrub, 6-14 in. high: sts. woolly, decumbent at base, erect above; branches grayish white-pubescent or almost villous: lvs. decussate, sessile, ¾ - ½ in. long, ovate-lanceolate, acute, glaucous, or pubescent, if both, dull shining, reddish at the base: racemes forming a small corymb-like head: fls. white, pink or red, with pink veins; calyx deeply 4-parted, segments ovate-oblong, ciliolate; capsule elliptical-oblong, didymous, turgid. New Zealand. B.M. 7304. — A species of doubtful systematic position, as some placed in section Hebe, by others in what corresponds to the section Chamaedrys.

56. **pinguifolia**, Hook. f. (V. carnosa, Hort., not Hook. f.). Branches stout, more or less decumbent, ringed with lur-scs: lvs. imbricating to erect-patent, sessile, narrow-oblong to almost orbicular, ½ - ¾ in. long, glabrous, usually thick, glaucous, generally margined red: spikes crowded near tips of branches, short, stout, dense-fld.: fls. white, ovate pubescent. Summer. Mount. 7 to 700 ft., New Zealand. B.M. 6587. — 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. carnosa in gardens, but this species, distinguished by its glabrous ovary and acute caps., is probably the true one. V. moriroides is an extremely striking allied plant readily distinguished by its far-spreading branches and coriaceous, semi-amplexical lvs. nearly 1 in. long. B.M. 7370. V. decumbens, J. B. Armstrong, is of similar habit to V. pinguifolia but the lvs. are green, though similarly margined red.

57. **glabco-caerules**, J. C. Armstrong. Suberect, fairly hardy shrub, about 1 ft. high: lvs. elliptic, acute, ½ in. long, rather thick, densely glaucous both surfaces, not keeled, margined red: spikes few-flld., rachis strongly pubescent: fls. ½ in. diam., bluish lilac. Midsummer. Dry ground, New Zealand. V. pimeleoides, Hook. f., is somewhat similar to the above but is more slender, the lvs. narrower and paler, the spikes longer, the rachis much less hairy and the fls. pale lilac. Var. **minor**, Hook. f., is only 1-4 in. high, and its fls. are darker and bluer.


59. **Hectori**, Hook. f. Stout fairly hardy shrub 6-9 in. tall: sts. terete; leaves marked by red if densely imbricating, opposite pairs united at middle forming a ring surrounding the branch, broadly orbicular-oblong, ½ - ¾ in. long, obtuse, smooth, shining, puberulous on margin: fls. crowded at tips of branches, forming small, ovate, terminal heads, small, white. Mountains 3,000-6,000 ft., New Zealand, chiefly in the south. Other allied whirpocord Veronica are: V. tetragona, Hook., branches obtusely 4-angled, lvs. obtuse, keeled; V. lycopodioides, Hook. f., branches acutely 4-angled, lvs. narrowed into a blunt point; V. Armorstroni, Kirk, branches flabellate, terete, lvs. subacute, fls. pale lilac; V. salicornioides, Hook. f., branches terete, lvs. undulate margined, short, slender, harsh, fls. white; V. prophyra, Cheesem. (V. cupressoides var. variabilis, N. Br.), was for many years cult. in gardens under the name of V. salicornioides but it is semi-decumbent with slender branches about ¾ in. diam. and minute lvs.


V. amakina, Hort., not Sieb., is described as growing 1 ft. high, flowering early: fls. rose in next spikes. The true V. amakina is apparently not in cult.—V. angustifolia var. robia, Hort., is offered in the trade as shrubby with fls. bright rose in spikes; not determinate, botanically as the specific name angustifolia has been used for several different forms.—V. bacchoeani, Hort., is offered in the trade as growing 4 ft. high: fls. dark blue in long slender spikes; possibly the same as V. B., Hort., offered in the trade as growing 1 ft. high, of close habit with lavender-blue fls.; possibly the same as V. B. Hort.—V. cirrodes, Don, is offered in the trade as not in cult. and possibly V. M. Hort., is a material passing under this name in the trade may be described as follows: Low, trailing or decumbent, 6-12 in. long, the branches, orbicular-oblong, crenate toward the apex, small, dark green, numerous; racemes many, 6 in. high; fls. small, dark blue. May, June. Considered one of the best. V. angustifolia is often seen on or at the front of a herbaceous border.—V. colensoi, Hort., is offered in the trade as very dwarf and spreading, with pale blue fls. Var. cupressoides, Hort. ex Don, is a nomen nudum, but material growing less than 9 in. high, with denseglomerate heads of dark blue fls. is offered in the trade under this name.—V. edmundsii = V. Hectori XV. pinholioidea, Hort., is a trade name.—V. eucarpedia, Hort., is a trade name.—V. Farnesi, Diels, Perennial, 6-15 in. high: sts. deciduous, creeping, branched and stoloniferous at base; lvs. petiolate, narrowly ovate or oblong, ¾ - ½ in. long, glabrous, paler and often purplish beneath; racemes terminal or axillary; fls. reddish; sepals oblong or ovate-oblong, glaucous, purplish beneath; capsules oblong, or caps. obliquely rhomboid. Mountains of W. Yunnan, China.—V. Gilviflora, Hort., is a trade name.—V. Gumboldi, Hort., is a trade name.—V. Guthroldiana, Hort., is a trade name.—V. mordeniana, Hort., is a trade name.—V. myrtifolia, Hort. ex M. Hort., is a trade name.—V. petiolaris, Hort., is offered in the trade as a very beautiful and vigorous form with pale blue fls.—V. pulearis, Hort., is probably V. Teucrium var. prostrata. The name pulearis has been used for various forms; that of S. Regel applies to V. Regelii. V. Regelii is offered in the trade by S. Russia, the description of which is not available.—V. pulearis of the trade has axillary, many-fld. racemes. It is a low plant with woolly, prostrate, 1-4 in. long, and erect flowering branches 4 or 5 in. high with strict racemes of purplish fls. borne in June and a 4-parted calyx. The caps. is offered under the name T. dinaea, W. Yunnan, China. Rocky nurserymen ever since 1894 and was cult. at Harvard Botanic Garden as far back as 1883. Lvs. narrowly oblong, entire or crenate, ¾-1 in. long; calyx sub-acuminate, densely pubescent on the outside and longer than calyx: petioles: lvs. sparsely ciliate, short-petiolate. Gn. 78, p. 161. Var. alba, Hort., has white fls.
Hort, is offered as a pretty trailing species with masses of lilac-blue flowers. *V. umbellata* is a trailing weed, and is a trade name. *V. cirrhata*, Hort, is a trade name. — *V. Veitchii*, Hort, is a horticultural *V.* G.M. 54:801. — *V. verbenacea*, Hort, is unknown botanically, but has been offered by Rochester nurserymen since 1884 as a form with lvs. short-petioled, narrowly elliptic, serrate in the upper half; racemes lateral; fls. blue. — *V. verbenifolia* f. folia varia, Hort, is a trade name. — *V. Haldasti* Hort., is offered in the trade as having dense hillocks of dark green foliage and spikes of pale blue fls. F. TRACY HUBBARD.†

**VERSCHAFFELTIA** (Ambroise Verschaffelt, 1825—1886, distinguished Belgian horticulturist; founded L'Illustration Horticole at Ghent in 1854 and introduced many choice plants, particularly palms and other foliage plants). *Palmacea*, tribe *Areceae*. A tall palm, spinose throughout or at length spineless.

Trunks slender, ringed, arising from above-ground roots: lvs. terminal, recurved; blade oblong or cuneate-obovate, bifid, plicate-nerved, usually incanescing, with teeth, midrib and nerves strong, scaly; pediole half-cylindrical; sheath long, scaly, deeply split; spadix 3–6 ft. long, panicle-laterally, long-peduncled, recurved, scaly; racis elongate; branches and branchlets spreading, slender: spathes 2 or 3, long, sheathing, the lower persistent, the upper decidual: fls. very small; fr. globose, smooth, 1 in. long. A genus of only 1 species from the Seychelles. Cult. as in *Lattania*.


*V. melanochites*, H. Wendl.—Roschera. — WILHELM MILLER.

**VERVAIN**: *Verbena.*

**VESICÁRIA** (Latin, bladder, referring to the shape of the pods). *Crucifera*. Branched annual or perennial herbs, treated as annuals in the garden: lvs. entire, sinuate or pinnatifid; racemes without bracts: fls. large, rarely small, yellow or purple, variable in form; sepals similar at base or the lateral somewhat securate; silique globular or inflated, 1–2-celled, many-seeded, valves swollen.—About 20 species, widely distributed. The annual species are prop. by seeds, the perennial by division.

sinuata, Poir. Lvs. softly tomentose, oblong-lanceolate, narrowed toward the base, sinuate-dentate or subentire. Spain.—According to DeCandolle the petals finally become whitish. Both seeds and plants of *V. sinuata* are offered by American dealers, but the plant is not generally known. DeCandolle says it is an annual or biennial, while Koch says it is perennial or subshrubby. In the American trade it is considered an early-flowering yelow annual, about 1 ft. high, blooming in May and June. F. TRACY HUBBARD.†


**VETIVERIA** (Vetiver, the Tamil vernacular name). *Gramineae*. Aromatic perennials with long panicles of numerous flowers, the growth sometimes decumbent, in pairs, one sessile and perfect, the other pedicelled and at times, the sessile spikelet bearing minute spines.—Species 1, with 1 or 2 varieties. *V. zizanioides*, Nash (Andropogon squarrosum, of authors, not Linn. *A. marilicus*, Retz. *V. arundinacea*, Griseb.). Fig. 3917. E. Indies, escaped from cult. in the American tropics and in the S. U. S. The rhizome is very aromatic. This is the *Khas Khas* or *Khus Khus* grass of India, the vittiver used in perfumery and the *Radix Anatheri* or *R. Vetiveriæ* of the apothecaries. It has been used in medicines and perfumes from prehistoric times. In India the plant is used to make screens, called "Ves-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). *Caprifoliâceae*. Ornamental woody plants grown for their attractive flowers, fruits, and foliage.

Deciduous or sometimes evergreen shrubs, rarely small trees, with opposite stipulate or exstipulate lvs.: *V.* are small, in whorls, paniculate or mostly umbel-like cymes with 5 minute teeth; corolla rotate or campanulate, rarely tubular; stamens 5; ovary usually 1-loculed: 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. tomentosum*, *V. Opulus*, *V. americum*, *V. Sargentii*, and *V. alnifolium*, and of the 3 first-named garden forms are known with 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 Belden, 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 subglobose to oblong, red, dark blue, or black fruits. The viburnum 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 good for hedges or screens. Most of the deciduous species are hardy North, but *V. macrocephalum* var. *sterile* and *V. obovatum* are tender; also *V. tomentosum*, *V. Wrightii*, *V. theifernum*, *V. colchifolium*, *V. nudum*, and *V. dilatatum* are not quite hardly farther north than New England. Of the evergreen species, *V. rhytidophylllum* is the hardest and at the same time one of the most distinct and hand- somest 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 shrubbery or planting along roads, and the more showy ones are handsome as single specimens on the lawn. They are mostly medium-sized shrubs, 5–10 feet high, but *V. Lentago*, *V. prunifolium*, and *V. rufidulum* sometimes grow into small trees, 30 feet high, while *V. dilatatum* may reach 40 feet.

The most decorative in fruit are *V. Opulus*, *V. dilatatum*, and *V. Wrightiti*, with 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. denta-
VIBURNUM

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 leaves are olive-green with brownish purple or bronze 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 is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as V. plicatum, 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 or third year. V. macrocephalum and V. prunifolium, grow well in drier places, while V. alnifolium and V. plicatum require shade and a porous soil of constant moisture. V. acerifolium does well under the shade of trees in rocky and rather dry soil. V. Tinus is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not intended for forcing, it requires during the winter a temperature only a little above the freezing-point and even an occasional slight frost will not hurt it. The common and the Japanese snowball are also sometimes forced and require the same treatment in forcing as other hardy shrubs.

Propagation is by seeds sown in fall or stratified; also by greenwood cuttings under glass, especially V. tomentosum, V. macrocephalum, V. venosum, V. cassioides, and the evergreen species; V. dentatum and V. Opulus and its allies grow readily from hardwood cuttings and all species can be increased by layers; grafting is also sometimes practised, and V. Opulus, V. dentatum, and V. Lantana are used as stock.

INDEX.

A. Les. penniserratum, not labeled.
B. Cymes paniculate, broadly pyramidal or semi-globose.
C. Foliage deciduous.
D. Corolla with cylindrical tube.
E. Cymes umbel-like, flat except in the snowball forms. See Nos. 12, 16, 29.
F. Secondary veins curving and anastomosing before reaching the margin; margin entire or finely serrate.
G. Branches and its glabrous, hirsute, or scaly.
H. Foliage persistent, entire.
I. Branches and its glabrous or slightly pubescent.
J. Les. entire or slightly undulate-dentate.
K. Cymes sessile; les. small.
L. Cymes peduncled.

KEY TO THE SPECIES.

A. Les. penniserratum, not labeled.
B. Cymes paniculate, broadly pyramidal or semi-globose.
C. Foliage deciduous.
D. Corolla with cylindrical tube.
E. Cymes umbel-like, flat except in the snowball forms. See Nos. 12, 16, 29.
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L. Cymes peduncled.

3918. Viburnum Sieboldii. (X 3/4)

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 leaves are olive-green with brownish purple or bronze 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 is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as V. plicatum, 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 or third year. V. macrocephalum and V. prunifolium, grow well in drier places, while V. alnifolium and V. plicatum require shade and a porous soil of constant moisture. V. acerifolium does well under the shade of trees in rocky and rather dry soil. V. Tinus is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not intended for forcing, it requires during the winter a temperature only a little above the freezing-point and even an occasional slight frost will not hurt it. The common and the Japanese snowball are also sometimes forced and require the same treatment in forcing as other hardy shrubs.

Propagation is by seeds sown in fall or stratified; also by greenwood cuttings under glass, especially V. tomentosum, V. macrocephalum, V. venosum, V. cassioides, and the evergreen species; V. dentatum and V. Opulus and its allies grow readily from hardwood cuttings and all species can be increased by layers; grafting is also sometimes practised, and V. Opulus, V. dentatum, and V. Lantana are used as stock.

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A. Les. penniserratum, not labeled.
B. Cymes paniculate, broadly pyramidal or semi-globose.
C. Foliage deciduous.
D. Corolla with cylindrical tube.
E. Cymes umbel-like, flat except in the snowball forms. See Nos. 12, 16, 29.
F. Secondary veins curving and anastomosing before reaching the margin; margin entire or finely serrate.
G. Branches and its glabrous, hirsute, or scaly.
H. Foliage persistent, entire.
I. Branches and its glabrous or slightly pubescent.
J. Les. entire or slightly undulate-dentate.
K. Cymes sessile; les. small.
L. Cymes peduncled.

KEY TO THE SPECIES.

A. Les. penniserratum, not labeled.
B. Cymes paniculate, broadly pyramidal or semi-globose.
C. Foliage deciduous.
D. Corolla with cylindrical tube.
E. Cymes umbel-like, flat except in the snowball forms. See Nos. 12, 16, 29.
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H. Foliage persistent, entire.
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J. Les. entire or slightly undulate-dentate.
K. Cymes sessile; les. small.
L. Cymes peduncled.
null
CXVI. Viburnum tomentosum.


8. cassinoides, Linn. (V. nudum var. cassinoides, Torr. & Gray. V. squamatum, Willd.). Withe-Rod. Appalachian Tea. Fig. 3919. Upright shrub, 2–6, occasionally 12 ft. high: lvs. oval to ovate to oblong, 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. 1904:85, 86. Em. 2:411 (as V. nudum).—A good shrub for borders of shrubberies; hardy.


10. rufidulum, Raf. (V. prunifolium var. ferrugineum, Torr. & Gray. V. ferrugineum and V. rifolium, Small). Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter buds scarcely pointed, obtuse, rusty-pubescent: petioles often with narrow margin, rusty-tomentose: lvs. elliptic to ovate, usually obtuse, glabrous and shining above, rusty-pubescent on the veins beneath, 2–4 in. long: fls. pure white: cymes 3–6 in. broad: fr. oval, dark blue, glaucous, ½ 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 arbor- escent 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, dentilicate, almost glabrous and dark green above, short-pubescent beneath. Fls. 2–4 in. long: fls. yellowish white, in peduncled cymes, 3–5 in. across, with the mar-
VIBURNUM

3922. Viburnum tomentosum. (×½)

VIBURNUM

J.H. III. 64:126. R.B. 33, p. 356. M.D.G. 1902:271; 1907:380; 1912:493. M.D. 1912, p. 196.—One of the 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. Carlesii is V. bitchuiénse, 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. Carlesii.

15. Lantana, Linn. WAYFARING TREE. Upright shrub or sometimes small tree, attaining 20 ft.: young branches scurvy-pubescent: lvs. ovate or oblong-ovate, usually cordate at base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, dentilicate, 2–4 in. long: fls. white: cymes dense, 2–3 in. broad, with usually 7 rays: fr. ovoid-oblong, bright red, changing to almost black. May, June. Eu., W. Asia. A.G. 18:453 and F.E. 9:593 (as V. lantanoídes). H.W. 3, p. 131. Gn. 61, p. 324.—Hardy shrub, especially for drier situations and limestone soil. Var. rugéseum, Hort. With larger and very wrinkled lvs. and larger cymes. There are a number of other varieties, including some with variegated lvs.


17. alnifólium, Marsh. (V. lantanoídes, Michx.). HOBBLE-BUSH. AMERICAN WAYFARING TREE. Fig. 3921. Low shrub, sometimes 10 ft. high, with widespread, often procumbent branches, scurvy-pubescent when young: lvs. orbicular or broadly ovate, cordate at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous
VIBURNUM the young: China.

Inherent, or branchlets Evergreen Upright folium, p. 2/6-3/6 type.

frs. catum shoots, hardy 113; Maxim. Gt. 36:234. B.R. 3/6-3/6 beneath, spreading G.W. 3

N. dark 20. C. broader 19. 1-2

Var. var. (adapted in Fig. 3922). Gng. 2/6-2/6, 26:265.

H. S.H. 2:535

May, June: Japan. S.T.S. 114.


19. japonicum, Spreng. (V. macrophyllum, Blume). Evergreen upright shrub, to 6 ft., with glabrous branches: lvs. broadly or rhombic-obovate to oblong-obvate, acute or shortly acuminate, remotely dentate except at the base, 3-6 in. long: frs. in short-peduncled, glabrous cymes 2-4 in. broad: fr. globose, red. June. Japan.—Handsome large-lvd. shrub, but not hardy N. lvs. toothed, ovob. long, 1/4-3 in. long: cymes on slender, lateral branchlets often spreading at right angles. W. China.

20. fœtidum, Wall. (V. ceanothodes, C. W. Wright). Upright shrub with spreading branches, to 10 ft.: branchlets stellate-pubescent: lvs. obovate to rhombic-obovate-oblong, acute or acuminate, rarely short-acuminate, cuneate at the base, sparsely 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, 1/2-2 1/2 in. long: petiole 1/2-2 1/2 in. long: lvs. white, in cymes 2-4 in. across on lateral spreading branchlets: fr. scarlet, ovoid, 1/2 in. long. June. Himalayas, S. W. China. Var. rectangulum, Rehd. (V. rectangulum, Graebn.). Shrub, to 12 ft., with spreading, often pendulous branches: lvs. obovate-oblong to lanceolate, acuminate, remotely dentate or denticulate, usually nearly glabrous, 1/2-2 in. long: cymes on slender, lateral branchlets often spreading at right angles. W. China.

21. dilatatum, Thunb. Fig. 3924. Upright bushy shrub, attaining 10 ft., with the branches hisurate when young: lvs. roundish or broadly obovate or obovate, usu-


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: frs. rather large, white, in usually short-stalked, 2-4 in.-broad cymes; corolla glabrous outside; stamens longer than the corolla: fr. globose, red. May, June. Japan. S.T.S. 11:19.—Hardy shrub, similar to the preceding, but of less dense habit, with larger frs.


23. theferum, Rehd. Upright shrub, to 12 ft.: branchlets glabrous: lvs. obovate-oblong, acuminate, rounded at the base, remotely denticulate, dark green and glabrous above, glabrous beneath except silky hairs on the veins, 3-5 in. long; petiole about 1/2 in. long: frs. in cymes, 1-1 1/2 in. across: calyx purple; stamens shorter or as long as corolla: fr. red, ovob. 1/4 in. long. May, June: fr. in Oct. Cent. and W. China. S.T.S. 2:121.—Strong-growing shrub with handsome large foliage and ornamental bright red frs. in autumn. It has proved fairly hardy at the Arnold Arboretum, only the tips of young branches being sometimes killed back.

24. dentatum, Linn. Arrow-Wood. Upright bushy shrub, attaining 15 ft., with glabrous branches: lvs. rather long-petioled, orbicular to ovate, acute or shortly acuminate, coarsely dentate, glabrous or pubescent only in the axils of the veins beneath, 1 1/2-3 in.

3923. Viburnum tomentosum var. plemum.—Japanese snowball. (x10)
VIBURNUM

3924. Viburnum dilatatum. (X½)

25. venésum, Brit. (V. mólle, Auth., not Michx. V. Hanceánum, Dipp., not Maxim. V. nepálense, Hort.). Fig. 3925. Shrub, to 8 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 ¼-⅓ in. long, pubescent: cyme long-stalked, slightly pubescent, 2½-4 in. across: fr. glbose or globose-ovoid, ¼ in. long, bluish black. June, July; fr. in Sept. Mass. to Va. S.T.S. 1:43. G.F. 4:29 (adapted in Fig. 3925). M.D.G. 1891:367. Var. Canbyi, Rehd. (V. longifolium, Hort., not Alt.). Lvs. thinner, less pubescent beneath, larger and broader, the pair below the infl. often 2-3 in. broad: cymes larger. Del. to Pa. M.D.G. 1904:217 (habit). This is a very handsome variety on account of its larger bright green lvs. and larger cymes. Var. longifolium, Rehd. (V. dentátum var. longifolium, Dipp.). Lvs. narrower and longer, generally ovate-oblong, pubescent on both sides, more densely beneath: infl. glabrous or pubescent. Blooms several weeks before the type.


27. mólle, Michx. (V. Demetriós, 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, 2½-4½ in. long: cymes long-peduncled, puberulous, about 2½ in. broad: fr. oblong, almost ½ in. long, bluish black. May; fr. in Aug. Ky., Mo., Iowa. B.B. (ed. 2) 3:272.—Has proved hardy at the Arnold Arboretum.

28. pubésčens, Pursh. Fig. 3926. Bushy shrub, 3-6 ft. high, with slender, upright branches: lvs. ovate to rounded or cordate at base, acute or acuminate, coarsely dentate, almost glabrous above, pubescent beneath, 1½-2½ in. long: cymes short-peduncled, dense, 1½-2½ in. broad: stamens exceeding the corolla about one-half: fr. oval, almost black, slightly flattened. May, June. New Bruns. to Minn., south to Ga. G.F. 10:332. Em. 2:414.—Handsome native shrub, thriving best in moist soil.

3925. Viburnum venésum. (X½)

29. acerifólium, Linn. Dockmackie. Shrub, attaining 5 ft., with slender, upright branches: lvs. orbicular or ovate, 3-lobed, with acute or acuminate lobes, coarsely dentate-serrate, pubescent or at length almost glabrous, 2-5 in. long: fls. yellowish white: cymes long-peduncled, terminal, 1½-3 in. broad: fr. almost black, ovoid. May, June. New Bruns. to Minn., south to N. C. Em. 2:414.—It grows fairly well in drier situations under trees. The foliage assumes a handsome dark purple fall color. Var. glabréscens, Rehd. Lvs. glabrous or nearly so beneath even while young. N. C.

30. paucifórurn, Raf. Straggling shrub, attaining 5 ft.: lvs. orbicular to ovate, coarsely dentate, with 3 short lobes above the middle or often without, glabrous or slightly pubescent beneath when young, 2-3½ in. long: cymes few-fl., small, on lateral, short usually 2-lvd. branchlets: 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.

31. Opulus, Linn. EUROPEAN CRANBERRY-BUSH. Shrub, attaining 12 ft., with rather smooth light gray branches and st.: lvs. broadly ovate, 3-lobed, with coarsely dentate-serrate, acuminate lobes, pubescent beneath, 2-4 in. long; petioles with narrow groove and large disk-like glands: fls. white, in peduncled cymes, 3-4 in. broad: fr. subglobose to oval, scarlet. May,
VIBURNUM

Gng. 1:9. Gn. 56, p. 83; 76, p. 35. F.F. 15:319; 20:313. G.W. 6, p. 159.—This is a very showy variety, but it lacks the decorativefrs. Var. *xanthocarpum*, Spaeth. Fr. yellow. There are also variegated forms of the type and of the sterile variety.

32. americanum, Mill. (*V. Opulus var. americanum*, Ait. *V. trifolium*, Marsh. *V. opulus*, Muhl. *V. edule*, Pursh. *V. Oxygoccus*, Pursh.). CRANBERRY. HIGH CRANBERRY. Fig. 3928. Closely allied to the preceding species, but habit more open and spreading: lvs. with coarsely toothed or nearly entirelobes, pilose on the veins beneath or nearly glabrous, 2–5 in. long; petiole with shallow groove and small, usually stalked glands; cymes with shorter peduncles; stamens somewhat shorter. May, June: fr. in Aug., Sept. B.B. (ed. 2) 3:270 (as *V. Opulus*). New Bruns. 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 not eaten by birds.

33. *Sargenti*, Koch. Similar to the preceding, of more upright, denser habit: bark of st., dark, fissured and somewhat cory, young branchlets with prominentlenticels: lvs. of thicker texture, pubescent beneath, the upper lvs. with much elongated and usually entire middle lobe and small, short, spreading lateral lobes; petioles with large glands; sterile fls. larger, sometimes to 1½ in. across; anthers purple, rarely yellow: fr. globose, in usually upright cymes. N. China, Japan. S.I.F. 2:73. S.T.S. 1:42. M.D.G. 1904:329.—Intro. under the name *V. Opulus* from Pekin. It does not seem to fruit as profusely as *V. Opulus*, but is handsomer in bloom and of more compact habit. Var. *calvescens*, Rehd. Lvs. glabrous or nearly so beneath.


VIBURNUM


VICTA

(c古典 Latin name). VETCH. TARE. 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. Fabo) 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 seed; 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 dehiscent, the seeds either globular or flatish; stamens diadelphous (9 and 1): fls. mostly blue or violet, sometimes yellowish or white.—About 150 species, with the species the most important present for agricultural purposes, and V. Cretacic, V. Gerardi, and V. julgenis are sometimes used as ornamentals. For literature, see Farmers’ Bulls. Nos. 515 and 529, Burr. Pl. Ind. Cir. No. 15, and U. S. Dept. Agric. Cir. No. 45.

INDEX.


2. narbonensis, L. FRENCH OR NARBONNE VETCH. Annual, pubescent, dark green; st. stout, erect or ascending, 4-angled, 2-4 ft. tall; lower lvs. with a single pair of lfts. without tendrils, upper with 2-3 pairs of lfts. and branching tendrils; lfts. 3^-2 in. long, 3^-4^-3 in. broad, somewhat fleshy, oval to elliptic or cuneate at base, entire or rarely few-toothed above: infl. 1-2 (rarely 5) -fl.; fls. stalked, 3^-3^-3 in long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel unequal; pod broadly linear to rhombic-linear, 2^-2^-3 in. long, 3^-3 in broad, compressed; seeds brown, 8^-8^-3 in. diam. S. Eu., cult. for forage. R.F.G. 22:241. — Not very hardy and turns black under severe summer heat. Best adapted to the N. W. Pacific coast. It has no advantage over common vetch and the seed cost is much greater.

A. Pods 1^-1^-3 in. broad with spongy septa between the seeds; seeds oblong, funicular attach to the end: st. thick, 1^-2 in. diam., 2^-4 ft. tall. Lvs. pubescent; fr. not to exceed 1 J in. diam.

B. Infl. very short-stalked or sessile; fls. medium to large, often 1^-2 in the fl.-axis.

C. Stipules very large, mostly toothed; lvs. with 1^-3 pairs of lfts.; plants annual.

2. narbonensis, L. FRENCH OR NARBONNE VETCH. Annual, pubescent, dark green; st. stout, erect or ascending, 4-angled, 2-4 ft. tall; lower lvs. with a single pair of lfts. without tendrils, upper with 2-3 pairs of lfts. and branching tendrils; lfts. 3^-2 in. long, 3^-4^-3 in. broad, somewhat fleshy, oval to elliptic or cuneate at base, entire or rarely few-toothed above: infl. 1-2 (rarely 5) -fl.; fls. stalked, 3^-3^-3 in long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel unequal; pod broadly linear to rhombic-linear, 2^-2^-3 in. long, 3^-3 in broad, compressed; seeds brown, 8^-8^-3 in. diam. S. Eu., cult. for forage. R.F.G. 22:241. — Not very hardy and turns black under severe summer heat. Best adapted to the N. W. Pacific coast. It has no advantage over common vetch and the seed cost is much greater.

C. Stipules small; lvs. with numerous pairs of lfts. (V. oroboides has often only 2 hairs.)

D. Banner distinctly pubescent without: plants annual.

3. panonica, Crantz. Annual, shortly to shaggy pubescent: sts. 2 to several, prostrate to ascending or climbing, rarely unbranched, 4^-20 in. long; lvs. short-petioled to nearly sessile, the lower with 4, the upper with often 8 pairs of lfts. and mostly short tendrils; lfts. very short-petioled, linear to oblong; infl. very short-stalked, 2^-4 (rarely 1) -fl.; fls. 3^-3^-3 in. long, pedicel much shorter than the calyx; corolla about 3 times longer than the calyx, yellowish to purple; pod about 3^-3 in. long, 3^-3 in. broad, 2^-8 (mostly 3^-5) -seeded; seed 3^-3^-3 in. diam., velvety black. S. and S. E. Eu. R.F.G. 22:243.
VICIA

DD. Banner glabrous or with few scattered hairs.
E. Plants perennial; Ivs. without tendrils; Ifts. few.
F. Lfts., lower with 1-3, upper with 4-6 pairs of Ifts.: fls. single, purple-violet.

4. pyrenáica, Pourr. Perennial, glabrous or nearly so; sts. 4-12 ft. long, prostrate or ascending, angular; lower lvs. with only 1-2 pairs of Ifts., the upper with 4-6 pairs of Ifts. 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.

FF. Lfts. with only 1-3 pairs of Ifts.: plant resembling a Lathyrus.

5. oroboides, Wulf. (Orobus lathyroides, Sibth. & Smith). Perennial, glabrous or sparingly pubescent; sts. mostly erect and unbranched, 2-3 ft. tall; lvs. short-petioled, with 1-3 pairs of Ifts., ending in a sharp point, without tendrils; Ifts. ovate, elliptic to oblong; infl. sessile, mostly 3-7-fld.: fls. %in. long, short-pedicilled; calyx-teeth equaling or shorter than the tube; corolla yellowish white to golden; pod linear-oblong, 1-1¼ in. long; seed nearly spherical, brown, %in. diam. S. Eu. R. F. G. 22:265. B.M. 1908.

EE. Plants annual or biennial; fls. violet to bluish; lvs. with tendrils; Ifts. many, small.
F. Lfts. oblong, oval or obovate.

6. sativa, Linn. Common Vetch or Tare. Annual or biennial or not surviving the winter in the N., more or less pubescent, 2-3 ft. high: Ifts. 7 pairs or less, elliptic, oblong or oblongate, mostly truncate and apiculate at the top, the tendril part of the lf. 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 strains of V. sativa in Eu. Seeds sometimes used for making flour. Var. Albà, Beck (V. duba, Moench.). Fls. white or whitish; seeds mostly whitish to gray. Var. macrocarpa, Moris. Fls. 1½-1¼ in. long; seed compressed, %in. diam.

FF. Ifts., except of the lower lvs., linear or linear-oblong.

7. angustifolia, Linn. Annual, glabrous or pubescent; sts. slender, 1-2 ft. long; lvs. short-petioled or nearly sessile with 4-8 pairs of Ifts. and an unbranched or 2-3-branched tendril; Ifts. linear, lanceolate or oblanceolate, up to 1½ in. long and %in. wide; fls. purple, %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.

VICTORIA

BB. Infl. distinctly, mostly long-stalked, few- to many-flowered.
C. Fls. %in. long or longer: infl. mostly many-flowered.
D. Ifts. oblate to oblong, never linear to lanceolate, few.
E. Pairs of Ifts. 10-15.

8. gigantèa, Hook. Perennial, pubescent, high-climbing: Ifts. 10-15 pairs, narrow-oblong, obtuse and mucronate; fls. about %in. long, pale purple, in 7-18-flowered racemes. Calif. and N.—Has been offered by dealers in native plants.

EE. Pairs of Ifts. 4-9.
F. Color of fls. nearly white: infl. mostly 6-20-flowered.

9. caroliniana, Watt. Carolina Vetch. Perennial, nearly or quite glabrous; Ifts. oblong to linear-oblong, usually obtuse or emarginate; fls. nearly white, %in. or less long, in several to many-flowered, loose racemes. Minn. and Kans. eastward. B. B. 2:2616.—Has been offered.

FF. Color of fls. blue to purple: infl. mostly 6-14-flowered.
G. Shape of Ifts. elliptic-oblong, truncate or retuse at the apex.

10. amerciana, Muhl. American Vetch. Fig. 3929. Perennial, trailing or climbing, 3 ft. long, nearly or quite glabrous: Ifts. 8-14, elliptic to oblong, obtuse or sometimes emarginate at the apex; fls. purplish, about %in. long, in few-flowered loose racemes; pods 1-1¼ in. long; seed brown, %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.

GG. Shape of fls. oblate, oblong at the apex.

11. dumetorum, Linn. Annual, glabrous: st. 1½-8 ft. long, trailing or climbing; Ifts. 8-10, oblate to oblong: infl. 2- or mostly 6-14-flowered: fls. %in. long; calyx with very unequal large triangular teeth; corolla purple becoming dirty reddish yellow to greenish; pod oblong to oblong-linear, 1¼-2 in. long and about %in. broad; seed spherical, about %in. diam., dark brown. Eu. R. F. G. 22:253.—Cult. for forage in Germany.

DD. Ifts. linear to lanceolate, numerous.
E. Limb of the banner as long as or longer than its claw.
F. Color of fls. red or nearly scarlet and purple-striped.

12. fulgens, Batt. Scarlet Vetch. Annual, 3-5 ft., pubescent: Ifts. 8-12 pairs, oblong or lance-linear,
VICTORIA


This remarkable aquatic genus may be recognized by its huge round floating lvs. often 6 ft., or more in diameter, with the margin turned up at right angles to the water surface to a height of 3–4 in. above. The leaf is bluish, nearly circular to nearly roundish, with a depressed, somewhat puckered margin, and mounted by a long broad tube, on the sides and summit of which the floral lvs. are situated; sepal 4; petals 50–70, obtuse, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150–200, linear-lanceolate; paracarpels 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, 2–21/2 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 opening of opening carpellary styles broad and fleshy in the lower part, produced upward to a fleshy subulate incurved process about 3/4 in. long: in fr. all of the floral lvs. have decayed away, leaving the basal tube 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. Amer., from British Guiana to Argentina.

In its native haunts victoria grows in 4 to 6 ft. of water, in great patches miles 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 fused pair of stipules, these organs serving to protect the apex of the seedling. The petioles are 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 to 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 leaf, as seen with a hand-lens that the leaf is perforated with a fine hole; these holes were called by Planchon "stomatodes" (F.S. 6:249). 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 upper 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 remain on the surface; it doubtless runs down at once through the tiny perforations. This would be an indispensable protection against fungi and algae, and for the function of assimilation.

The huge 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

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.

FF. Color of fls. purplish or violet.


EE. Limb of banner not over half as long as its claw.

16. V. villosa, Roth. Hardy. HAND OF RUSSIAN VETCH. Fig. 3930. Annual or biennial (sometimes perennial?), enduring the winters in the N., villous-pubescent: lfts. 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-fl. racemes. Eu., Asia. R.F.G. 22:234.—Now considerably used as a cover-crop to enrich the soil, but the pods shed more easily and the seeds are smaller. In Italy it can be cut early enough to produce a crop of millet the same season.

GG. Plant with short appressed pubescence: fls. only up to 3/8 in. long.


FF. Pod pubescent: plant with thick shaggy pubescence: fls. whitish below, purplish above.


CC. Fls. 3/8 in. long or less: infl. 2–4–few-fl.: plants annual.

17. Ervilia, Willd. (Ervum Ertilia, Linn.). Bitter Vetch. Annual, pubescent: st. erect, angular: lvs. with 8–12 pairs of lfts. without tendrils: lfts. oblong-linear to linear: infl. 2–4-fl.; 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 livestock but it has been found to be an excellent winter green-manure crop in Calif.

P. L. Ricker
The leaves of this plant reach and maintain a temperature of 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 1823 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 Froriep'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 Mosoes, 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, and Caleb Cope, of Philadelphia, was the earliest successful cultivator in this country. His gardener was the late Thomas Meehan. The first flower opened August 21, 1851. In 1852 John F. Allen, of Salem, Massachusetts, had a plant from seed of Mr. Cope's growing. This plant lived through four summers and matured over 200 flowers.

The next notable importation of seed was sent by Edward S. Rand, Jr., from Para, Brazil, to Mr. Sturtevant, then at Bordentown, N. J. The resulting plants flowered in 1886 and, proving to be slightly different from the former type, were called V. regia var. Randii. It is doubtless the same form that was described by Plancho as V. amazonica, and retained with grave doubts by Caspary. In 1894 Mr. Tricker received from Europe seed of quite another species, which was provisionally named V. regia var. Trickeri. It is much more amenable to out-of-door culture than the older type, and has received a well-deserved popularity. Specimens grown at Kew from seeds sent by Tricker were regarded simply as garden forms of V. regia. Later investigation by Tricker and the writer brought out the fact that the stock came originally from Corrientes, Argentina, and that the plant is truly
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 starchy seeds of this species are used as food in Paraguay under the name of Mais del Agua, “water-corn.” The form of victoria originally introduced from British Guiana has leaves entirely flat until the plant attained considerable size; then a low rim appeared. The leaf was deeply purple-colored beneath. V. Cruziana forma magogrossensis 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 interface.

For much interesting information on Victoria, see Hooker, “Botanical Magazine” 4725-4728; Planchon, “Flore des Serres” 6:193-224; Caspary in “Flora Brasiliensis” 4, part 2, page 143 ff. In 1854 John Fisk Allen published in Boston a quarto 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.”

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 3/5 in. (10-11 mm.) long; seed ellipsoid-globose, nearly white, less than 6 mm. long (7-8 mm. long, 5-6 mm. diam.); raphe indistinct; operculum elliptic-orbicular, with the micropyle at its center and hilum at the margin. British Guiana. B.M. 4275 (poor); 4276-78 (incorrect in some details). F.S. 6:395-404. Kernher, Natural History of Plants, pl. xi. Tricker, Water Garden, pl. 1; pp. 21, 35. Caspary, Fl. Brasil. 4, pt. 2, pl. 38, fig. 15 (seed). Var. Randii, Hort., has rim of fl. 5-6 in. high, and under side of fl. deeper red: fl. turning to deep crimson on second day. This is the form commonly cult. in American gardens now as V. regia. Amazon and its tributaries. A.G. 18:469. Intro. by Sturtevant in 1886.


Henry S. Conard.

Cultivation of victorias.

At first V. regia was cultivated at a great expense in conservatories and tanks built especially for the purpose. Then it was grown in artificially heated ponds in the Terrarium and the Victoria Gardens, and public gardens throughout the United States at the present time, together with tropical nymphaes, and in some cases without artificial heat, but this method of culture is uncertain and often unsatisfactory. V. Cruziana is by far the best kind for out-of-door culture. Moreover, it can be grown where V. regia fails to grow, as it revels in a temperature of only 75° to 80°. Its introduction has been of great interest. It has stimulated the culture of aquatic plants in the United States, also in Europe where it is now largely grown.

The Victoria regia is the true water-lily. Its requirements are heat, light, and a rich mellow loam in abundance. The seed should be sown in February and March. The temperature of the water should range between 85° to 90° F. The seed may be planted in pots or seed-pans and placed in shallow water. A tank 5 to 12 inches deep, lining a metal lining, copper preferred, is very serviceable for seedlings and young plants. Where sufficient heat is not attained from the heating pipes, an addition can be made by the use of an oil-lamp. It is altogether unnecessary and unnatural to file or chip the seed to assist or hasten germination. The seedlings will appear in about twenty days, though occasionally a few may appear in ten days. These should be potted off singly into 2½-inch pots, using fine loamy soil. The water temperature for the young plants should be the same as directed for the seed-pots. As soon as the young plants acquire their first floating leaf they will doubtless be benefited by repotting. From the first they are kept steadily growing, repotting at intervals, until they are planted out in their summer quarters. As the young plants advance they will require more space, so that the leaves are not crowded and overlap each other. To raise plants of V. Cruziana (V. Trickeri) is altogether a different matter. The seed will not germinate in a high temperature; 85° to 70° is sufficient. The seed may be sown 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, at least 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 nymphaes, 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, earliness or lateness of the season, locality, 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 victorias, 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 early in May and heat applied until the middle of June, or rather a temperature of 85° maintained until the advent of summer weather.

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 Allegheny Park; also at rock-side, 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 involved in this method of culture. The glass is heated by 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 nym-
peas, or rootstock as do the hardy nympeas.

Few, if any, insects are troublesome on these plants. The worst is the black-fly or aphis. The use of insec-
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. W. M. TRICKER.

**VIGNÁ** (Dominic Vigni, Paduan commentator on
Theophrastus in the seventeenth century). *Legum-
index.* Herbs grown mostly for the seeds and fodder;
cowpea group.

The usual cultivated species of Vigna are annual bean-
like rambling vines with 3 rhomboid-ovate stalked
fls., the lateral ones unequally-sided, the petioles long:

![3932. Vigna strobilophora. (X½)](image)

fls. bean-like, white, pale to violet-purple and pale
yellow, borne 2 or 3 together on the summit of a long
axillary peduncle: pods slender, straight, or slightly
curved, a few inches to 3½ ft. long; seeds small, nearly
round to kidney-shaped, bean-like, white or dark, self-
colored or variously mottled, usually with a different
color about the eye.—Species 60 or more, tropical.
The species show great variation in stature and growth-
habit, and particularly in the color of the seeds. The
genus may be distinguished from Phaseolus by the
fact that the keel is bent inward at right angles but is
not coiled. Vigna resembles Dolichos in having a simi-
lar keel but differs from it in the form and position of
the stigma. In the former species this is lateral, occupyp-
ing a position just beneath the apex of the style and
above the line of pubescence which extends up the
inner face of this organ. Just opposite the stigma the
apex of the style is bent backward and prolonged into
a beak. The stigma in Dolichos, on the other hand, is
terminal or merely oblique. The prolonged beak of the
style is also absent. Vigna may be further distinguished

from Dolichos in the shorter petioles of the first pair of
aerial Ivs. In Vigna these are about ¼in. long or shorter, whereas in Dolichos they are 1 in. long or
longer, varieties.

Three species of Vigna are in common cultivation:
the cowpea, *V. sinensis;* the catjang, *V. Catjang;*
and the asparagus bean, *V. sesquipedalis.* The asparagus bean (*V. sesquipedalis*) can be used as a forage plant
for stock, or the green pods may be cooked as a snap
bean since they are more tender and brittle than those
of the cowpea or catjang. This species is found from
South America, but its cultivation is limited, however,
due to a lack of productivity, except as a curiosity or novelty. The nomenclature of the cul-
v articulated varieties of the cowpea and catjang is almost
hopelessly confused. Piper enumerates 220 agricul-
tural varieties of the former and 50 of the latter.
Formerly the name cowpea was restricted to the buff-
colored or clay-pea, but it is now commonly used
generically; it is an Americanism. Common generic
terms now in use in the South are "black-eyed pea"
and "corn-field pea." While the cowpea and the cat-
jang are now employed mostly for animal food and
green-manuring, the pea itself is a good human food
and has been so used for many years. For table use
the peas are best gathered when the pods first begin
to change color; however, they are most extensively used
from the dry ripe pods. As long ago as 1855 an ex-
cellent essay on cowpeas was written by Edmund Ruffin
( '"Essays and Notes on Agriculture,"' Richmond,
1836). Piper (Bulletin No. 229, Bureau of Plant Indus-
try, United States Department of Agriculture) describes
these three species as follows:

**sesquipedalis,** W. F. Wight (*Dolichos sesquipedalis,*
Linn.). Seeds elongated kidney-form, 8–12 mm.
(¾–1½in.) long, their thickness much less than their
breadth; pods pendent, 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 seeds when separated seeds when dry. S. Asia.

**Cätjang,** Walp. Seeds small, usually oblong or
cylindric and but slightly kidney-shaped, 5–6 mm.
(¾–¼in.) 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.

**sinensis,** Endl. Seeds mostly 6–9 mm. (¼–½in.)
long, varying from subreniform to subglobose; pods
8–12 in. long, early becoming pendent, not at all flabby
or inflated when green. Probably Cent. Afr.

Some species of Vigna are useful for ornament. *V.
strobilóphora,* 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: st. slender and flexuous, pubescent;
fls. 3, ovate, acuminate, entire, rounded at base, 2½
in. long: fls. in dense axillary peduncled racemes, blue-
purple, standard orbicular, slightly retuse, with 2 small
appendages at base; bracts large, closely imbric-
ated. *V. ocellata,* seeds with *Phila. ocellata*;
(Linn.), widely spread in the tropics and warm parts of
Old World, is intro. in S. Calif.: woody perennial
with pink fls., the rootstock tuberos, hairy: fls.
usually ovate-lanceolate to narrow-lanceolate, entire,
2–4 in. long: fls. 2–4 in a cluster on summit of pedunc-
le; standard nearly 1 in. across, reflexed: pod 3–4 in.
long, nearly cylindrical.

**VIGUIÉRA** (Dr. A. Viguier, botanist of Montpellier,
France). *Compótax.* 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
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.

tomentosa, Gray. Shrub or branching subshrubs: lvs. opposite, subcordate, serrate, tomentose on both sides, 3-5 in. long: heads corymbose: achenes villous, with 2 long awns and many small scales.


VILLARÉSIA (named for Matthias Villarez, a Spanish botanist). Icacinaceae. Evergreen tall climbing trees or shrubs, adapted to the warmhouse: lvs. alternate, oblong, entire or spinose-dentate, thick and 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 15-15 species, distributed in the islands of the Pacific, Trop. Austral., Indian Archipelago, and Brazil and Chile.


muconata, Ruiz & Pav. (Iléx pongénha, 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 shorty pubescent thyrsses, terminal or in the upper axes, yellowish white; sepals wide elliptic or nearly orbicular; petals elliptic-oblong; ovary by abortion 1-celled: drupe ovoid. Chile. B.M. 8376.

—Prop. by cuttings. Rare in cult. P. TRACY HUBBARD.

VILLÁRISIA (named for Dominigo Villars, 1745-1814). Gentianaceae. Marsh-loving herbs, suitable for greenhouse cult.: sts. simple and leafless or somewhat branched and few-lvd.: lvs. radical, long-petioled, entire or irregularly sinuate-dentate: cymes usually many-fl., sometimes lady paniculate, sometimes corymbosely congested or capitate and involucrate: fls. yellow or white; calyx 5-parted or deeply 5-cleft, segms. lanceolate; corolla broadly campanulate or rather rotate; stamens 5: caps. 1-celled, subglobose, twisted, overlapping to the left; stamens included, above the middle of the tube; disk none; ovary 2 distinct carpels, glabrous: follicles 2, erect or divergent, narrowly cylindrical.—About 12 species, Medit. region, Trop. Amer., India, and Madagascar.

One of the commonest and best plants for covering the ground in deep shade, especially under trees and in cemeteries, is *V. minor*. It is a hardy trailing plant with shining-green foliage and blue salver-shaped five-lobed flowers about an inch across, appearing in spring or early summer. It forms a dense carpet to the exclusion of other herbs. It thrives best in moist shaded positions, but will grow in the deepest shade even in poor soil, especially if it is stony. It is a capital plant for clothing steep banks, covering rocks, and carpeting groves. It can be planted successfully on a large scale any time from spring to fall during mild or
rainy weather. It is propagated by division or by cuttings, as seeds very rarely mature. The periwinkle will be found in nearly all gardens, and in many parts of the country is seen growing in profusion in cracks and crevices in the stone. It is propagated from cuttings during the summer, by divisions of the roots, and is propagated by seed in the spring. The roots, when cuttings are used, should be planted in the early spring, and the plants should be transplanted to the flower-beds as soon as they are large enough to thrive. The periwinkle is a low, spreading, evergreen shrub, with small, oval leaves, and small, white flowers, which are borne in clusters at the tips of the branches. It is a hardy plant, and will grow in almost any soil, but it prefers a loamy soil, and should be planted in full sun. The periwinkle is a common plant in gardens and flower-beds, and is often used for hedges.
VINCETOXICUM in warm or tropical parts: they are twining or trailing woody or perennial herbaceous vines, with opposite cordate simple lvs. and small greenish or purplish fls.: corolla campanulate or rotate, deeply 5-lobed and the petals sometimes reflexed. They are small, mostly ring-like or cup-like and thereby differing from the anned crown-lobs of Gonolobus (Definition of Gonolobus, p. 1356, to be amended): follicles thick, pointed, muricate 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 acuminatifolium.

VINES: Planting, Vol. V. (Index p. 2557.)

VIOLA (classical name). Violacea. Violet. Paney. 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 Violet.

Either stemless, bearing lvs. and 1-fl. scape; or the crown of the rootstock, or stemmed with manifest internodes between the lvs., from the axis of which arise 1-fl. 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 5 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 height of often of 0 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 leaf-mold until the seeds are ripe, when the peduncle lengthens and lifts the caps. into the air, where it scatters its seeds as did the earlier caps. (Fig. 3936.) See Rhodora, vol. vi, p. 50, for cleistogamous fls. and frs. of 6 other species.—Probably 300 species widely distributed in the N. and S. Temp. zones of both the Old World and the New, of which about 80 species are native to N. Amer. north of Mex.

The classification of the wild violas into species was for many years a perplexing task, because students of the genus failed to recognize the fact that all closely allied species. The many hybrids in nature. But in 1900 the important discoveries of Mendel became known to biologists, and gave rise to the new science of genetics. With a better understanding of the laws of inheritance that determine the characters of offspring from unlike parents, it is practicable in a genus like Viola to discover what forms are proper species and what are hybrids or the offspring of hybrids. Some of the tests employed by the specialist in Viola may be briefly indicated as follows: (1) The hybrid is notably intermediate in its characters between two well-known species found in the same vicinity. (2) The hybrid usually shows great impairment of fertility, 50 to 100 per cent of the ovules being aborted, but a marked increase in vegetative vigor. (3) The pollen-grains of most hybrids are seen under the microscope to be largely shriveled and functionally impotent. (4) The hybrid is found to be 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 violas of eastern North America—that is, more hybrids than there are pure species. In Wilhelm Becker's systematic treatise on the violas 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 violas 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 wood 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, covered with burlap, to the freezing cold of winter. 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 violas 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. pedatifidacea* (Fig. 3936). A partial albino 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. Priceana*, 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 Southeastern 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. compestris*.

INDEX

**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. (*Erpétion reniforme*, Sweet. *E. hederaceum*, *E. petiolare*, and *E. spatulatum*, 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 scape: fls. small, usually blue, sometimes white, the spur almost none. Austral. G. 32:35.—Offered in S. Calif.

**cc. 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., Afr., 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 florist's violets. Fig. 3937, from G.C. III. 21:248, represents var. *sulfurea*, "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. *cyanea*, Celak. Stemless, stoloniferous: lvs. broadly cordate-ovate, crenate, bright green, glabrate and shining after flowering; stipules lanceolate, long-acuminate, fimbriate; pedicels 2–4 lines long, about equaling or slightly shorter than the petioles after flowering; sepals oblong, obtuse, with short appendages which are rotundate and pressed to the pedicle; corolla medium-sized; petals sky-blue-white below the middle, lower petal emarginate, the others about as long, scarcely emarginate; spur conical, rather straight; ovary short-conoid, very smooth. Eu.


4. *flava*, 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: lvs. fragrant, usually white, but sometimes in various shades of violet and rose. Cent. and S. Eu.

**nn. Plants with evident st., 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, several times longer than the petiole: sepals lanceolate, acuminate; petals oblanceolate, narrow, not overlapping. Widely distributed in Eu. G.W. 13:73.

6. *eätior*, Fries. Sts. tall and straight: lvs. lanceolate from a rounded or cordate base, when young with appressed pubescence; the middle stipes as long or
longer than the petiole, the upper much surpassing it; corolla large, pale blue. Cent. Eu. and southeastward.

cc. Style much enlarged upward into a globose hollow summit.


8. gracilis, Sibth. & Smith (V. olgympica, Boiss.). 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 rotund and abruptly contracted below, somewhat obtuse at apex, the margin crenate; stipules pinnately parted; fls. medium size, the petals violet or yellow; sepals oblong-lanceolate, acute, shorter than petals; 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. Ítea, Huds. Plant persisting by filiform prostrate branching sts.: stipules digerlate much divided, middle division linear and enlarged: sepals oblong-lanceolate, obtuse or short-pointed; spur hardly longer than the appendages of the calyx; petals yellow, rarely the two upper or all of them violet. Cent. Eu. and Great Britain.

11. cornuta, Linn. HORNED VIOLET. BEDDING PANSY. Fig. 3938. Plant tufted, glabrous or nearly so, producing evident sts. with long peduncles in the fl.-axis: lvs. subcordate-ovate and usually acuminate, crenate serrate; stipules triangular, large, coarsely dentate: fls. normally violet, the petals obovate-obtuse, standing well apart, the spur slender, acute, shorter than the petals. Spain 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. álba, Hort. Gn. 78, p. 449. Var. purpúrea, Hort. G.M. 52: 886. Var. Papílio, Hort. (Fig. 3939) has very large fls., violet in color, with small dark eye. Var. admirábilis, Hort., a garden group of various colors, is probably a hybrid offshoot of this species. Manne Queen 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 high-bred self varieties), the spur usually twice as long as the appendages of the calyx. Eu. G.Z. 27:1. R.B. 38:157.—When strayed from cult., the fls. become small and lose the markings characteristic of the high-bred pansies. A small-fl. field form, becoming common, is the European V. arvensis, Murray. A similar but more delicate species, distinguished by petals longer than the calyx, V. Rafnésquisi, Greene. (V. tricolor var. arvensis, American Auth., not DC.), is indigenous to the U. S. from N. J., southward and westward to Texas and Colo. For cult., see Pansy

AA. Species native in the U. S. and Canada, not do-

mesticated but sometimes planted from the wild.

B. Plants stemless.

C. Petals normally violet or purplish.

D. Lvs. more or less dissected.

13. pedáta, Linn. BIRD-FOOT VIOLET. Fig. 3939. Plant short and erect: plant glabrous: lvs. pedately 3–5 parted or -cleft, the segms. usually 2–4-cleft or -toothed near the apex: petals all beardless. Sandy soil, Mass. and Minn. to Fla.; a handsome wild species. G.Z. 11:144.

14. palmáta, 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, middle segm. largest, all of them variously toothed or cleft: fls. violet-purple, about ¾–1 in. across; lateral petals bearded; sepals rather blunt, ovate-lanceolate; produces cleistogamous fls. on prostrate peduncles. Woodlands, Mass. to Minn. and to Fls.; a garden species.

15. pedátifida, Don. Rootstock short and erect: lvs. palmately multifid, primarily 3-parted or -divided, each segm. again 3-cleft or -parted into linear subdivisions, these often further cut into 2–4 lobes: fls. showy, violet, on scapes surpassing the lvs.; produces cleistogamous fls. with yellowish caps. on erect peduncles. Prairies, Ohio northwestward and south-westward.

DD. Lvs. lanceolate or oblong-lanceolate.

16. sagittáta, Ait. A small species, with erect short rootstock, usually glabrous: mature normal lvs. lanceo-

late 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; sepals narrow-lanceolate, acute. Banks and fields, Mass. to Minn. and southward.

**DD.** *Lvs. cordate-ovate to cordate-reniform.*

17. *papilionacea*, Pursh (*V. cucullata* of older Manuals). Figs. 3935–6, 3942. Commonest and most variable N. American Viola. A robust plant, with a strong branching horizontal rootstalk, 2–6 in. high; lvs. deltoid-ovate to cordate-ovate, not lobed, bluntish, serrate, 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. Princeana*, Pollard, is probably a form of this, with white blue-centered fls. Ky. See remarks on p. 3473.

—Besides albino there are striped and pied forms now in the trade known as *ststriata*, *picta*, and *variegata*, Hort. All forms are easily colonized in the garden. G.M. 57:313. G. 3:223 (both as *V. cucullata*). p.t. 1:194.

18. *sororia*, Willd. Much like No. 17, but petioles and lower surface of lvs. villous-pubescent; a sturdy grower, in pubescent, 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 Colo.; 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 obovate.

20. *septentrionalis*, Greene. Scapes and lvs. more or less hirsutolus: 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 whitish); 3 lowest petals villous at base; sepals ovate and usually obtuse; cleistogamous fls. on ascending peduncles. Newf. and westward along the Canadian border, to Brit. Col. and southward to Conn.—Albino forms, varying all the way to pure white, occur in New England.

21. *nephrophylla*, Greene (*V. cognata*, Greene). Nearly or quite glabrous: lvs. orbicular to somewhat reniform, crenate-serrate, obtuse, the lower ones broadly cordate: fls. large, deep violet, on long peduncles; spurred petal villous, the lateral ones densely bearded; sepals ovate to lanceolate, obtuse; cleistogamous fls. erect. Cold mossy bogs and borders of streams and lakes. Newf. to Brit. Col., south to N.W. Col. and N. Wis., and in high mountains to New Mex. and Cent. Calif.

22. *Sélkirkii*, Pursh. A very distinct small species with pale violet beardless petals, the spur long and much enlarged toward the rounded end; glabrous except for minute spreading hairs on the upper surface of the fl.-blades: lvs. thin, ovate to nearly orbicular, deeply cordate with a narrow sinus, crenate: sepals lanceolate or ovate-lanceolate, usually acute; cleistogamous fls.

3943. *Viola blanda*. (X1)

**D**. *Lvs. ovate, with either narrowed or rounded base.*

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.** *Lvs. cordate.*

25. *pallens*, Brainerd. Small neat species, for the most part glabrous, stoloniferous: lvs. broadly ovate or cordate-orbicular, sometimes only 3⁄4 in. wide, but usually 1 1/2 in., crenate-serrate, obtuse: fls. faintly fragrant, white; lateral petals usually with small tuft of hairs, the upper ones broadly obovate. Springy land and along cold brooks, Que. and southward, especially in the mountains to S. C. and Tenn.—The plant formerly known by many as *V. blanda*, and still often confused.

26. *blanda*, Willd. 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.
27. **renifolia**, Gray. Pubescent to nearly glabrous; rootstock in mature plants mostly stout and scaly; mature lvs. of summer reniform, distantly crenate-serrate, rounded at the summit: fls. white; petals bearded, the 3 lower ones veined or tinged brownish; sepals narrow-lanceolate; cleistogamous fls. purple, on horizontal peduncles: stolons absent. **Arbor-vitæ swamps and cold woods, Newf. to the Mackenzie River, and southward in the Alleghany and Rocky Mts.**

**c. Petals yellow.**

28. **rotundifolia**, Michx. Plant with long and stout scaly rootstocks, and making short stolons: lvs. in midsummer oval, 2–5 in. wide, thick and prostrate, crenate, fls. bright yellow, with brown lines on the 3 lower petals; lateral petals bearded; cleistogamous fls. on distantly pubescent peduncles. Cold woods in the mountains from Maine to N. Ga.

**BB. Plants with evident sts.**

**c. Species eastern, or found east of the 100th meridian.**

**d. Petals yellow.**

29. **Nuttallii**, Pursh. Pubescent or nearly glabrous, with a deep stout rootstock: early lvs. and fls. from near the crown, the later fls. crenate-dentate and on long peduncles; lvs. oblong-lanceolate, tapering into margined petioles, obtuse at apex, crenate-dentate or entire: fls. yellow, the petals beardless or with slight beards; sepals lanceolate or linear. From the Rocky Mts. eastward to Dak. and Mo.

30. **ericócarpa**, Schr. (V. scabriuscula, Schr.). 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 narrowly lanceolate. Low woods, Nova Scotia to Man. and far southward.

31. **pubèscens**, 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 N. D. and to Va. and Mo.

**DD. Petals white inside with bright yellow base.**


33. **canadensis**, Linn. 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 axils of the st.-lvs., white inside with yellow center, the outside more or less tinged with violet, the 3 lower petals with darker lines, 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; petals thick and blunt. Shady places, N. Y. to Minn., Ga. and Mo.

**DD. Petals usually violet-blue.**

35. **consépresa**, Reichb. (V. canina var. Mühlenbergii, Gray). Plant glabrous, 3–6 in. high, with oblique often much-branched rootstock: lower lvs. cordate-orbicular, 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. **rostràta**, 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 acute, all serrate: fls. lilac with darker spots; petals beardless; spur long (½–2¼ 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.
38. pedunculata, Torr. & Gray. Sts. ascending, often 2 ft. long, bearing normally in each lf.-axil as the st. develops a large (1 in. across) orange-yellow 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 sae-like. Moist or shady places; widely distributed in the mountains of the N. W. and along the Pacific coast.

DD. Lvs. more or less 3-9-lobed or -parted.

40. lobata, Benth. St. long and mostly naked at the base, the plant either glabrous or finely pubescent: rootstock erect: lvs. reniform to broad-cuneate, palmately cleft into 5-9 narrow lobes and the central lobe toothed: fls. yellow, the upper petals brownish purple on the outside. Calif. and W. Ore.

DDD. Lvs. compoundly dissected into numerous small lobes: sts. leafy from the base.

E. Lateral petals beardless.

41. Shletonii, Torr. Fig. 3945 (adapted from Pacific R. R. Report). Sts. quite or quite glabrous: lvs. orbicular-reniform to cordate, 3-divided, the divisions 3-parted, lobed and cleft into narrow segms., not exceeding the peduncles: upper petals brownish, the 3 lower pale yellow. N. W. Colo. and N. E. Calif.

EE. Lateral petals bearded, the 2 upper deep violet.

42. Béckwithii, Torr. & Gray. Fig. 3946 (adapted from Pacific R. R. Report). Plant pubescent or puberulent: lvs. palmately about 3 times 3-parted into very narrow lobes, about equaling the peduncles: 3 lower petals pale violet, the fls. thus closely resembling those of V. pedata. Utah to N. E. Calif. and Ore.

43. Hálílii, Gray. Plant glabrous; rootstock deep: lvs. 3-divided, the divisions 3-5-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. trinceráta, Howell. Plant glabrous: ultimate segms. of the l. lanceolate or ovate-lanceolate, tapering to an acute callosus apex, thick and firm, prominently 3-ribbed: upper petals dark blue, the lower ones pale blue to whitish with a yellow base. Cent. and S. Wash.

Viola Beckwithii. (X ½)

3946. Viola Beckwithii. (X ½)

39. glabélia, 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 sae-like. Moist or shady places; widely distributed in the mountains of the N. W. and along the Pacific coast.

DD. Lvs. more or less 3-9-lobed or -parted.

40. lobátas, Benth. St. long and mostly naked at the base, the plant either glabrous or finely pubescent: rootstock erect: lvs. reniform to broad-cuneate, palmately cleft into 5-9 narrow lobes and the central lobe toothed: fls. yellow, the upper petals brownish purple on the outside. Calif. and W. Ore.

DDD. Lvs. compoundly dissected into numerous small lobes: sts. leafy from the base.

E. Lateral petals beardless.

41. Shletonii, Torr. Fig. 3945 (adapted from Pacific R. R. Report). Sts. quite or quite glabrous: lvs. orbicular-reniform to cordate, 3-divided, the divisions 3-parted, lobed and cleft into narrow segms., not exceeding the peduncles: upper petals brownish, the 3 lower pale yellow. N. W. Colo. and N. E. Calif.

EE. Lateral petals bearded, the 2 upper deep violet.

42. Béckwithii, Torr. & Gray. Fig. 3946 (adapted from Pacific R. R. Report). Plant pubescent or puberulent: lvs. palmately about 3 times 3-parted into very narrow lobes, about equaling the peduncles: 3 lower petals pale violet, the fls. thus closely resembling those of V. pedata. Utah to N. E. Calif. and Ore.

43. Hálílii, Gray. Plant glabrous; rootstock deep: lvs. 3-divided, the divisions 3-5-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. trinceráta, Howell. Plant glabrous: ultimate segms. of the l. lanceolate or ovate-lanceolate, tapering to an acute callosus apex, thick and firm, prominently 3-ribbed: upper petals dark blue, the lower ones pale blue to whitish with a yellow base. Cent. and S. Wash.

VIOLET. One of the choicest of fragrant garden flowers. See Viola.

Comparatively few changes have taken place in the commercial cultivation of the violet within the past decade. The industry is more or less stabilized, and while there has been a tendency to increased planting of the single varieties, on the whole there has been no marked growth in the actual area under cultivation. The violet still offers some unique opportunities for the untrained lover of plants for the reason that it may be grown at less expense and with fewer and more simple houses and frames than almost any other of the major florist crops. While the violet readily responds to good treatment and to clean and healthy surroundings, its status is still relatively low owing to the fact that the risks of production are great, and this seems to develop a tendency toward carelessness on the part of those who take up the work as a business.

The cultivated varieties of the florist's violet are limited in number and probably all have been derived from the common sweet violet, Viola odorata, widely distributed over Europe and Asia. So far as known, no true varieties of the violet, either single or double, have originated in America. Of the double varieties and strains the most widely planted in this country are the Marie Louise (Fig. 3947) in its several forms, including Farquhar and Imperial; Lady Hume Campbell, Neapolitan (Fig. 3948), De Parme, Swanley White (Fig. 3949), and Madame Millet. For all practical purposes the culture of the double violet is confined to the Marie Louise, a true mauve in color, and the Campbell, a light mauve. The Neapolitan is a somewhat hardy type, but its color is too light for the market. The single varieties are coming to be important in the trade, and in the South and West are taking the place of the double sorts. South of Philadelphia, and north of Richmond, Virginia, the growing of any of the doubles is more or less risky, and it is in this territory and the Pacific coast that the singles are becoming so popular. The principal varieties are the Princess of Wales, Admiral Avellan, La France, California, and Baron Rothschild. The last is a promising variety, being a very free bloomer and a good keeper. The habit of this plant is compact and the foliage is of good texture, shape, and color. The Violets will grow and thrive in almost any good garden soil. The soil that will grow strawberries or potatoes should, with proper care, grow good violets. Under such intensive cultivation as must necessarily be given the violet, it is important to give strict attention to soil preparation. Sod from an old pasture makes excellent soil for the crop, but care should be taken that it is not too heavy. A moderately sandy loam soil is

VIOLET. Marie Louise. (X 1)
This should preferably be cut in the fall and composted with well-decomposed stable-manure. Many growers use cow-manure, but no particular advantage has been observed in this material so far as the vigor of the crop is concerned. It is more difficult to secure and is not so easily handled; hence ordinary well-decomposed stable-manure is preferred. About one part manure should be used to four parts of soil, and a little extra work in thoroughly incorporating the manure with the soil always pays well. Some of the best growers make up the heaps by bringing the soil and manure together by means of wheelbarrows and then mixing by shoveling over the pile, as is done for concrete-mixing.

When there are large quantities of soil to be mixed, the hauling can of course be done with wagons or carts. A one-horse cart makes a very convenient means of bringing the materials together. Before putting the soil into the houses or frames it should be turned and mixed again and for about every two or three thousand plants use a 200-pound bag of powdered quick-lime. The lime may be sprinkled on the heap from time to time as the mixing takes place.

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. There is still considerable growing done in frames, but there are so many inconveniences involved in this work that most of the frame culture has been abandoned for the cheaper forms of houses. Gradually, also, the method of growing the plants in the open field and later covering with frames is being abandoned. The violet is subject to so many diseases and troubles which are materially influenced by weather conditions that it is important to have control over at least the moisture conditions the greater part of the year. In house culture the crop is preferably grown in solid beds (Fig. 3950). Experience has shown that better and more flowers are secured by this method than by growing on benches. Again, there is the advantage of the long life of the solid beds and the lessened expense of the general work. 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 practise changing the soil each year. At least 5 inches of fresh soil should be put on 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 practically all the violet-growing sections preparations may begin at this time for clearing the houses and getting ready for the new crop. The plants, having been properly prepared, as will be described later, should be set 8 or 9 inches apart in rows 10 inches apart. This is the distance for the doubles. For the singles they are usually planted about 12 inches apart in the rows, the rows being from 12 to 18 inches apart. Most of the single varieties now under cultivation may be planted closer than this, say from 10 to 12 inches apart. After the plants are put out it is necessary that they should be carefully watered and all weeds in the beds kept down. It is desirable to keep the temperature as low as possible in summer. To this end the houses should be shaded. It is desirable to give plenty of fresh air, but care should be taken to have the top ventilators so arranged that the plants may be protected from rain. 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 soil. Early in summer the runners will begin to appear and these must be cut off as rapidly as the plants can be gone over conveniently. The object is to secure a good strong healthy compact plant and to induce free growth at all times, as with such strong free-growing plants developed by October 1 all the conditions will be at hand for the production of long-stemmed, good-colored flowers.

The violet may be propagated in a number of ways. One of the common practices is to divide the crown. This is usually done in spring after the flowering season is over. The plant is lifted and the soil shaken off, and then it may be readily pulled apart and the small plants either set in beds or flats. This method has objections because a great many plants or crowns so separated are hard and woody, and they will refuse to grow into good vigorous healthy crowns. A second and more desirable method is carefully to select young vigorous offsets and root these in the ordinary way in sand. Following the second method the young plants can be secured from time to time during the late winter without disturbing the main plant. If proper care is exercised and good selection made, another good supply of stock may be readily available early in March, and selections may be made from these for the planting, which is performed the latter part of May.

Comparatively little attention has been given to proper houses for violet-culture. Then, again, the 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 beginners and those who have not a large amount of capital to invest one of the inexpensive houses is an ordinary even-span type, 12 feet wide. The height of such house from the bottom of the walk to the ridge is 7 feet. The height of the side from the top of the plate to bottom of gutter is 20 inches. The walls can be easily boarded up with rough lumber and then plastered. One of the single sides is made through the center of the house. This gives two beds, each 5 feet 5 inches wide. Such beds are a little wide for conveniently 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 sash 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 con-
ected with commercial violet-growing and is seldom
understood in all its details. The grower should be
thoroughly familiar with the many needs and require-
ments 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.

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 produc-
ing definite circular whit-
tish spots, frequently with
concentric rings, of a
darker shade, very often
with a light central por-
tion resembling the bite
or sting of an insect.

Cospora violae, Phyllosticta
viole, Septoria 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 trouble-
some and destructive in
some localities, especially to young plants that are
transplanted during hot dry weather. It causes
the browsin or blackening of the parts attacked and the
final death of the plant.

Wet-rot (Botrytis sp.) attacks leaves, petioles, flower-
talks, 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 causes.

It is difficult to exterminate any of the diseases
named after they once gain a foothold. However, they
may 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 atten-
tion must be given to watering, cultivation, and ven-
tilation, 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
suffice to warrant discussion here.

Aphides (Aphis sp. and Rhopalosiphum violae) are
generally known as the green and the black aphid or
the green- and black-fly. They cause the young grow-
ing parts to curl and twist, resulting in a stunted ill-
formed plant. They work their way into the young,
unopened flower-buds, and, thrusting their bills through
the overlapping petals, feed on the juice. Each punc-
ture produces a greenish white blotch on the petal, and
the flower becomes deformed, distorted, and worthless
for market. Aphides can be easily controlled by fumi-
gating with hydrocyanic acid gas, and this is now in
general use. To each cubic foot of space in the house or
frame use 1.5 gram of 98 per cent cyanide of potash for
double varieties and .1 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 be lowered into the manholes at the outside of the house into its respective jar. Pour into each jar an amount of water 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 to an hour and single varieties two 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 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. A common 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, Aphelenchus olesistus, 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 bringing in 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, Under the 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 (Diplipsis violicola), violet sawfly (Empythus canadensis), greenhouse leaf-treader (Phylctena rubigalis), and several species of cutworms (Agr Pant 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.

B. T. GALLOWAY.


VIRGILIA (named for the poet Virgil). Laguminosae. Tree sometimes grown in the greenhouse: lvs. pinnately compound; lfts. small, without stipules; stipules narrow, caduceous; lvs. rose-purple, in short terminal racemes; calyx 2-lipped, upper 2-toothed, lower 3-toothed; petals long-clawed; standard recurved, orbicular; wings ovate, falcate, keel shorter than the wings, beaked; stamens free; ovary sessile: pod linear, plane-compressed, leathery, 2-valved. One species, S. Afr. V. capensis, Lam. (Podalypia capensis, Andrt.). Tree: lvs. with 6-10 pairs of lfts. which are linear-oblong, mucronate, the young ones silky on both sides, the old ones glabrous and glossy above: fls. rosy purple, 3½ in. long; calyx silky, widely campanulate. S. Afr. B.M. 1500.

V. lutea, Michx.—Craspides lutes.


VIRGIN'S BOWER: Clematis.

VISCÁRIA: Lu drainage.

VÍSCUM (the old Latin name used by Virgil and Pliny). Loranthaceae. Miselitoide shrubs. Parasite shrubs which grow on trees and are well known to all on account of their use at Christmas. The lvs. are sometimes flat and rather thick, sometimes reduced to minute teeth or scales: fls. diocese or moreaceous at the axis or nodes; berry 1-seeded, naked or crowned with the perianth. About 70 species, natives of the temperate and winter regions. Two seen and deserve mention: V. albus, Linn. COMMON MISLETOE (of Eu.) Yellowish green, glabrous shrub, 1-4 ft. high: lvs. opposite or in whorls of 3, 1-3 in. long, obovate-lanceolate, obtuse, 5-7-nerved: fr. white, nearly ½ in. diam., ovoid or globose, viscid. Eu. and Temp. Asia. V. cristatum, Sieb. & Zucc. A. V. in habit, foliage, and infl., but the lvs. are very pale yellow-green and 3-nerved; berries red-brown, larger and long-ped. Spain, N. E. Afr., and Syria. B.M. 7828. See also Loranthus and Phoradendron.

VÍSNEA (after a Lisbon merchant). Ternstroemia. Evergreen tree with the habit and infl. of Eurya, sometimes grown in the warmhouse: lvs. small, subsessile; sepal 5, strongly imbricated, bases somewhat connate; petals 5, imbricate, bases connate; stamens numerous, adhering to the corolla at the very base; ovary 3-celled: fr. an indehiscent berry, included in the enlarged and fleshy calyx. One species, Canary Isls., little known in cult.

Mocanera, Linn. f. Tender evergreen shrub, 6-9 ft. high, of compact habit and with dark green, shining leathery foliage: lvs. short-petioled, ovate-lanceolate, serrate: fls. solitary, white, pendulous. Canaries.—It is a large evergreen shrub or small tree resembling in a general way a tea plant or camellia. The specific name Mocanera was given by the younger Linnaeus because the fr. was supposed to be the "mocan" of the aborigines which was made into a kind of sirup and used to a considerable extent. The fls. are only ½ in. across, not very numerous and much shorter than the lvs., but they are very sweet-scented. It has been offered in S. Calif. F. TRACY HUBBARD.†

VITÉX (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 1-1: fls. in often panicked, few- to many-fld. cymes; calyx campanulate, usually 5-toothed; corolla tubular-funneliform, with 5-lobed, oblique and slightly 2-lipped limb; stamens 4, 2 longer and 2 shorter ones: fr. a small drupe, with a 4-celled stone.—About 80 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. leucoczyon, in S. Asia are important timber trees.
CXVII. Victoria and nymphs in a good setting.
The two species most often cultivated are shrubs or small trees with deciduous dictate leaves and lilac-blue or white flowers in terminal spires or loose panicles appearing in summer and autumn. The hardest seems to be *V. Negundo* var. *incisa*, which stands most ordinary winters as far north as Massachusetts. *V. Agnus-castus* 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 by seeds sown in spring and by greenwood cuttings under glass; also by layers.

3952. Vitex Negundo var. incisa. (X½)
small tree, with a strong aromatic odor, grayish tomentose: lvs. long-stalked; lfts. 5-7, lanceolate, acuminate, narrowed at the base into a short stalk, entire or with few coarse teeth, grayish-tomentose beneath, the middle one 3-4 in long; the lfts. in dense, sessile, short, forming terminal, often paniced spikes 5-7 in. long; corolla usually pale or lilac, grayish outside, ½ in. long; stems and style exsert. July-Sept. S. Eu., W. Asia. Mn. 2, p. 44. G.C. III. 51:32. Var. *alba*, Rehd. (V. alboflora, Hort. *Agnus-castus vulgaris alba*, Carr.). Fls. white.

V. Negundo, Linn. Shrub or small tree with quadrangular branches: lfts. usually 5, or occasionally 3, stalked, elliptic-ovate to lanceolate, acuminate, entire or entire, grayish tomentulose beneath, 1½-4 in. long: lfts. lilac or lavender, small, scarcely ½ in. long, stalked, in rather loose clusters forming slender spikes usually crowded into loose terminal panicles 5-8 in. long; stems and style slightly exserted. China, India. Tender. Var. *incisa*, Clarke (V. *incisa*, Lam. *V. lentiscus*, Hort.). Fig. 3952. Lfts. incised or serrate or almost pinnatifid, ¾-3 in. long; the more extreme form with deeply pinnatifid lfts. and narrow remote segms. may be distinguished as f. *multifida*, Rehd. (*Agnus-castus incisa* 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, has smaller lfts. than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.

3953. Vitis.—Forms of leaf on the same vine.


ALFRED REEDER.

**VITIS** (classical Latin name). VINE. GRAPE. *Vitaceae* or *Ampelidaceae*. 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: fls. polygamo-dioecious (i.e., some individuals perfect and fertile, others sterile with at most only a rudimentary ovary), 5-merous; corolla calyx-tube-acute—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 pulp; seeds pyriform, with contracted beak-like base.—A widespread genus of the New World, most abundant in temperate countries. In its stricter limitations, the genus includes less than 60 known species, but some authors unite *Cissus* and *Ampelopsis* with it, when it includes some 250 species. The standard monographer (Planchnon, DC. Monogr. Planter, 3), 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 vinifera*). For an account of the evolution of these native 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 Weichert, Journ. Roy. Hort. Soc. 28 (1903-4). For cult., and control of insects and diseases, see *Grape*. For recent studies in fl. variation and in pollen sterility, see M. J. Dorsey, 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 experiment stations and amateurs by the late T. V. Munson, of Texas, a well-known authority on both the botany and horticulture.
of the grape. The popular interest in these species is primarily pomological; for, although the fruit may not be directly useful, the species give promise of development through hybridization and plant-breeding, and some of them afford useful stocks on which to graft kinds that do not resist the phylloxera or root-louse. The following discussion includes all the species native to North America north of Mexico; it is adapted from the writer's account in Gray's "Synoptical Flora," vol. 1, 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-resisting 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. Coignetia and V. amurensis are hardy in the northern states. Those tender at the Arnold Arboretum and more or less killed back in winter are V. Davidii, V. flexuosa, V. Romanetii, V. pulchra, V. reticulata, V. Piazecki, and V. penagona.

Vitis species are of easy culture for ornament, and probably all of them propagate by hardwood cuttings, although layering may be easier with some species. Even species that are tender in any locality often make very attractive new growths each year if the roots are not injured. Attention must be given to fungous diseases.

In southern California and other southern parts, a number of evergreen species now attain more or less prominence, particularly "the evergreen grape-vine" or V. capensis. These plants are mostly species of Cissus (which see, page 775), which is separated from Vitis by the mostly four-merous flowers with separate expanding petals and different disk, the plants often fleshy and sometimes erect rather than climbing. The evergreen set in cultivation more or less prominently in this country comprises Cissus antarctica (V. Baudiniana), page 776; C. capensis (V. capensis); C. gongylodes (V. pierophora), page 776; C. hyptoplaeca (V. hyptoplaeca); C. oblonga (V. oblonga); C. quadrandularis (V. quadrangularis); C. rhombifolia (V. rhombifolia); Cissus Romanetii (V. rutulans); Cissus striata (V. sempervirens), page 776. The standard English authorities combine Cissus and Vitis, but continental as well as American 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.

3954. Grape flowers, enlarged. J, 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.

3955. Vitis capensis (preferably known as Cissus capensis), an evergreen species prized in southern California. (×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. woolly, with 5 triangular-ovate petals and 5 stamens. The ovary hirsute and style short, fr. globose, red-black staining. inflo. angled, 4’ B.


4. C. rhombifolia, Planch. (Vitis rhombifolia, Vahl). Scandent evergreen, the branches angled but not winged: its. 3-foliolate, petiolar; its. all long-petiolate, serrate, glabrous above, the lateral ones oblique and somewhat cordate, the middle one ovate to rhomb-ovate: fls. many in if.-opposed clusters, the calyx and petals pubescent. W. Indies. S. Amer.

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: its. simple, broad-oblong to ovate-oblong, obtuse, about 1-2 in. long, entire, obscurely 3-nerved: fr. ovoid, small, 1-2-seeded, in short-peduncled cymes. Austral.—Allied to C. antarctica.

II. Species of Vitis, or true grapes: plants yielding the grapes of commerce, but some of them grown for arbor and for ornament.

A. Bark bearing prominent lenticels, never shredding; nodes without diaphragmata; tendrils simple, fl-clusters small and not much elongated: seeds oval or oblong, without a distinct stipe-like beak. (Muscadinia; separated as a genus by Small.)

B. Berries large (½ in. or more diam.), musky-tasted; its. firm or dense in texture, prominently pointed...

BB. Berries half smaller, acid: its. thin, not prominently pointed...

AA. Bark without distinct lenticels, on the old wood scaling in long thin strips and fibers: nodes provided with diaphragmata; tendrils forked: fl-clusters mostly large and elongated: seeds pyriform. (Vitis.)

A. 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 thin fr.

BB. 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.

C. Its. stiff-hairy or bristly, or prickly. (Spinosita.)

D. Its. becoming glabrous beneath: Its. glabrous and prickly. ...

DD. Its. floccose or loosely pubescent beneath: Its. glandular-bristly and pubescent...

CC. Its. glabrous or pubescent, not acuminate or armed...

D. Vitis species of N. Amer., some of them giving rise to pomological races and the others of botanical interest. (Nos. 11-13).

B. Class of green-leafed, grapes, mostly marked at maturity by absence of prominent white, rusty, or blue tomentum or scurf or conspicuous bloom on the Its. beneath (under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even cohered): foliage mostly thin: tendrils terminal, s. e. every third joint bearing no tendrils (or infl.). V. cinerea and V. arizonica are partial exceptions and might be looked for in EE (Nos. 11-13).

F. Group of pulvinula-like grapes, characterized by thin light or bright green mostly glossy lvs. (which are generally glabrous below at maturity except perhaps in the axils of the veins and in V. Champini, with a long or at least a prominent point and usually long and sharp teeth or the edges even jagged.

G. Lvs. broader than long, with truncate-oblique base. (V. Treleasei might be sought here). . 

GG. Lvs. ovate in outline, with a mostly well-marked basal sinus.

H. Diaphragm (in the nodes) thin: young shoots not red: Its. not deeply lobed...

I. Lf.-margin not lobed or only obscurely so, the teeth small or else not elongated...

JJ. Young shoots nearly or quite glabrous...

K. Tendrils prominent and persisting...

KK. Tendrils small and deciduous...

LL. Diaphragm very thick and strong: young shoots bright red: Its. often strongly lobed...

MF. Group of cordifolia-like grapes, with thickish and dull-colored or grayish green lvs. often holding some close dull pubescence below at maturity and the shoots and Its. nearly always more or less pubescent when young, the teeth mostly short, the point mostly rectangular and conspicuous.

G. Plant strong and climbing, with stout persistent tendrils.

H. Young shoots slender, and glabrous or very soon becoming so...

III. Young shoots angled, and covered the first year with tomentum or wool.

I. Under surface of Its. glabrous or essentially so at maturity.

J. Blade of Its. lustrous or glossy when full grown...

JJ. Blade of Its. dull...

K. Under surface of Its. glabrous...

GG. Plant scarcely climbing, the tendrils perishing when failing to find support...

PP. Group of orbicular-callopal-ted. species of the Pacific coast...

EE. Class of colored-leaved grapes, marked by thick or at least firm foliage, the Its. prominently rusty or white-tomentose or glaucous-blue. V. cinerea, V. arizonica, and possibly V. californica might be sought here; and late-gathered forms of V. bicolor might be looked for in.

3483
6. rouxii, Michx. (V. muscadinia, V. angulata, V. verrucosa, V. pelota, Muscadinia rouxii, Small), MUSCADINE, SOUTHERN FOX GRAPE. BULLACE, BULLIT, or BULL GRAPE. Fig. 1708, Vol. III. Vine with hard warty wood, running even 60-100 ft. over bushes and trees, in the shade often sending down dichotomous aerial shoots; lvs. rather small to medium (2-6 in. long), dense in texture and glabrous both sides (sometimes pubescent along the veins beneath), cor- date-ovate and not lobed, mostly with a prominent and sometimes an acuminate point (but somewhat contracted above the termination of the 2 main side veins), the under surface finely reticulated between the veins, the teeth and the apex angular, coarse and acute, the basal sinus shallow, broad and edentate; petiole slender and (like the young growth) fine-seury, about the length of the If.-blade; tendrils (or fl.-clusters) discontinuous, every third node being bare: fl.-bearing clusters smaller than the sterile ones, and ripening from 3-20 grapes in a nearly globular bunch: berries falling from the clusters when ripe, spherical or nearly so and large (1/4-1 in. diam.), with very thick and tough skin and a tough musky flesh, dull purple in color without bloom (in the Seuppernong va- riety silvery amber-green), ripe in sum mer and early au- tumn; seeds 1/2- 3/2 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. For a recent pomolo- logical account of the Muscadine grapes see Hus- mann, Farmers' Bull. No. 709, U. S. Dept. Agric. (1916); for a treatise on Muscadine grape-sirup, consult Dearing, Farm- ers' Bull. No. 758 (1916).

7. Mussoniana, Simpson (Muscadinia Mussoniana, Small), MUSTANG GRAPE of Fla. BIRD, EVERBEARING, or EVERLASTING GRAPE. Very slender grower, prefer- ring 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 thyre-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 reef keys; also in the Bahamas.—Difficult to distinguish from V. rouxii, in herbarium specimens, but distinct in the field. The plant often bears fls. and both green and ripe fr. into Dec.

8. vinifera, Linn. WINE GRAPE. EUROPEAN GRAPE. Fig. 3956. Young growth smooth or flocose, the plant
VITIS

not so high-climbing as most American species; tendrils intermitten: lvs. mostly thinnish, rounded, with a deep sinus and the basal lobes usually overlapping, tenonctome or glabrous beneath, the margins coarsely notched or jagged: clusters long and long, the berries usually over 1 in. long, many of them almost all-globular-fruited. Probably native to the Caspian or Caucasian region and W. India. Cult. from the earliest times, and the grape of history; now greatly varied. The hothouse grapes, as Black Hamburg, Barbarossa, are of this species; also the vineyard grapes of Calif. Not hardy in the northern states and very subject to phylloxers (root-louse) and mildew. Regel, a Russian botanist, considered the wine grape to be a hybrid of 2 species that he characterized as V. Labruscea and V. vulpina, but this view is not accepted. Var. apiiifolia, Loud. (V. laciniosa, Linn. V. vinifera var. laciniosa, Dipp.), has the lvs. cut into 5 much-clft segms; ornamented: known as "parsley vine," and "cicatia." Gn. 54, p. 425.

9. Dávidii, Fexx (Spínoviták Dávidíi, Romanet. Vitis Davidiana, Dipp. V. armata, Diels & Gilg. V. vinifera var. Dávidíi, Hort.). Sts. and petioles armed with straight or slightly recurved prickles, glabrous: tendrils interrupted: lvs. long-petaled, large, paper-like, somewhat glaucous and becoming glabrous before becoming broadly ovate, obscurely angled; the base truncate, the apex acuminate and acute, the margin lightly repand-apiculate-serrate: thyrse peduncled, long-conical, usually surpassing the fl., the fls. very early: fr. rather large, globose, black. China.—Old branches prickly.


10. Romanetíi, Romanet (V. rútíla, Carr.). Petioles and young sts. floccose-pubescent and bearing spreading gland-bearing purplish hairs or bristles; sts. becoming nearly glabrous the second year: tendrils interrupted: lvs. large, cordate-orbicular and obscurely angled-3 lobed, coarsely crenate-dentate, at maturity nearly or quite glabrous above, below more or less flocc-pubescent at least on the nerves: thyrse peduncled, elongated-conical, surpassing the lvs.: fr. black, edible, the seeds globose-ovoid. China. R.H. 1890:444.

11. rupéstris, Scheele. Sand, Sugar, Rock, Bush, CURRANT, or MOUNTAIN GRAPE. Shrub, 2-6 ft. high, or sometimes slightly climbing; tendrils few, not normally in pairs, and rather thin: lvs. refoefficient to reniform-ovate (about 3-4 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 under surface, the base only rarely cut into a well-marked sinus, the margins 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 (3½-5½ in. diam.), purple-black and somewhat glaucous, pleasant-tasted, ripe in late autumn; seeds small and broad. Sandy banks, low hills, and mountains, S. Pa. to Tenn., Ind., Mo., Okla., and S. W. Texas. Var. dissécta, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency toward irregular lobing. Mo.

12. montícola, Buckl. (V. težina, Munson. V. Florida, Florida, 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 angled and floccose (sometimes glabrous), the diaphragms and plane rather thin: lvs. small and thin (rarely reaching 4 in. in width and generally from 2-3 in. high), cordate-ovate to triangular-ovate, with the basal sinus ranging from nearly truncate to nearly truncate oblique to normally inverted U-shaped, rather dark green but glossy above and grayish green below, when young more or less pubescent or even arachnoid below, the blade either prominently notched on either upper margin or almost lobed, the point acute and often prolonged, margins irregularly notched with smaller teeth than in V. rupéstris: clusters short and broad, much branched: berries medium or small (averaging about ½ in. diam.), black or light-colored, seedy, sweet: seeds large (about ½ in. long) and broad. Limestone hills in S. W. Texas.—This species has been the subject of much misunderstanding.

13. Chámpini, Planche. Probably a hybrid of V. rupéstris or V. Berlandieri and V. cándica, bearing medium to large reinfoiment 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. cándica, V. Berlandieri, and V. montícola only, and in others with the above and V. rupéstris. Often composing dense thicket 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. microspérmus**, Bailey (*V. Solonis var. microspérmus*, 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. illinoensis* 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 lvs. 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 lvs. sweet-scented: berries small (less than ¼ 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. **Trélibæsi**, 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 ½ 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 notched-toothed (not jagged as in *V. vulpina*) and distinctly 3-lobed, the apex much shorter than in *V. vulpina*: fertile lvs. with very short, recurved stamens, sterile with ascending stamens: clusters small (2–3 in. long): berries ½ 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. *glabra*, 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. monospérmus*, 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 lvs. long and erect: clusters loose and long-flowered, branched, the lvs. opening very late: berries small and late (¼–½ in. diam.),
black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Ill. and Mex. to Texas; known mostly along the Wash. River and along the Mississippi in the latitude of St. Louis. G.F. 2:341 (repeated in Fig. 3959).—A handsome plant. V. palmata, Vahl, founded on Virginian specimens, is probably V. vulpina, although it is sometimes made to replace the name V. rubra.

18. cordifolia, Michx. TRUE FROST GRAPE. CHICKEN, RACCOON, or WINTER GRAPE. One of the most vigorous of American vines, climbing to the tops of the tallest trees, and sometimes making a trunk 1-2 ft. diam.: diaphragms thick and strong: lvs. long-cordate, triangular-cordate with rounded base, or cor-
drate-ovate, undivided but sometimes very indistinctly 3-lobed or 3-angled, the basal sinus rather deep and narrow, the margin with large acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower bright green and either becoming perfectly glabrous or bearing a little close and fine inconspicuous grayish pubescence on the veins; petioles long: stamens erect in the sterile fls. and short reflexed-curved in the fertile ones: clusters long and very many-flowered, most of the pedicels branched or at least bearing a cluster of fls. The berries numerous and small (about ½ in. diam.), in a loose bunch, black and only very slightly glaucous, late and persistent, with a thick skin and little pulp, becoming edible after frost; seeds medium and broad. In thickets and along streams from Pa. (and probably S. N. Y.) to E. Kans., Fl., and Texas.

Var. fœtida, Engelm., has fetidly aromatic berries, and grows in the Mississippi Valley.

Var. sempérvires, Munson. A glossy-lvd. form holding its foliage very late: lvs. sometimes suggesting foliage of V. rubra, deltoid with a truncate base; clusters small, the fr. ripening later than in the type. S. Fla.

Var. Hélleri, Bailey (V. Hélleri, 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-ovate-lobar (frequently 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: stamens long and ascending in the sterile fls., laterly 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-tasted; 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 side shoots, but frequently smaller, the larger ones shorty 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 rarely 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. cinérea, 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 divaricately 3-angled or shortly 3-lobed toward the apex, the triangular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (not glossy), the under surface remaining ash-gray or dun-gray, webby-pubescent: stamens in sterile fls. long, slender, and ascending, in the fertile ones short and laterly 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. aestivalis by the triangular-topped sharply 3-lobed ash-gray lvs. and the gray tomentum of the young growth.

Var. floridana, Munson (V. australis, Small). Growing tips rusty-tomentose, as are sometimes the veins on
the under sides of the lvs.: cluster longer-peduncled and more compound. Manatee Co., Fla.; and apparently also in Ark.; possibly a compound with V. *axilefolis*, but the lvs. have the characteristic shape of *V. cinerea*. Not to be confounded with any form of *V. arizonica*, 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 lf. 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 lvs. 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 gulleys, 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. Treleosii*.

23. *californica*, Benth. Fig. 3062. 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-reiniform (the broader ones the shape of a horse’s hoof-print), rather thin, either glabrous and glassy 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 and 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 (½–¾ 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; seed medium in size, pyriform. S. Calif., south of the 36th parallel.

—Difters 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 mutinous teeth, and such specimens without the fl.-clusters are difficult 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 understood and its merits as a species are yet to be determined. It bears the name of H. H. Gird, of Calif.

25. *Doaniâna*, 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,
bearing large (½ in. and less diam.), black, glaucous berries of excellent quality; seeds large (½ – ¾ in. long), distinctly pyriform. Chiefly in N. W. Texas, but ranging from Greer Co., Okla., to beyond the Pecos River in New Mex. G.F. 9:455.—The species varies greatly in pubescence, some specimens being very nearly glabrous at maturity and others densely white-tomentose. The plant would pass as a hybrid of V. vulpina and V. candicans, except that these species do not often occur in its range. It bears the name of Judge J. Doan, of Wilbarger 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. caribea, DC. Fig. 3963. Climbing, with flocculent-woolly (or rarely almost glabrous) and striate shoots: tendrils rarely continuous: lvs. cordate-ovate or even broader and mostly acuminate-pointed, sometimes 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; seed obovate, grooved on the dorsal side. A widely distributed and variable species in the American tropics, running into white-lvd. forms (as in V. Blancou, Munson). Although supposed to occur from Fla. to Texas, Munson is “unable to discover the slightest traces of this species in the U. S.;” he considers the Fla. plants to be hybrids of other species, or forms of V. cinerea. The species is considered to be promising for the development of new species and new varieties for the American tropics (F. S. Eaves, Journ. Heredity, Dec., 1915).

V. rufotomentosa, Small, differs in having the lf.-blades usually distinctly lobed and the margins coarsely toothed, rusty-tomentose on nerves beneath: sandy soil, Fla. to La.

27. bicolor, Le Conte (V. argenitofolia, Munson). BLUE GRAPE, or SUMMER GRAPE of the N. Fig. 3964. A strong high-climbing vine, with mostly long nodes and thick diaphragms, the young growth and canes generally perfectly glabrous and mostly (but not always) glaucous-blue: tendrils and petioles very long: 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 deeply 3-lobed and on the older growths shallowly 3-lobed, the basal sinus running from deep to shallow, the margins mostly slightly toothed or sinuate-toothed (at least not so prominently notch-toothed as in V. xevialis): cluster mostly long and nearly simple (sometimes forked generally with a long or prominent sinus at the apex of the rufous tomentum, the purple and densely glaucous berries of medium size (½ in. or less diam.), sour but pleasant-tasted when ripe (just before frost); seeds rather small. Abundant northward along streams and on banks, there taking the place of V. xevialis. Ranges from New England and Ill. to the mountains of W. N. C. and to W. Tenn.

—Well distinguished from V. xevialis (at v. 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. xevialis, Michx. (V. Nortoni, Prince. V. Labrissa var. xevialis, Regel. V. braceiula and V. araneouses, Le Conte). SUMMER, Beven, or Promy. GRAPE. Strong tall-climbing vine, with medium short internodes, thick diaphragms, and often pubescent petioles: lvs. mostly large, thinnest at first but becoming rather thick, ovate-cordate to round-cordate in outline, the sinus either deep (the basal lobes often overlapping) and broad or open, the limb always lobed or prominently angled, the lobes either 3 or 5, in the latter case the lobal sinuses usually enlarged and rounded at the extremity, the apex of the lf. broadly and often obtusely triangular, the upper surface dull and becoming glabrous and the under surface retaining a covering of copious rusty or red-brown pubescence which clings to the veins and draws together in small, tufty masses: stamens in fertile fls. reflexed and laterally bent: clusters mostly long and long-peduncled, not greatly branched or even nearly simple (mostly interrupted when in flower), bearing small (½ in. or less diam.), black, glaucous berries, which have a tough skin and a pulp ranging from dryish and astringent to juicy and sweet; seeds 2–4, medium size (½ in. or less long). S. N. Y. to Cent. Fla. and westward to the Mississippi and Missouri rivers.—A marked type readily distinguished from other species by the redish fuzz of the under side of the lvs.

Var. Bourquiniana, Bailey (V. Bourquiniana, Munson). A domestic offshoot, represented in such cult. varieties as Herbemont and Le Noir, differing from V. xevialis in its mostly thinner lvs. which (like the young shoots) are only slightly red-brown below, the pubescence mostly cinerous or dun-colored or the under surface sometimes blue-green: berries large and juicy, black or amber-colored. A mixed type, native of 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. *vitisidialis* var. *Linsecomii*, Munson). Post-Oak, Pine-Wood, or Turkey Grape. More stocky than *V. vitisidialis*, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below; berries large (3½-3¼ in. diam.), black and glaucous, mostly palatable; seeds mostly much larger than in *V. vitisidialis* (often 5½ in. long). High post-oak (Quercus stellata) lands, S. W. Mo. to Texas and E. La.—Munson distinguishes it from *V. vitisidialis* by its larger 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 Lincecum, and is often written *V. Lincecomii*, but if such original spellings as Wisteria, Zanthoriza, Gleditsia, Stewartia and many others are to be retained, consistency requires that we hold to Buckley's original spelling: *V. Lincecomii*.

*Var. glauca*, Munson (*V. vitisidialis* 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 scurfy.

30. *candidus*, Engelm. (V. *mustangensis*, Buckl.). MUSTANG GRAPe. Plant strong and high-climbing, with densely woolly young growth (which is generally rusty-tipped), and very thick diaphragms: lvs. medium in size and more or less poplar-like, ranging from reniform-ovate 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 lf, if nearly truncate), deeply 5-7-lobed (with enlarging rounded sinuses) on the strong shoots and more or less indistinctly lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the sterile fls. long and strong, those in the fertile fls. very short and laterally reflexed: cluster small, mostly branched, bearing 12-20 large (¾ in. or less diam.) purple or light-colored or even whitish berries, which have a thick and rough skin: the character of the fruit is disagreeable fiery flavor; seeds large, pyriform. W. Ark., Okla., N. Texas, mostly on limestone soils.

*Var. coriaceae*, Bailey (*V. coriacea*, Shuttlew.). LEATHER-LYF or CAL-LOONA GRAPE. (Fig. 3965.)

Differs from the species chiefly in bearing much smaller (about ¼ 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 Texas plants reappear.—The more agreeable quality of the fr. is perhaps the result of a more equable and moister climate.

31. *Simpsonii*, Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin, large, and large-toothed ones on the main shoots, rustily white tomentum below and very prominently brown-tomentose in young growths. Lvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fls.—This is perhaps a hybrid of *V. vitisidialis* and *V. candida* 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. *Blondii*, 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 obscurely 3-lobed toward 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, the petiolar sinus mostly shallow and very open (ranging to narrow and half or more the length of the petiole), the margins shallowly scalloped-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 fls. 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 Alleghany 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 Tenn.—The parent of the greater part of American cult. grapes (probably largely through hybridization). It is often confounded with *V. vitisidialis* 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. *Pissézkii*, Maxim. (Ampelópeis Davidiana, Mott.). A species with variable foliage: dioecious: young branches, petioles, and under surface of lvs. rufous-pubescent: lvs. membraneous, ternate; lfts. petiolulate, the central one rhomboid and more or less lobed and acuminate, the lateral ones obliquely ovate and acute, all of them inceised-serrate: cymes many-fld., becoming forking and exceeding the pedicel: lfs. small, with calyptrae petals. W. China. *V. Pagnuccii*, Rom. var. differs only in being more glabrescent; probably not distinct.—The foliage of this species-group is said to turn bronze-colored in autumn. The lvs. are very variable, sometimes trifoliate and undivided on the same branch. *V. sinénsis*, Hort., appears to belong here.
34. reticulata, Pampapani (V. Wilsonii, Veitch). Scant
dent with glabrous branches: lvs. ocrea-cordate,
subeniform, about 3 in. diam., base cordate-truncate,
 apex very shortly acuminate, margin entire or inco
spicuously 3-lobed, glabrous above, cobwebby on the
nerves beneath: infl. racemose: fls. in glomerules,
minute: fr. black, but glaucescent-pruinose, up to ½ in.

35. flexuosa, Thunb. Sts. slender and usually flex
uose, glabrous at maturity, the new ones more or less
rufous-tomentose: lvs. petiolar, cordate-ovate or tri
angular-ovate, entire or angular-3-lobed, short
cupulose, unequally dentate, at maturity glabrous
above and more or less hairy or floccose beneath (at
least on the veins): fl. cluster peduncled and branching:
fr. very small, 2-3-seeded. China, Korea, Japan.
Var. parvifolia, Gagnep. (V. parvifolia, Roxbg. V.
flexuosa var. Wilsonii, Veitch), is a small-lvd. form.
cult. for the color of the lvs., which are purple beneath
and bronze with metallic luster above. China.

36. amurenensis, Rupr. (V. vulpina var. amurenensis,
Regel). A hardy species, well known to botanists but
little planted although found in growing collections:
sts. obscurely angled and striate, the young shoots
loosely floccose or webby, later glabrous or nearly so:
lvs. ovate to ovate-oblong, not quite glabrous, with
broad-rounded apex (only 40.36.36.221 diam.),
apiculate-dentate: lvs. pungent and margin somewhat
convergent, apex acuminate, the young fr. thyrse
like a cyme, the ovaries or seeds shortly peduncled:
fr. very small, about ⅓ in. diam., 2-3-seeded. Manchuria,
Amoor region. Gn. 54, p. 425. G.Z. 12:160.—It has
very ornamental purple-tinted lvs. in autumn.

37. Thunbergii, Sieb. & Zucc. (V. Sieboldii, Hort.).
A variable species resembling V. Labrusca: sts. angled,
and these other parts rusty-tomentose: lvs. glabrous
above, tomentose or pubescent on the nerves beneath.
cordate, 3-5-lobed or deeply cut, unequally mucro
nate-dentate: fr. shorter than lvs., or about equal
and these other parts rusty-tomentose: lvs. glabrous
above, tomentose or pubescent on the nerves beneath.
cordate, 3-5-lobed or deeply cut, unequally mucro
nate-dentate: fr. shorter than lvs., or about equal
them: fr. very small (½-⅓ in. long), 2-3-seeded, purplish
black. China. B.M. 8568.—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. Thun
bergii in England.

38. pentagona, Diels & Gilg. Climbing, the tendrils
interrupted: sts. and lvs. reddish gray-tomentose: lvs.
long-petioled, the blade membranaceous, ovate, usu
ally 5-angled, the base truncate or shallowly emargin
ate, the apex acute, the margin re-pand and denticulate,
lightly pubescent on nerves above but rarely tomentose beneath: thryse elongated. China.

—Allied to V. lanata. It appears to have been dis
tributed in cult. as V. Thunbergii. Var. bélula, Rehd.
& Wilson. Lvs. much smaller, 1-2 in. long: very similar to V. flexuosa var. parvifolia, but lvs. tomentose beneath.

39. púchra, Rehd. Described as a handsome plant
with simple more or less obscurely 3-lobed lvs. coarsely
serrate, 7-8 in. long and 9-10 in. broad, much like those
of V. Coignetiae, villous beneath, the young shoots
equally pubescent and bearing glossy bronze-green and
purplish beneath and later green. Sts. sparsely
floccose, glabrescent, purplish: lvs. ovate to broad
ate, acuminate, the base shallow cordate or truncate
(only rarely deeply cordate), coarsely and unequally
toothed, glabrous and somewhat shining above. China
or Japan.—Described from plants cult. at the Arnold Arboretum, where it is not quite hardy.

40. Coignetia, Pulliat. Fig. 3966. Very strongly
grape-vine, covering trees and arbors with a thatch
of heavy showy flowers: branches floccose-tomentose
when young: tendrils intermittent: lvs. cordate-orbi
cular, with 3-5 lobe-like points, the margins shallowly
apiculate-toothed, dull above, thickly gray-pubescent
beneath: thryse stalked, short: fr. globular, about ½ in.
diam., practically inedible, although said to be eaten
after being frozen by the Japanese. N. Japan. Gn. 49,
pp. 426-8. G.C. III. 22:305 (adapted in Fig. 3966).—One
of the best of all strong-growing vines, and hardy in the
northern states; at Chicago recommended as the best
vine for large effects. Its foliage becomes brilliant scar
let to the fall, when it is called the "crimson glory
vine." In general appearance it much resembles Vitis
Labrusca. In cult. it has been confused with V. Thun
bergii. It grows readily from imported seeds; it can also
be prop. by layering and by grafting on other stocks.
Named for Mme. Coignet, of Lyons, France.

41. lanata, Roxbg. A tropical or warm-temperate
variable species, probably not hardy in this country
outside of the southern parts: sts. and lvs. pubescent
or tomentose: lvs. 3-6 in. or more long (sometimes
very large), sometimes nearly glabrous but

3966. Vitis Coignetia.
heterophylla var.—V. Voinieriana, Balt. Climbing, the tendrils spiral, red-purple; lvs. persistent, coriaceous, long-stalked, digitate with usually 3 elliptical coarsely dentate lfts. which are glabrous above and bright green; fls. in axillary short-peduncled cymes, hermaphroditic; sepalas 4, oval, shorter than the 4 oval-lanceolate separate petals; carpels woody, with a short 4-lobed style, the 2 carpels biovulate. Tonkin. R.H. 1902, pp. 56, 57. R.B. 28:3; Genus doubtful.—V. vourapiana, Hort., “observed in a Nice villa garden” (1713), sta. brown-felted; lvs. large and leathery, deeply cut into fine lobes, brown-tomentose, deep olive-green at maturity.

L. H. B.

VITTADÍNIA (Dr. C. Vittadini, an Austrian who wrote on fungi, 1826-1842). *Compósiteae*. 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 pinnatisect, numerous, crowded, in more than one row: achenea 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 Zeal., 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 Vittadínia are awl-shaped. For *V. triloba*, Hort., not DC., see *Erigeron mucronatus*.

australis, A. Rich. (*V. triloba*, DC., not Hort.). Herbaceous plant of uncertain place, 1 ft. high or less, tomentose: lvs. obovate or spatulate to linear-cuneate, 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., Tasman.—There are botanical varieties.

V. tricolor, Hort., is apparently *V. australis*, A. Rich.

WILHELM MILLER.

VIT'TÁRIA (Latin, a fillet or head-band or ?vitta, a line). *Polygodiaceae*. 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. Fl., where it grows on the cabbage palmetto. Rare in cult. and interesting only as an oddity. *V. filifolia*, Fée. Fig. 3067. 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.

3067. Vittaria filifolia.

VOANDŽÉIA (from a native name). *Leguminóseae*. One species, *V. subtrareána*, Thouars, cult. widely by the natives of Cent. Afr. for its underground peanut-like seeds. It is a prostrate herb with a creeping pubescent rhizome from which arise slender-stalked compound lvs. 3, oblong or lanceolate, 3 in. or less long, with minute obtuse stipels: fls. yellow, 1/4 or 1/2 in. long, papilionaceous, 1-3 on flexuous peduncles; calyx very small; standard obovate; wings equaling standard, oblongo-elliptic; keel boat-shaped, not beaked; stamens diadelphous; fr. a tuber-like roundish pod, about 1/2 in. or more long; when 2-seeded: the 2 rows after flowering and the ovary is buried in the earth, where the fr. ripens; seeds globose-ellipsoid, about 1/4-1/2 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 Adamawa (see Kow Bull. 1912, p. 215; and in this article the plant is distinguished from *Kerangium geocarpa*, page 1737, another underground legume widely cult. in Trop. Afr.). Voandzeia appears not to have been intro. in this country.

L. H. B.

VOCHÍSIA (Voch, is the name of one of the species in Guiana). *Vochysiaceae*. Glabrous or tomentose usually resinous trees, frequently tall shrubs, occasionally grown in the greenhouse: 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 3-celled: caps. leathery or woody, 3-celled, loculicidally 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, 55 ft. or more high; lvs. ovate-oblong, long-acuminate, attenuate at base, glabrous above, ferrugineous-tomentose beneath: fls. in terminal racemes, which are loose and slightly nodding. Guiana.—V. guianensis, Aubl. Tree, 12 ft. or more high; lvs. obovate-oblong, shortly acutate, glabrous on both surfaces: fls. in simple racemes, which are erect, terminal and dense-did; spur spreading. Guiana.

VOLKAMÉRIA: *Clerodendron*.

VOLUTÁRÉLLA (diminutive of *Volutaria*). *Amberboa*. *Compósiteae*. Erect or divaricately diffuse villous or glabrous annual herbs, sparingly grown in Calif.: lvs. alternate, rose-dentate or remotely pinnatifid: heads heterogamous, outer fls. 1-row, neuter, disk-fls. fertile; involucre ovate or globose; bracts in many rows, imbricate; corolla purplish, violet, or blue, regular tube slender and very short, limb cylindrical, deeply 5-lobed: achenes obovoid or oblong, prominently 10-15-ribbed. About 7 species, Medit. region, W. Asia, and India. This genus is treated as a part of Centarea by Hoffmann in Engler and Prantl, *Pflanzenfamilien* IV, pt. 3. *V. murielii*, Benth. & Hook. f. (*Amberboa murieta*, DC.). St. erect, 1-2 ft. high: basal lvs. lanceolate, attenuate to the petiole; calyce sessile, middle ones auricled, upper and lowest not auricled, linear-oblong-lanceolate: fls. purple. Spain and Morocco.

According to the Brussels’ Congress, Amberboa is placed in the list of genera in which this ruling is followed, the species above mentioned will take the name *A. murieta*, DC.

VOUÁPA (native name in Guiana). *Leguminóseae*. Unarmed trees, rarely cult.: lvs. abruptly or some, very seldom pinnately-cordate or lobate: lfts. few-pair, or few-paired, sometimes many-paired; stipules leafy or inconspicuous: fls. yellow, red, or white, small or medium-sized, in terminal and axillary simple racemes or shortly fascicled-paniculate; calyx-tube bearing a disk, short-turbinate, rarely narrow, segms. 4; petals, uppermost clawed, 2-4, lower small, scale-like or none;
perfect stamens 3; ovary stipitate, 3- to many-ovuled: pod obliquely orbiculate, ovate-oblong or falcate, 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 "nomina conservanda" accepted at Vienna. Macrolobium bijolium, Pers. (M. Vouapa, J. F. Gmel. Vouapa bijolium, Aubl.). Tree, about 10 ft. high: lfts. sessile, ovate, acuminate, oblique: fls. violet; calyx lobes spreading; stamens nearly equaling the corolla.

Guiana.

VRIESIA (named for Dr. W. de Vriese, of Amsterdam). Bromeliaceae. Often spelled Vriesea, 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 Vrieseia of 2 ligules or a single cleft or emarginate ligule on the inside of the base of petals. Culturally, vrieseias 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. Infl. simple.
c. Bracts of infl. strongly imbricate.

speciosa, Hook. (Tillandsia splendens, Hort. T. pica, 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; 6, p. 162. 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 V. zebrina.

3969. Vrieseia carinata.

carinata, Wawra (V. brachystachys, Regel. Tillandsia carinata, Baker). Fig. 3969. Lvs. rosulate, about 6 in. long, the base sheathing, mucronate at the tip, somewhat glaucous, not spotted: spike with wide-spreading nearly disarticulate acuminate bracts which are scarlet at the base and yellowish green at the end: fls. protruding, pale yellow. Brazil. B.M. 6014.

c. Bracts of infl. remote, not imbricate.


c. Bracts of infl. strongly imbricate.

psittacina, Lindl. (Tillandsia psittacina, Hook.). About 1 ft. high when in bloom: lvs. rosulate, 6–10 in. long, dilated at the base, yellowish green: fls. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. B.R. 29:10, where the genus is founded. B.M. 2841. R.H. 1855:221.—A showy species when in bloom.

AA. Stamens shorter than the petals.

B. Lvs. not barred, mottled, or tessellated.

heliconioides, Lindl. (V. billula, Hort. Tillandsia heliconioides, HBK.). Dwarf and tufted, with many rosulate recurving or arching lanceolate lvs. (about 12 in. long) which are bright green above and purple-tinted beneath: scape over-topping 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 checkerwork) or minutely variegated.


fenestràlis, Lind. & André (Tillandsia fenestràlis, Hook. f.). Robust, densely tufted, the lvs. stout (1–2 ft.

**BBB.** Lvs. marked with strong transverse bands.

**hieroglyphica, Morr.** *(Tillandsia hieroglyphica, Bull.)*. Fig. 3970. Lvs. many, rosetulate, 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. Gn. 37, p. 244 (adapted in Fig. 3970).—A very striking and showy plant. Sometimes known as a Massangea.

**V. Bloki, Hort.** *(Tillandsia Bloki, Hort.)*. Infl. crimson, pinnately paniculate, 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. C.C. III. 45:388.—**V. fulgida, Hort.,** has been catalogued in this country. It is a garden hybrid (V. ineuvata×V. Duvalii). It has short green lvs. and an exserted simple spike with distinct red banded bracts. I.H. 32:67.—**V. glaucophilla, Hook,** is Tillandsia fasciculata.—**V. Leopoldi=V. spenndens×V.** Maloine, G. 54:1539.—**V. muscica=Guzmania.**—**V. repina, Ant.** Lvs. very long-acute; infl. large; bracts elliptic-ovate, rounded at apex: fls. dirty yellow. Brazil.—**V. Itux.** Hybrid. R.H. 1907:570.

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**VUYLSTEKEARA**

**VYLSLEKEARA**, a multi-generic orchid hybrid embracing Cochlidio, Miltonia, and Odontoglossum. It bears the name of Charles Vuylnsteke, of Ghent, Belgium, and the name is conformable with Adamara, Linnea, Lowiara, Wilsonara. 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 (C.C. III. 56:14) as a hybrid of *Miltonioda Blevana* and *Odontioda Chartenworthii*, bearing cream-white fls. with brownish spots; and **V. Hyeana**, Hort., a hybrid between *Odontonia Lairessex* and *Cochlioda Nozalina*, with fls. 2 in. across with a cinnamon tint suffusing the greater part of the surface of the sepals and petals after the color of *C. Nozalina*, but with the form of fl. approaching *O. Lairessex* 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 *Miltonia Warscewiczii*.

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[Image of Vriesia hieroglyphica.](3970)
WAHLENBERGIA (named after Georg Wahlenberg, 1780–1851, Swedish botanist). Including Edraianthus (Hedraianthus). Campanulaceae. Annual or perennial herbs, base of the stems sometimes woody, used as greenhouse and border plants, mostly the latter.

Leaves alternate, rarely opposite; id. usually irregularly centrifugal; peduncles terminal, lateral or axillary, solitary or rarely paniculate; fls. usually blue and nodding; calyx-tube adnate, hemispherical, turbinate or oboconical-oblong, limb 5-parted, very rarely 3-4-merous; corolla campanulate, funnel-shaped, tubular or rather rotate, 5-cleft, very rarely 3-4-cleft; ovary inferior or semi-inferior, 2-5-celled: caps. erect, loculicidally 5-valved.—About 110 species, Eu., Medit. region, S. Afr., 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. Fls. solitary on the peduncles.

c. Fls. several to numerous on the peduncles.


It seems to have replaced W. aurea, Steetz, the favorite of a former generation, being larger-fld., more robust, and rather easier of cult.

Wilhelm Miller.

WAKE ROBIN: In England, Arum maculatum; in America, Trillium.

3972. Yellow or barren strawberry.—Waldsteinia fragarioides.

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 flush 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 effort 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.

fragarioides, Tratt. Fig. 3972. Pubescent or nearly glabrous: lfts. dentate or crenate except at the base, 1-2 in. long; scapes corymbose 3-8-fld.: achenes 4-6. May, June. Woods and shaded hillsides, New England to Minn. and Ind., along the Alleghanies to Ga. B.B. 2:218. R.H. 1890, p. 510. B.M. 1567 and L.B.C. 5:408 (both as Dalibordia fragarioides).


WALKS

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 grass. (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) rectangular (Fig. 3974). The stones should be set 20 inches apart,

3973. A good garden walk.

lobata, Torr. & Gray. Foliage slightly hairy; lvs. cordate, 3-lobed, the lobes crenate with mucronulate teeth; petioles slender, longer than blades: scapes about as long as lvs.: sepals triangular-lanceolate, acute; petals narrowly oblong or elliptic: achenes usually 2, densely pubescent. S. W. Ga. F. Tracy Hubbard.

WALKING-LEAF FERN: Camptosorus.
center to center, well bedded in earth, and level with the sod.

Tanbark paths, grass-bordered, are a degree more pronounced. The tanbark should be spread 2 inches thick over a bottom of 6 to 12 inches of broken stone or cinders. If the path is of such importance to the 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 planted with low-lying perennials like Sedum acre, Armeria vulgaris, certain saxifrages, 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, subdividing charming greenward, 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 strolls. 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
WALKS

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 mowing 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 lamp-black to destroy the usual whiteness of cement surface. These walks may be constructed in the usual way (8 inches cinders, 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. These will carry the surface water to park inlets which discharge into sewer lines.

Driveaways.

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 a straight avenue 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 driveaways 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 tire-some turnings are esthetically pleasing; grades must be considered and fine existing natural features, trees, rocks, and the like usually avoided. The driveaways 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 more length to the approach should be avoided.

To be comfortable as well as practicable, the gradient should be as low as 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.

3978. Walk crossing a lawn in slight depression for concealment.

3979. Transition of grades. Method of sighting by stakes and twine.

3980. Planting of curves, and free views. Entrance at right angle to highway.
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 special 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. 3980), 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 \( \frac{1}{2} \) 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\(\frac{1}{2}\)-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 cementious 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 “chinking 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 rustie 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.

WALFLOWER. The vernacular name of Cheiranthus Chetri, 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.

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 without 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.

WALLICHIA (Nathaniel Wallich, 1786–1854, Danish botanist; wrote on plants of India.) Palmaces. 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, cespitose, with short branching caudices, or in 1 species tall; lvs. densely fasciculate, terminal, distichous, scaly, usually pinnatisect; spadix, solitary or the lowest in groups, cuneate at the base, oblong-obovate or obovate, erose-dentate, the terminal one cuneate; midnerve distinct; nerves fimbriate; margins recurved at the base; petiole slender, laterally compressed; sheath short, spart, with the margins deeply crenate: spadices short-peduncled, the staminode or recurved, ovoid, much branched, densely ffd., the pistillate looser, eert: spathes very numerous, slender-coriaceous, the lower ones the narrower, tubular, the upper ones cymbiform, entire, imbriated: ffs. 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-lobed calyx, and in Arenga the calyx has 3 distinct sepal.

disticha, T. Anders. Fig. 3988. Caudex 10-15 ft. high, about 6-6 in. diam.: lvs. graceful, 6-10 ft. long, alternate, eert: ffs. 1-2 ft. long, 2-2½ 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: ffs. in many spiral series, green. Himalaya.

caryotoides, Roxb. (Harina caryotoides, Buch.-Ham. Didymosperma caryotoides, Hort.). St. very short or none, often sheathed with the persistent leaf-bases: lfs. obovate or linear-oblong, panduriformly excised and acutely toothed, white beneath: spadix about 18 in. long, the ffs. purple or yellow, according to sex. F. 1874, p. 161. R.H. 1870, p. 368.

W. densifiHora, Mart., a palm like W. caryotoides and differing only in the following ovary characters, is offered in Eu. Under Amer. J.F. 3, pl. 233, 234. W. parphysodrpe, Mart. See Didymosperma.

JARED G. SMITH.

N. TAYLOR.†

WALNUT (formerly sometimes written wallnut, 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 or of the Juglans regia is sometimes, but provincially, given to hickory-nuts.

The walnuts may be thrown into three horticultural groups: (1) The Persian or English domesticated species, *Juglans regia* (Fig. 3980), 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. 3991), 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.

The 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 $3,500,000. 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 $45,000,000.

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 this industry 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 all trace back more or less directly to the efforts of Sexton. 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 planted by many of the orchardists engaged in this industry. Success with this crop depends on the soil 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 underlaid with a fluctuating water-table by a hardpan within 4 or 5 feet of surface are usually 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 best production of nuts.

The walnut industry has been most successful throughout the coastal 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 practised 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.

Cropping is made possible 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.

Companion crops in bearing groves are seldom seen, 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 hoed 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 plantings of walnuts 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 men-tioned 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 an 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 pickers receive 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. 3900), sacked, and sacked on the farm. They 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 sodium dichromate, to which sulfuric acid is added. Either 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 dry enough to sack. 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 the nuts 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 and 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 profitableness 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 income may 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 fungous 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. 3905). 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 melaxuma.

**Bibliography.**

WALNUT


Commercial possibilities of walnuts other than Persian in the United States.

Theoretically, the commercial possibilities of a number of walnut species in this country are large and encouraging. The genus Juglans, to which all true walnuts belong, either as native or as planted trees, covers practically every cultivated section of the United States wherever suited to hardwood growth. Apparently some of its representatives may be taken to many new small localities where it is now not found. The nuts of practically all species possess kernels rich in food properties and exceedingly pleasing to the taste. Most of its species are fairly rapid growers and develop into shapely trees. Rightly chosen and well cared for, they may be used most effectively as ornamentals and as nut-producers at the same time. The eastern black walnut, Juglans nigra, is exceedingly valuable for timber purposes, and its planting is now strongly urged by the foresters; to a large extent the various native walnuts and their hybrids make the best stocks now available for the Persian walnut.

Practically, there is little doubt that each of these species will ultimately be developed for purposes of nut production, although in common with most new industries the progress will be slow and beset with more or less disappointment. It should be borne in mind that these walnuts are wild and uncultivated species and cannot be expected to respond to cultivation with the same readiness as species which have been selected and cultivated for centuries.

The principal problem now before the prospective planter appears to be one of varieties. It is well established that seedlings vary greatly in all essential characteristics and, therefore, are less desirable than are budded or grafted trees of suitable varieties. However, to date, there are fewer than a half-dozen varieties of black walnuts offered by the nurserymen, and so far as generally known, there is none of butternuts or other kinds of walnuts, exclusive of Persian. Therefore, for the present, planters must depend very largely on seedling trees, for which, although they are generally condemned by the leading horti-

culturists, there are at least four substantial reasons for using, as follows: (1) Budded and grafted trees are as yet offered by the nurserymen only to a very limited extent; (2) the available varieties are new and practically untried; (3) the prices necessarily asked by the nurserymen are beyond the reach of many who would otherwise plant walnut trees; (4) desirable varieties are liable to result from the planting of nuts from choice trees.

Definite steps are now being taken toward the development of these species and already some distinct progress has been made; but as yet it is very doubtful whether commercial planting of trees of any species of Juglans, other than J. regia, for purposes of nut production alone, is to be recommended. In general, it is unwise to attempt the growing of trees for the dual-purpose of timber and nut production, as for the former, the trees should be set close together in order to induce the development of long trunks with a minimum of top, while for the latter purpose, they should be given orchard space between in order to allow for the development of low heads, large tops, and a maximum fruiting surface. But in view of the uncertainty of outcome with any of the present available varieties and the value of black walnut timber, it is possible that trees of this species might wisely 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 Californian forms produces nuts of value in commercial quantities.

Without doubt, the most promising place for walnut planting at the present time is about the home grounds, both in the city and in the country, and along the fence-rows everywhere. Very often walnuts yielding both beauty and product could as well be planted as trees of other species capable of affording beauty and shade only. In the country, few grounds are so crowded that there is not room for a few walnut trees, which could be procured at small initial cost and which could 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 nurserymen. 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 shorter-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 but revert to each other or to intermediate forms. Occasionally, and not frequently, the nuts of which are often practically indistinguishable from those of the butternut. These forms are now fairly common throughout much of the eastern and southern United States. The trees are dwarfish in habit, broadly spreading, ornamental, precocious, and usually prolific. A few varieties have been recognized and propagated to a limited extent, but so far as can be ascertained, none is now listed by the nurserymen. However, enough good strains may now be selected to cover practically every section of the United States, with the possible exception of the dry Southwest. The nuts vary in size and form, 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. Hindeli*, *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 × J. nigra*); *J. quadrangulata* (*J. regia × 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 stock for other species, as already noted, but usually they are practically nonproductive and of little value to the orchardist.

C. A. Reed.
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.

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WARPÚRIA (named after G. Warpur, who collected the genus). Acanthâceae. 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 axils; calyx hyaline, 5-parted, segments narrow, posterior 3 distinct nearly to their base, anterior 2 con

nate to their middle; corolla-tube rather cylindrical, limb minute, lobes 5, rotundate; stamina 4; disk annular; ovary 2-celled, cells 2-ovuled: caps. oblong, the upper third contracted into a beak.—One species, Madagascar.

clandestina, Stapf. Plant about 4–5 in. high, pilose: st. short, prostrate or ascending: lvs. petioloed, oblong or oblong-lanceolate, 2½–3 × ⅚–1⅛ in., acute or subacute at both ends; peduncles declinate, densely canescent; head ½–1 in. diam., white-pilose: calyx-segments triangular-subulate from the base; corolla white, limb minute. Madagascar.

WÁRREA (named for Frederick Warre, who discovered the first species in Brazil). Orchidâceae. Plants with the habit of small forms of Phaius. Lvs. few, long, plicate; scape tall, bracted, bearing a raceme of terminal showy fls.: sepals and petals subequal, concave, the lateral sepals united with the base of the column; labellum not spurred, united with the base of the column, undivided, concave, with longitudinal ridges; column without appendages; pollinia 4, with a narrow stipe.—Two species, Peru and Colombia. They require the same treatment as phaius.

bidentâta, Lindl. (W. Lindenianâ, Henfr.). Labellum regular, slit at the end; ridges convex, the central one thinner and deeper: bracts one-fourth as long as the pedicels. Sept. Venezuela and Colombia. A.F. 8:655.

W. cyanâ, Lindl.—Aganisia cyanâ.

HEINRICH HASSELBRING.

WARSCEWICZÉLLA (from J. von Warszewiez, a Pole, collected in S. Amer. for Van Houtte; died 1866 in Cracow). Orchidâceae. Orchids suitable for a cool-house. Fls. solitary, large, on a peduncle; sepals and petals similar, the lateral sepals forming a chink; lip united to the foot of the column, 2–5-lobed, with erect side lobes; and a transverse plate free from but lying upon the middle lobe; pollina 4.—About 10 species, from Costa Rica to Colombia and Peru. By some included in Zygopetalum.

discolor, Reichb. fam. (Wârscewiczâ discolor, Lindl. Zygopetalum discolor, Reichb. f.). Fig. 3996. Lvs. narrowly lanceolate, jointed, 6 in. long: scapes 1-fl., shorter than the lvs.: sepals spreading, lanceolate, white; petals shorter, ovate, white with a tinge of purple, half-spreading; labellum large, broadly obovate, somewhat convolute, white, changing to deep purple toward the disk, and having a whitish or yellowish crest. Cent. Amer. B.M. 4890.

Wândlándii, Hort. (Zygopetalum Wândlándii, Reichb. f.). Lvs. tufted, lanceolate: fls. 4–5 in. across, solitary, on a scape 3–4 in. long; sepals and petals lanceolate, somewhat twisted, greenish white; labellum ovate, cor- date, undulate, white, streaked and spotted with violet-purple; apex revolute, crest semi-circular, violet-purple.

W. aromáctica is offered by Lager & Hurrell. Apparently little known. Described as having white fls., with an azure lip, white-bordered. Said to come from Costa Rica.

GEORGE V. NASH.


Trunks clothed above with remains of the sheaths and petioles: lvs. terminal, ample, spreading, orbicular, flabellately plicate, lobed nearly to the middle; segments induplicate, filamentous on the margins; rachis short; ligule large, appressed; petiole long, stout, plano-convex, very spiny along the edges: spadices long, copiouslypaniculate branched, glabrous: branches slender, flexuous; spathes long membranous, split, glabrous: fls. white; fr. small, ellipsoid, black drupe, with a thin and sweetish rather dry pulp; seed brown, oblong to oblong-ovate, flattened, excavated or wrinkled on the raphal face.—Species 3, now recognized, Ariz., S. Calif., and Mex.

Probably the oldest use of the generic name Washingtonia is by Rafinesque in 1818 for the umbelliferous plants commonly known as Osmorrhiza; it was also once proposed for the Sequoias; and the name Neowashingtonia has been advanced for these palms. However, the use of Washingtonia for the palm is too well established to warrant the change. Parish, who has recently studied these palms, retains the name Wash-ingtonia as the only tenable one, discarding the name Washingtonia when applied to the sequoias and also when used for the osmorrhizas on what he considers to be sound nomenclatorial grounds (Bot. Gaz. 44, pp. 408–434, 1907). His systematic treatment of the genus is followed in the present volume.

The Washingtonia that is best known in the wild is W. filifera var. robusta. The finest grove occupies the narrow palm cañon for a mile or more, 22 miles east of
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 older trees are still vigorous. Most of the canons of the desert bases of San Jacinto, according to Parish, contain these palms; and a few grow in the canon 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 base 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 edges and in the sinuses, and W. gracilis which is practically devoid of filaments.

A. Petiole prolonged into the blade with an acuminate point.
B. Blade of if. abundantly supplied with threads or filaments........... filifera
Bn. Blade nearly or quite destitute of filaments or threads........... gracilis
AA. Petiole obtuse at its top where it joins the blade........ Sonora

filifera, Wendl. (Brâheâa filamentâa, Hort. B. filifera, Hort. Prichardia 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 (2-3 ft.), covered with persistent petiole-bases: petioles 2-5 ft. long, 1-2½ in. wide at the summit, glabrous, plano-convex; ligule large, glabrous, lacerate; blade circular, tomentose on the margins of the many segms., 3-5 ft. diam., cleft on the upper side nearly to the middle, gray-green; segms. margined with numerous fibers 6-12 in. long; seed flattened on the raphal face. Probably S. Calif. and W. Ariz.—Cult. on the Riviera, S. France, but not distinguished in this country.

Var. robusta, Parish (W. robusta, Wendl. W. filifera, Hort., not Wendl. Neowashingtonia filamentosa, Sudw.). Fig. 3997. The palm usually cult. in this country as W. filifera, whereas the one cult. as W. robusta is really a 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 lbs., the inflo- dense, but in fr. becoming diffuse or open: flowers, with heavy odor; seed excavated on raphal face. Borders of the Colorado Desert in S. Calif., at low altitudes.—The commonly planted Washingtonia in Calif. with filiferous lbs. The portraits in horticultural magazines are mostly not clearly referable.

Var. microspérmâ, Becc. Cult. in the Riviera but yet undiscovered in the wild, differing in smaller stature, and

WATER ALOE

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gráciilis, Parish (W. robusta, Hort., not Wendl.). A slender-trunked palm, to 80 ft. or so, the lbs. nearly or quite destitute of filaments: petioles 2-3 ft. long, rather convex on upper surface, the hard margins armed with short yellow hooked spines for the entire length, the top acuminate where it joins the blade; ligule paper-like, narrow, entire; if.-blade about 3 ft. diam., with 75-80 folds, cleft little more than one-third toward base: peduncle declined, exceeding the lbs.: flowers nearly sessile: seed broad-ovate, about ¥2 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 lbs. which bear no filaments or threads except now and then one in the sinuses of some of the folds.

3997. Old tree of Washingtonia filifera var. robusta.

Sonóra, Wats. (Neowashingtonâa Sonóra, Rose). Top of petiole obtuse where it joins the blade, the latter abundantly supplied with filaments: st. 25 ft. high, 1 ft. diam.: lbs. 3-4 ft. diam., somewhat glaucous, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, ¥2 in. at apex, floccose-hairy along the margins and with stout curved spines: fr. ¥2 in. long, edible. Guyamas 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 when and how much to water. The judgment varies with the varieties of plants and the conditions. In fact, however, the essential elements of success in watering 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 untachable; 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. 3998.

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 take 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. Softwooded 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. Hardwooded 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 plant's 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 beginning and sour unless watered with special care 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 the heavier clay soils are in danger of becoming waterlogged and sour unless watered with special care if they are subsequently shaded for a few days, is usually sufficient until they have become established.

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 drier out by nightfall. It is seldom advisable to let plants under glass go to bed at 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 seasons 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 richarddias 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. Sprinkling 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 exces-
WATERING 3509


WATSONIA (named for Sir Wm. Watson, M.D., 1715-1757, electrician and professor of botany at Chelsea). Iridiacea. Tunicate bulbous herbs, much like gladioli, used in the garden for summer bloom.

Stems usually tall; lvs. long, sword-shaped; spikes long, simple or slightly branched; spathes lanceolate oblong or narrow, usually numerous; fls. 1 to a spathe, sessile; perianth-tube curved, broadened above, lobes subequal, ovate, oblong or lanceolate; stamina affixed within the throat; ovary 3-celled, cells many-ovuled; capsule 3-valved.—About 33 species, S. Afr. The main differences between Watsonia and Gladiolus, from the horticultural as well as botanical points of view, are the longer tube and regular fl. of Watsonia, 3 of the 6 perianth-segms. in Gladiolus being usually different in size, shape, and direction of spread. An important botanical difference is that the style-branches of Watsonia are simple, while those of Gladiolus are bifid.

Watsonia bloom from July to September and have scarlet, rose, or white six-lobed flowers, with usually a long slender tube which is bent near the base. They are very much like gladioli, having the same kind of a corm, the same sword-shaped rigid leaves, the same kind of a spike and the same season of bloom. It is, therefore, a great mistake to suppose that they are suited only to greenhouse cultivation. Great interest has been aroused in Watsonia by the introduction of the white watsonia, known to the trade as W. Ardernei. The plant might be roughly described as a white gladiolus. It grows 3 to 4 feet high, strong specimens being branched, and bears a dozen or more flowers, each 2½ to 3 inches long and about 3 inches across. The purity of its color and its value for cutting make it of exceptional interest to florists. There are other white-flowered forms of watsonia, but none of them seems to be in the American trade. Pure white is the exception in the iris family, while it is a common, if not dominant, "color" in the lily and amaryllis families. The white watsonia has acquired so many names that a short historical sketch of this plant is desirable. All the stock in the trade at present is supposed to be descended from plants cultivated by H. W. Arderne, of Cape Town. The original bulb was found 80 miles away in a peat-bog amongst thousands of the common pink-flowered kind. In October, 1892, Arderne had 400 spikes in bloom and in March, 1893, some of his plants were pictured in "The Garden" under the name of Watsonia alba. However, a pure white-flowered form had been previously found near Port Elizabeth and a bulb sent to J. O'Brien, of Harrow, flowered in England in 1889 and was then fully described as W. iridifolia var. O'Brientii, the name adopted in this work. In the recent discussions on short-olivaceous plants, geraniums more especially, for these are quickly exhausted by too frequent waterings.

In watering beds in the open ground and lawns, the chief consideration is thoroughness. Superficial waterings induce the formation of roots near the surface. Neglect and subsequent drought then prove more disastrous than ever. The evening is the best time for surface sprinkling. Watered in the heat of the day, grass and various other plants are likely to have the foliage injured. One great advantage in this method is that plants which plants which would otherwise need a shift into a size larger pot can be carried along another month in perfect health. This applies more particularly to quick-growing soft-wooded plants, geraniums more especially, for these are quickly exhausted by too frequent waterings.

A. Upper part of tube cylindrical or narrowly funnel-shaped.

B. Length of perianth-segms. ¾-1 in.

C. Sts. tall, 3-4 ft., often branched.

D. Spikes lax, 12-20-fld.

E. Fls. scarlet.

A. Angustifolia, Ker-Gawl. Bright scarlet or pale pink-fl. species, 1-2 ft. high, remarkable for the short perianth-segms.: st. simple or branched; spikes 6-12-fl.d. B.M. 533 (rosy scarlet, splashed with cardinal, the inner segms. white at the tip).

B. Length of perianth-segms. ¾-1 in.

C. Sts. tall, 3-4 ft., often branched.

D. Spikes lax, 12-20-fl.d.

E. Fls. scarlet.
WEDELIA (Georg Wolfgang Wedel, professor at Jena, Germany, 1646-1721). Compositae. Scabrous-pulverulent or laráceous, annual or perennial herbs or subshrubs, suitable for growing in the greenhouse: lvs. opposite, usually dentate, rarely 3-leaf or entire: head heterogamous; ray-fls. male, disk-fls. fertile or the innermost sterile; involucres ovoid, campanulate or somewhat hemispherical, bracts in 2 rows; corolla yellow or white, limbulate, solitary or in heads female regular, tubular, 5-toothed or shortly 5-leaf: achenes glabrous or pilose, smooth or tuberculate, cunate-oblong or obovate.—About 70 species, natives of the warmer regions of the world.

oblonga, Hutchins. Glandular-hairy herb, up to nearly 3 ft. high; lvs. oblong or oblong-lanceolate, 3-5×3-5 ft. in. long; head lemon-yellow, 1½-2 in. diam.; outer bracts leaflike, inner somewhat scarious; ray-florets about 12, 3-toothed. British E. Afr.

To this genus, Pascalia is referred by recent authors. P. glacis, Ortega, is from Chile, probably not cult. The plant cult, under this name in England, is probably the plant shown in F.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 hardy sunflowers. P. glacis 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 so 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 pigweed and the purslane are sometimes vegetables, 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 to be neglectful of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are amongst the chief.

The one way to destroy weeds is to practise good farming. Judicious tillage should always keep weeds down in cultivated areas. In idle lands weeds are likely to be 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. If such weeds are perennial, as dandelion and plantain, it is advisable to pull them out; but in order to keep them out, a stiffer sod should be secured. The annual weeds that come in the lawn the first year are usually destroyed by frequent use of the lawn.

Foul lands may usually be cleared of weeds by a short and sharp system of rotation of crops, combined with good tillage in some of the crops of the series. When the land for any reason is fallow—as when it is waiting for a crop—surface tillage with harrows or discs will often remove weeds, and keep the field free for the crop. It is always a good practice 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 methods of ridding the place of weeds. Coarse and rough stable manure, which is not well rotted, may also be a considerable source of weeds. The seeds of weeds are sometimes carried in the seed with
which the land is sown, particularly in grass and grain seeds.

It does not follow that weeds are always 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 entangle some extra care the next year in order to prevent them from gaining a mastery, but this 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 and 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 roadsides and vacant lots. The greatest difficulty arises on commons and waste land, not on farrows.

Weeds are often troublesome in walks, particularly in those made of gravel. If the walk were excavated 2 feet deep and filled with stones, rubble, or coalashes, weeds cannot secure a foothold. It is particularly important that gutters be not laid directly on the soil, else they become weed. There are various precautions that can be applied to walks to kill the weeds, although, of course, they also kill the grass edgings if carelessly applied. Strong brine, applied hot, is one of the best (one pound of salt to one gallon of water). There are also preparations of arsenie, vitriol, lime, and sulfur, known as herbicides. For identification of weeds and means of control, see Georgia’s “Manual of Weeds.” New York, 1914.

L. H. B.

WEIGELA, WEIGELIA: Diervilla.

WELDENIA (for Ludwig von Welden, an Austrian army officer, wrote on natural history; 1780–1835). Commelinaeae. Tuberous-rooted herb, suitable for the greenhouse: lvs. numerous, grouped at the top of the stem, forming a sort of involution about the fls.: cymes very densely fasciculate, sessile among the lvs.; calyx sessile, 1½ in. or less long, membranaceous, long and laxly tubular, the segments forming a constricted, narrow, corolla-tube slender, much longer than the calyx, lobes broad, spreading, subequal; stamens 6; ovary ovoid.—One species. W. cándida, Schult. f. St. short, simple: lvs. 6–8, strap-shaped, 2–6 in. long, with folding bases, pale green: fls. snow-white, 1 in. diam., solitary on erect scapes. Mex. and Guatemala. B.M. 7405.

WÉLFLIA (named in honor of the English royal family). Palmáceae. Unarmed palm, with a thick tall reed-like caudex, suitable for the greenhouse: lvs. terminal, pinnatisect; segms. coriaceous, strongly narrowed at base, apex entire or acuminately cut, many-nerved, plicate: spadices stout, pendulous; spathes 2, decussate: fls. in deep hexagonal depressions, monocious; male asymmetrical, sepals lanceolate, acute, compressed, sepals free, cymbiform-lanceolate, acuminate, petals much larger, 2 lateral cymbiform wing-keeled, distinct, narrower, flat, staminodes in a conical cup, ovary conic-cylindrical, 3-celled: fr. oblong, compressed, about 2 in. long, dark violet.—Two species, Cent. Amer. and Colombia. W. régiá, H. Wendl. Up to 60 ft. high: lvs. when young divided almost to the base into a pair of oblong acuminate lobes, having a bronzy tint, at length becoming pinnatisect, borne on slender peduncles; adult lvs. about 20 ft. long, pinnae numerous, narrow, unequal, decurrent on the angular rachis, whitish beneath. G.C. 1870:764. F.M. 1873:60. I.H. 18:62.

WELLINGTONIA: Sequoia

WELWITSCHIA (Dr. Friedrich Welwitsch, 1806–1872, botanical traveler, who brought this remarkable plant to notice). Gnetaceæ. 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 cotyledons), 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 curiosity; st. or trunk thick, cone- or top-shaped, usually somewhat raised, the lobes, said to be sometimes 14 ft. in circum.: lvs. 2, lasting the life of the plant, linear at first, later splitting into many sections: infl. axillary, paniculate, dichotomously branched, the branches ending in 4-angled amert-like spikes which are colored: fls. dioecious; male fls. with 4 perianth-segms. in the shape of a cross, stamens 6, joined at the base, seed sterile; 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 Tumbo, which was mentioned incidentally in the Gardener’s Chronicle, 1861, 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 1862 the name T. strobilifera was also mentioned. Neither the genus nor the species was botanically defined. In Gardeners’ Chronicle for 1862, the name Welwitschia was proposed, and under this name the characters were carefully drawn and the plant regularly described in Trans. Linn. Soc., 1863, 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 Tumbo as the proper name, and this name is taken up in Cat. Welwitschia Afr., pl. II, pt. 1 (1890). All the preceding literature is under Welwitschia and all the horticultural references; and inasmuch as the aim in nomenclature is, or should be, stability rather than priority, the principle of the oldest accepted usage should be invoked in this case and the name Welwitschia retained, particularly as the name Tumbo was not formally defined 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 sunshine, 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 reeling on the ground, flat and long-narrow, attached at the base to the main stem, and hard trunk: plant said to persist a century. G.C. III. 47:56. J.H. III. 46:38. G.W. 9, pp. 294–5.

L. H. B.

WESTRÍNGIA (J. P. Westring, Swedish physician and author; died 1833). Lavátae. Shrubs, suitable for greenhouse cult., although apparently not now in common cult.: lvs. in whorls of 3, 4, or rarely more, entire.
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.

WHITFIELDIA: F. Tracy Hubbard.*


WHIPPLE (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 sparsely 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-spatulate; stamens 10, rarely 12, with dilated lanceolate filaments and subglobose anthers; ovary half-superior or nearly superior, with 3-5 short styles: fr. a caps. separating into 3-6 1-seeded carpels. They are not hardy N. and rarely cult. in botanical collections only, as they possess no particular ornamental qualities. They are plants of dry regions and demand a well-drained soil; the best place for them is in a rockery. Prop. is by greenwood cuttings under glass and by seeds treated like those of deutzia or hydrangea.

modesta, Torr. Sarmentose; the long shoots with numerous short upright flowering branches, pubescent; lvs. broadly ovate to elliptic, acutish, with a few shallow teeth or nearly entire, appressed-hairy on both sides, 1/2-1 in. long; fls. white, about 1/4 in. across, in slender-stalked dense cymes 1/2-1/2 in. long. May. Ore., Calif.

WHITFIELDIA (named after Thomas Whitfield, intrepid naturalist who made several explorations into Trop. W. Afr. and brought back many choice plants). *Acanthaceae. Glabrous shrubs, rarely used as warm-house ornamentals; lvs. opposite, entire; fls. white or brick-colored, solitary in the axils of opposing bracts, arranged in a terminal raceme; calyx 5-parted, segms. membranaceous, colored, oblong or lanceolate; corolla-tube swollen almost from the base or slender-cylindrical and abruptly inflexed above widening to a campanulate throat, 6-lobed, lobes ovate or oblong-lanceolate; stamens 4, in pairs.—About 17 species, Trop. Afr. The material which has been offered in Amer. as *W. lateritia is really *Jacobiaria carnea (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. 4155. F.S. 1:30.

WHITLAVIA: *Phacelia.

WHORLIEBERRY: *Vaccinium.

WIDDRINGTONIA: *Callicris.

WIGANDIA (named after Johannes Wigand, Pomera-nian 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-segms. linear; corolla-tube shortly and broadly campanulate, scaled inside; lobes broad, spreading, with the throat, lower 2-celled: 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. 50 (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 *Hydrolea urens. When Choisy came to monograph the whole family he transferred *Hydrolea urens to the genus *Wigandia and called it *Wigandia urens, Choisy. He therefore had to rename the Mexican plant, and this he called *Wigandia Kunthii.

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 6 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.
CARCASANA, HBK. Fig. 3999. Erect robust subshrub, up to 9 ft. high, softly golden or silky-pubescent: lvs. rather long-petioled, ovate, obtuse, base subcordate, 18 x 10 in., coarsely, doubly and irregularly crenate, white-toothed beneath: infl. golden silky-pubescent, terminal, elongate, strict (a thyrsoid cin-cinus); corolla violet, tube white: caps. equaling or a little longer than the calyx, rayed, slightly longer than the calyx, rarely densely hispid: Mex. to Honduras.

URENS, Choisy, not HBK. (W. peruviana, W. Mill. Hybræola urens, Ruiz & Pav.). Stout erect subshrub up to 12 ft. high, very densely dirty-white: lvs. short-petioled, 8-12 x 6-7 in., broadly ovate, irregularly dentate-serrate, base cordate or truncate, apex obtuse: fls. arranged in a broad terminal raceme (cincinnus); sepals lanceolate-acute, hispid; corolla violet, purple, 4-lobed, anthers ovate, slightly longer than the calyx, very densely hispid. Mex. to Honduras.

Carrière merely said it was a silvery plant instead of something and gluttonous like W. caracasana. It is frequently listed in the trade and is sold to have blue-blue or wine-colored fls.

F. TRACY HUBBARD.†

WILKSTÆRMIA (named after J. E. Wilksœm, professor of botany at Stockholm, 1785-1856). Thymelëaceae. Shrubs or trees, occasionally grown in the warmhouse or greenhouse: lvs. opposite or rarely alternate: fls. in short terminal or axillary racemes, spikes or heads, usually in pairs or in clusters of 3-4, or rarely in the axils of the leaves: seeds papery, without scales in the throat; stamens 8; ovary villous, I-celled: fr. a berry-like drupe.—About 40 species, Trop. Asia, Austral., and the islands of the Pacific.


POSÉLÉGÉRI, Brit. & Rose (Echinocereus tuberosus, Rümpl. Cereus tuberosus, Posel.). Roots black, several, borne near the surface: sts. 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, delicate, pubescent, radials 9-12; central one ascending, black-tipped: fls. purple, 2 in. long; seeds pitted or rugose, ½ 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 Selenicereus, it does extremely well.

J. N. Rose.
List of state and provincial flowers.

<table>
<thead>
<tr>
<th>State</th>
<th>Flower</th>
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<tr>
<td>Alaska</td>
<td>Forget-me-not</td>
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<tr>
<td>Arkansas</td>
<td>Apple blossom</td>
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<td>California</td>
<td>Golden poppy</td>
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<td>Canada</td>
<td>Sugar maple</td>
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<td>Colorado</td>
<td>Blue columbine</td>
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<td>Connecticut</td>
<td>Mountain laurel</td>
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<td>Delaware</td>
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<td>Idaho</td>
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<td>Illinois</td>
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<td>Indiana</td>
<td>Carnation (pink)</td>
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<td>Maine</td>
<td>Pine cone and tassel</td>
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<td>Massachusetts</td>
<td>Peabody, May-flower</td>
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<td>Minnesota</td>
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<td>Magnolia</td>
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<td>Montana</td>
<td>Bitter-root (Lewisia)</td>
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<td>Nebraska</td>
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<td>South Dakota</td>
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<td>Daisy</td>
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<td>Texas</td>
<td>Blue bonnet, lupines</td>
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<td>Utah</td>
<td>Sego lily (Calochortus)</td>
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<td>Vermont</td>
<td>Red clover</td>
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<td>Washington</td>
<td>Rhododendron</td>
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<td>West Virginia</td>
<td>Rhododendron</td>
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<td>Wisconsin</td>
<td>Gentian</td>
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<tr>
<td>Wyoming</td>
<td>Lehua (Metrosideros)</td>
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</table>

Hawaii                          | Lehua (Metrosideros)          |

Elizabeth G. Britton.

4000. Windbreaks running across the direction of the prevailing winds.


WILLOW: Salix W., Virginian: Ita virginica.

WILSONARA (from a personal name). Orchidaceae. A hybrid orchid described and figured in G.C. III. 59, pp. 312, 313 (June 10, 1916). "The parents include Cochlioda, Oncidium, and Odontoglossum: Oncidium Charlesworthii (Oncidium incurum x Cochlioda Noeziana), and Odontoglossum illustrium (Lambeaunium x ardentissimum), and through the parentage of the latter O. crispum, O. Pescatorei, and O. Harrynum enter into its composition. The hybrid approaches closely to Oncidium Charlesworthii, and in a marked degree resembles Odontioda Hermione (C. vulcanica x Oda. heatonensis), many of the factors in the combination being difficult to trace. The erect oncidium-like spike bore ten pretty flowers, with purplish claret-red sepals and petals, the three-lobed lip being of white lilac color, with a blotch of claret-red in front of the crest."—Exhibited by Charlesworth & Co. For names of similar construction, see Adamara, Linnea, Louira, Vuplsteckera.

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 deflected, 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 best to use native trees for the break, since they are hardy and well adapted to the particular climate. Windbreaks often harbor injurious insects and fungi, and care must be taken that species of trees liable to these difficulties are not used. In the northeastern states, for example, it would be bad practice to plant the wild cherry tree, since it is so much infested with the tent caterpillar. In some cases, very low breaks may be as desirable as high ones. This is true in the open farming lands in the dry regions, since it may be necessary only to check the force of the wind near the surface of the ground. Windbreaks only 2 or 3 feet high, placed at intervals, may have this effect. Fence-rows sometimes act as efficient windbreaks. Near the seacoast, gardeners often plant low hedges for the purpose of protecting the surface of the garden. (See Plants for the Seaside, page 2670.) Along the Atlantic coast, the California privet is considerably used. This is Ligustrum ovalifolium, a Japanese plant. Farms in the open windy country may be efficiently protected by belts of woodland, or, if the country is wholly cleared, rows of trees may be established at intervals of a quarter or half mile across the direction of the prevailing winds (Fig. 4000).

In middle California, the most common windbreak is a tall thick hedge of Monterey cypress (Cupressus macrocarpa), either clipped close or allowed to grow naturally; it withstands heavy winds better than almost any other heavy-foliaged tree and is rapid in its growth. (Fig. 1790.) The Italians and Chinese, who have almost complete control of the truck-gardening industry in and around San Francisco, make extensive use of a Californian tree-mallow, Lavatera assurgentiflora (see page 1830), as a break and protection from the drift-sand. In California, various species of Eucalyptus may be used for breaks and wind-stops. The giant reed (Arundo Donax) is frequently grown around vineyards, particularly in the immediate vicinity of water. In California the olive, European walnut, fig, and almond are frequently planted for the outside row of an orchard of deciduous fruit-trees, to act as a partial windbreak.

On the plains and prairies, several kinds of poplars and willows, and also the box-elder (Acer Negundo), are 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 pleasure 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 dropping 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.

This 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-manure, 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
a shady corner or a northern exposure, more delicate plants may be used. For the former, such plants as geranium, coleus, achyranthus (iresine), Paris daisy, double petunias, may be used; or, if a more pretentious display is desired, crotons, colored-leaved dracenas, acalypha, nephidria, or small palms may be employed. Low-growing plants for the front of the box may consist of the dwarf white-leaved geranium Madame Sal-leroi, the golden feverfew, lobelia, sweet alyssum, and the white-leaved cineraria. For the drooping vines, nothing excels the variegated-leaved vinca, 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 seasonal appearance given by the use of small conifers, broad-leaved evergreens, small Irish junipers, low-growing junipers, arbor-vite, both pyramidal or globular, young trees of spruce, hemlock, or pine. Of broad-leaved evergreens, dwarf box, mahonia, Evonymus 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 barberries. These fruits are held through the winter without change in color. Hardy strains of English ivy or drooping plants of Evonymus radicans may be used to hide the boxes in winter.

It often happens that one or more plants in a box fail to thrive and the desired effect is lost. An attempt to remove such a plant by digging it out injures the remaining plants, or if the plant is cut out spaces are left. This condition may be obviated by using pot-grown plants, setting the pots containing the plants in the boxes and filling in around the pots with earth or manure; by so doing, any one plant may be removed and another substituted without injury or check to those remaining. By this method it is also possible to effect quick changes in the character of the boxes. The change may be from the winter material to spring-flowering bulbs, from bulbs to pansies, then to summer-blooming annuals, and again to autumn-blooming plants. Combinations may be changed at will, and reasonable effects be secured, and the monotony of a planted box be overcome. It is not necessary to grow the plants in large pots, a 4- or 5-inch size being large enough for most of the kinds to be used. In employing this method, however, it is best to have 2 or 3 inches of rich earth in the bottom of the box on which to place the pots; the roots of the plants will escape through the hole in the bottom of the pot and find sufficient food to develop. This plan of filling the boxes with potted plants will recommend itself when it is not possible to heat the room at all times, as a schoolroom from Friday until Monday; in this case the plants may be carried home over this period.

C. E. HUHN.


WINTERGREEN: Gaultheria and Pyrola. W., Flowering; Polygala paeonifolia.

CXIX. *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. If 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 picturesque branches and gives a certain oriental effect, but it is not the best method for covering a wall-space solidly or for making the best display of bloom. To cover a wall completely it is necessary to keep the leaders taut and to train outside branches wherever they are needed. If quantity of bloom is the first consideration, the vines should be pruned back every year to spurs, a common method in Japan. The low one-storied Japanese building will have a wisteria so trained that the vine follows the eaves all around the house. The foliage is all above, and the yard-long clusters of purple blossoms depend therefrom in solid unbroken linear masses two or three ranks deep. When trained as a standard, the wisteria requires much care. A fine standard is figured in G.F. 6:256 and Gng. 1:321, where directions may be found.

"When young plants of wisteria are cut back 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."

INDEX.

1. floribunda, DC. (Glycine floribunda, Willd. Wisteria brachybotrys, Sieb. & Zucc. Kraainhia 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, suborbate at base and auriculate, with a short stipe-like claw; calyx hairy, the 2 upper teeth very short and broad. Common on the margins of woods and along streams in Japan; much cult, there in temple grounds, parks, and gardens; also grown in this country. F.S. 9:880.—From the Chinese wisteria (W. sinensis) it is distinguished by more numerous lfts. which are shed earlier in autumn, much smaller, and 2-3-weeks-later fls., and greater hardiness. It runs into several marked forms. Var. alba (forma alba, Rehd. & Wils. W. multijuga var. alba, Carr.) has white fls. R.H. 1891, p. 421. Var. rosea (forma rosea, Rehd. & Wils.) has rose-colored or pale pink fls. with wings and tip of keel purple. Var. variegata (forma variegata, Rehd. & Wils. W. chinensis var. variegata, Nichols.) has variegated foliage. Var. violaceo-plena (forma violaceo-plena, Rehd. & Wils. W. chinensis var. flora-plena, Mill.) is a double-flowered form. R.H. 1887:564. Gn. 17, p. 105. F. 1882:557. Var. macrobotrys (forma macrobotrys, Rehd. & Wils. W. macrobotrys, Sieb. W. multijuga, Van Houtte. W. grandiflora, Hort.) has very long racemes, sometimes 2-3 ft.: much prized. F.S. 19:2002. R.H. 1891, p. 176. Under the name W. multijuga Russelliana, a slender racemed form is shown in Gn. W. 21, suppl. Apr. 2, although the lfts. are not more than 5 pairs. This variety is described as having a purple calyx, soft purple standard deepening in color with age on both faces and a creamy white eye-like blotch on the inner face; wings and keel dark blue, the tip of the keel violet; racemes reach 2½ ft. in length. Named for John Russell, Richmond, Surrey.

2. sinensis, Sweet (Glycine sinensis, Sims. Wisteria chinensis, DC. W. consequa, Loud. Kraainhia chinensis, DC. W. floribunda, Var. floribunda, Rehd. & Wils. W. floribunda DC. W. floribunda, DC.) has small, rounded, and slightly pubescent lfts. to 6 in. or more across, and clusters of small, usually purple or blue, racemes, 6-12 in. or more across. R.H. 1891, p. 421.
4005. Wisteria sinensis. (X about $\frac{1}{2}$)

nate or acute, cordate or rounded at base: racemes 6–10 in. long, drooping, loosely fl.d., the pedicels and calyx glandular-hairy; fls. light blue or purplish, the standard about $\frac{1}{2}$ in. across and not prominently auricled; calyx-teeth half or more the length of the tube. Swamps, III., southward.—Probably rarely if at all cult.

4. frutescens. Poir. (Glycine frutescens, Linn. Kraihia frutescens, Greene. Bradieia frutescens, Brit. W. speciosa, Nutt.). Tall stout climber, the trunk attaining several inches in diam.: not glandular, smoothish or somewhat downy at maturity: ft.s 4–6–7 pairs, ovate to ovate-lanceolate, acuminate but obtuse, glabrous above: racemes 4–6 in. long, densely ft.d.; 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 fl.s, has been listed. Var. magnifica, Herincq (W. magnifica, Hort.), supposed to belong here, has racemes 50–60-fl.d. and 6–8 in. long: fls. 1 in. across, lilac with a yellow spot, earlier than in the type. F.S. 11:1151.

5. venusta, Rehd. & Wils. (W. brachybotrys var. alba, Mill.). SILKY WISTERIA. Tall, reaching 30 ft. or more, the young growth pubescent: ft.s usually 5 pairs (from 4–6 pairs), velvety both sides, oblong-lanceolate or elliptic to ovate-oblong, short-acuminate, at the base subacute or rounded or truncate, entire: raceme pendulous 6 in. or less long including the short peduncle, broad, the rachis densely appressed-villosa. Fl.: of very large, white, on horizontally spreading pedicels; standard suborbicular, truncate at apex and auricled at base, clawed; upper calyx-teeth subulate: pod compressed, densely velvety; China, province Chi-n.—

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-fl. white wisteria known.

6. japonica, Sieb. & Zucc. (Milléitia japonica, Gray. Phaseolodes japonicum, Kunth. Kraihia japonica, Tark.) Glabrous throughout: ft.s 4–6 pairs, petiolulate, 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 callories at base; ovary and style glabrous, pod linear, 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 Millettea, where it was placed by Asa Gray; and under that name it is described in Vol. IV, page 2561.

L. H. B.†

WITCH-HAZEL: Hamamelis.

WITHÀNIA. See note under Salpiglooa.

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 Chicory.

The vegetable known as barbe-de-capuein, 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 beds or boxes where moderate heat can be applied, first cutting them off at the bottom to a uniform length of 8–9 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 bleeding the heads during their growth; 8 inches of clear sand is a good medium. This may be placed on the bedding material as soon as the roots are set. One or more free applications of water should be made. From 50° to 60° F. is a desirable temperature, the latter probably preferable since growth is slower at the lower temperature. Higher temperatures 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 should 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 or sizes of roots were used: extra, averaging 2 inches in diameter, large, 1.4 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 makes a satisfactory package for American markets.

L. H. B.

WOODWARDIA (named for L. Wittmack, professor at Berlin). Bromeliaceae. Tall herbs: lvs. with relatively small thorns, never branded; infl. arising from the lf.-rosette, with membranous sheaths, often nodding or hanging, compound panicles with long many-fld. racemose branches: calyx free or slightly adnate, the right side strongly winged; petals free, linear, acuminate, without scales; fr. a dry berry. About 5 species, Cent. and S. Amer. This genus has sometimes been referred to Aechmea; see Billbergia for cult. W. tingulata, Mez. Lvs. about 10 in a rosette, firm, strap-shaped, rounded, shortly cupulidate, about 2 ft. long, 2½ in. wide, spines short, broad-based, about 3 lines apart: scape floccose when young; sheaths lanceolate; pani permissible branched: fls. numerous, sessile; sepals white, ovate, bearing an awn nearly 1 in. long; petals yellow, ovate from an oblong base; ovary glabrous, rather cylindrical. W. Indies. B. M. 8056.

WOOD BETONY: 


WOÖDSIA (after Joseph Woods, an English botanist, 1776-1864). Polypodiaceae. A genus of mainly rock-loving ferns characterized by their inferior indium, 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 amongst rocks.

livénis, R. Br. Growing in rosettes or tufts: inf.-stalks dark, polished, jointed about ½ in. from the rootstock; inf.-blades 3-8 in. long, 1 in. or more wide, bipinnatifid; segms. crowded, obscurely crenate: sori confluent when old. Eu. and N. Amer. north of Va.

obtusa, Torr. Lvs. clustered, 6-15 in. long, 2-4 in. wide, minutely glandular-hairy, bipinnate; pinnae rather remote, triangular-or deltoid. W. shihii, R. Br., and W. alpina, Gray, are two rare alpine hardy species which have been offered. They are of interest only as rarities in large collections.

R. C. BENEDICT.


a. Lvs. of two sorts, the veins everywhere forming arocles.

arcédáta, Moore (W. angustifolia, Smith). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinna; sporophylls 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 arocles.

radicán, Smith. Lvs. rising from a short erect st., 3-5 ft. long, gracefully curved; pinnae 8-15 in. long, 2-4 in. wide, pinnatifid nearly to the midrib. The true W. radiéns from Eu. bears scaly buds toward the apex of the attached roots to form new plants. The Californian and Mexican species, which has often been referred to

4007. Woodwardia orientalis.
this species, is really distinct and never roots; it is apparently not in the trade.

orientalis, Swartz. Fig. 4007. Lvs. 4–8 ft. long, 12–18 in. wide, with lanceolate pinne and sinuate pinnules; veins uniting freely. Japan and Formosa.

Veins free between the sorti and the margin.

virginica, Smith. Fig. 4008. Lvs. arising singly from a long creeping rootstock; lf.-blades 12–18 in. long, 6–9 in. wide on stout stalks; pinna-linear-lanceolate, 4–6 in. long, cut nearly to the rachis into oblong lobes. Canada to Mich., Ark., and Fla.—Better separated as a distinct genus, Anchistea, on account of its slender long creeping rootstock, from which the lvs. arise at intervals.

W. spiculata, Mar. & Gal. (W. paradoxus, Wright). Resembles W. radicans but has narrower trends, and veins perfectly free from sorus to the margin. Vancouver Isl. to Mex.

L. M. UNDERWOOD.
R. C. BENEDICT.

WORMS. Under the names of "worms," "snails," and "caterpillars," various odd fruits of leguminous plants are grown as curiosities. The pods are often put in soups as a practical joke, not for their edible qualities. The plants chiefly grown for this purpose are Scorpiurus verticulata, Linn., S. subvellosa, Linn., S. muricata, Linn., S. sulcata, Linn., Medicago scutellata, Mill., and Astragalus hamosus, Linn. The last is the one usually known as "worms." The picture, Fig. 4009, shows species of Scorpiurus, chiefly S. verticulata (beneath) and S. subvellosa (above). All these various plants are annuals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See Caterpillars.

L. H. B.

WORMWOOD (Artemisia Absinthium). Fig. 4010. An erect hardy herbaceous perennial, native of middle and western Europe and the countries that bound the Mediterranean, and sometimes found in waste places as an escape from American gardens, having angular rather shrubby stems 2 to 4 feet tall, which bear abundant much-divided hoary leaves of intensely and persistently bitter flavor, and panicles of greenish or yellowish flower-heads. The seed, grayish and very small, retains its vitality for about four years, but is usually sown soon after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and, as its name implies, anthelmintic properties, although now, for no apparent reason other than caprice of practice, they are less popular with the profession than formerly. In domestic medicine they are employed as mentioned and as a diuretic; locally as a fomentation or as a decoction with vinegar to ulcers, sprains, and bruises. In the dry state they are occasionally placed among clothing as a moth-repellent. Formerly wormwood was used by brewers to embitter and preserve liquors, but at the present time it finds its most extensive use as the principal ingredient in absinthe, in the manufacture of which peppermint, angelica, anise, cloves, and cinnamon are also ingredients. According to Blythe, the green color of this liquor is due not to wormwood but to the chlorophyll of spinach, 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 may 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.

W. Scrophulariaceae.

Hardy perennial glabrous or slightly pilose herbs, suitable for the border or rock-garden.

Leaves nearly radical, petioled, crenate: peduncles scab-like, simple: fls. racemose at the top of the seape or spicate, solitary at the axis of the bracts, nodding, blue; calyx 5-parted, segms. narrow; corolla-tube exserted, cylindrical, limb 4-lobed, erect-spreadling; stamens 2; caps. acute, septicidally and loculicidally dehiscnt, 4-valved.—About 8 species. Eu. and Asia.

Amberstiana, Benth. Lvs. obovate-oblong or obovate-spatulate, 2–5 in. long, coarsely crenate or lobulate, narrowed at base and subpinatifid; petioles ½–1½ in. long; scapes 5–10 in. long, slender; racemes long, many-flid.: corolla ½ in. long. Himalayas. G.W. 9. p. 375.

carinthiaca, Jacq. About 9 in. high: lvs. oblong or ova-oblong, doubly crenate, slightly lobed, narrowed at base, radical few, 3–8 in. long: scape 1–2 ft. long; raceme dense, spike-like, at length elongated: corolla-tube ¾ in. long, limb shorter, upper segms. bifid, lower somewhat crenate. Mountains of Carinthia.

W. cordata, Greene—Synthysis reniformis.

F. TRACY HUBBARD.

WYETHIA (named for N. J. Wyeth, North American botanical collector). Compositae. Hardy perennial herbs, probably adapted to the wild-garden or border. Cauldron stout: sts. usually simple, 1-headed: lvs. radical or alternate, entire: heads large, heterogamous; ray-fls. pistillate, in 1 row, disc-fls. perfect and fertile; involucres hemispherical, the outer with narrow, yellow, rays liguulate, spreading, entire or minutely 2-toothed.—About 7 species, N. Amer. W. mollis, 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.
XANTHÍSMA (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.

texánnum, DC. (*Centauridium Drámondii*, Torr. & Gray). Fig. 4011. Nearly glabrous biennial or annual, 1–4 ft. high: lvs. narrowly oblong to lanceolate; st-lvs. 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. texánnum* var. *Berlandieri*, Gray), also of the prairies in Texas, is probably not cult.

N. TAYLOR.

XANTHÓCERAS (Greek, *xanthos*, yellow, and *keras*, horn, alluding to the yellow horn-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 racemes stamine, with rarely a few pistillate ones at the apex; sepals and petals 5; disk with 4 sub-erect cylindrical horns about half as long as stamens; stamens 8; ovary superior, 3-loculed, 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 foraging. 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.


XANTHÓRRHÍZA: _Zanthoxylum._

XANTHÓRHÓHÉA (Greek, yellow flower, referring to the resin which exudes from the trunks). *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 arborescent: 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, segms. 6, 3 outer glume-like, erect, concave or almost hood-shaped at the top, 3 inner much thinner, erect with the
XANTHORRHEA

XANTHOSOMA

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. Præssii. 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. Præssii seems to be the most desirable species.

a. Trunk very short.
b. Spike 3–8 in. long.

minor, R. Br. Lvs. 1–2 ft. long, 1–2 lines wide; scape longer than the lvs.: spike less than 3/4 in. wide. B.M. 6297.—Belongs to the group in which the inner perianth-segms. have a white blade conspicuously spreading above the outer ones, while in the next two species the inner segms. have a short whitish tip, little longer than the outer and scarcely spreading.

BB. Spike 1½–2 ft. long.


AA. Trunk becoming 5–6, or even 15 ft. long.

Præssii, Endl. Lvs. 2–4 ft. long, 1–2 lines broad, rigid, very brittle when young; scapes 2–6 ft. long, including the spike, which occupies one-half to nearly all its length. B.M. 6093. 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 fls. Austral.

F. TRACY HUBBARD.†

XANTHOSOMA (Greek, yellow body, referring to the stigma). Aracee. This group is interesting to the horticulturist as containing the handsome variegated stove foliage plant known to the trade as Phyllostemon Léndem, and part of the vegetables known as yautia, malanga, and tanier, 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; fls. unisexual, naked; males with 4–6 stamens connate in an inversely pyramidal sán-drum with 5 or 6 faces; ovary 2–4-loculed; ovaries 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 scald and more or less poisonous properties are destroyed by cook-

ending. 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.
as cultivated in southern United States. Yautia corns 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.

**XANTHOSOMA**

**Xanthosoma 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 corn 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 is easily prop., or if suffered to remain the plant becomes tufted, and numerous lvs. are produced from the summit of the short, yet st.-like trunks" (B.M. 4989). Lvs. 1-2 or almost 3 ft. long, broadly sagittate-ovate, suddenly and shortly acute at apex, basal lobes obuse; spathe large, with a creamy white limb. Trop. Amer.—In northern hothouses said to bloom in winter.

**AA. Caudex tuberosus.**

**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 Black Mexican sweet corn, produces purple seeds on ears which would otherwise have white or yellow seeds, and pollen from a yellow-seeded variety produces the yellow-properly purple—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 characters affect only the endosperm (albumen) of the seeds, while characters of the seed-coat show no xenia. The correct interpretation of xenia in maize was given by de Vries (1899) and Correns (1899), and almost simultaneously by Webber (1900). This explanation is briefly as follows: The pollen-tube contains two male nuclei, one of which fertilizes the egg, while the other unites 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 doubtless a case of this kind.

GEO. H. SHULL.

XERANTHÉMUM (Greek, dry flower: it is one of the 'everlastings'). Composite. Annual erect herbs, densely plumose or tomentose, of which X. annuum is one of the oldest and best known of the 'everlastings' or immortelles.

Heads rayless, 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 rows, glabrous; heads solitary on long naked peduncles.—Four or 5 species, Medit. region.

The culture of xeranthemum 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 hardy annuals.

annuum, Linn. Fig. 4016. Annual, 2-3 ft. tall; erect, white-tomentose, oblong-lanceolate, acute, entire: heads purple, 1-1½ in. across, the longer scales wide-spreading and ray-like. S. Eu. G. 4: 74, 75.—Fruit and many varieties. Var. ligulosum, Voss. (X. plurinervium and X. imperiale, Hort.). A double or half-double form. Var. periligulosum, Voss. (X. superflum, Hort.), has very full double heads. In these and the single types there are white-fl. (var. albim), rose-fl. (var. roseum), and purple-fl. (var. purpureum) varieties. There are also violet-fl. forms. Var. multiflorum, Hort. (var. compadactum), has a more compact and bushy habit, with somewhat smaller heads. X. vibrus, 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. induratum, Mill. (X. erectum, Presl), has white heads, of which the scales are little or not at all open or spreading. S. Eu. to S. W. Asia.

L. H. B.

XEROCLÁDIA (dry branch, from the character of the growth). Leguminosae. One species, X. viridirâmmis, Taub. (X. Zygieri, Harv. Aocica viridirâmmis, Burch.), of S. Afr., likely to be planted in warm dry regions in choice collections, differs from Acaea in having only 10 (rather than indefinite) stamens, powdery pollen, 5 free petals, and other technical characters. It is described as a small, dry, and very rigid bush 1-2 ft. high, with pale bar, stipules deciduous, linear, flat, and 1-2 ft. in length, 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 semi-orbicular, indehiscent, 1-seeded, about ½in. long, winged.

XERÔNÊMA (Greek, dry and thread, referring to the filaments which dry and persist). Liliaceae. Perennial herb, sometimes grown in the greenhouse: rhizome very short: st. erect, simple: lvs. grouped at base of st., elongate, rigidly veined: raceme terminal, simple, some racis abruptly bent at base, commonly horizontal: fls. grouped on erect short pedicels; perianth red, showy, about ½ in. across, persisting, segms. distinct, linear, erect, 1-nerved; stamens 6; ovary sessile, obtuse, 3-celled: caps. very short-stipitate, loculicidally dehiscent. One species, New Caledonia. X. Moreni, Brongn. & Gris. St. about 20 in. long with a few reduced lvs.; basal lvs. 12-16 in. long, erect: fls. bright crimson; perianth ½-3 in. long; stamens exserted. New Caledonia. B. M. 8942.

XERÖFÔLÜM (Greek, dry leaf). Liliaceae. Turkey's Beard. Tall subaquatic hardy perennial herbs not extensively in cultivation. Rhizome short, thick and woody: sts. erect, tall, simple: lvs. radical or grouped at base of st., long-linear, rather stiff, margin scabrous; cauline lvs. sparse, much smaller: fls. white, numerous, in a terminal raceme; perianth withering, persistent, segms. distinct, oblong or lanceolate; stamens 6; ovary sessile, 3-grooved, obtuse, 3-celled: caps. subglobose, or short-oblong, 3-grooved, loculicidally dehiscent.—Three species, N. Amer. Watson, in Proc. Am. Acad. 14: 284.

The turkeys' 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. Douglasti, Wats., 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.


tenax, Nutt. Two to 5 ft. high: lvs. about 2 lines wide: raceme 1-2 ft. long; pedicels longer: perianth-
XEROPHYLLUM


XIMÈNIA (named after Francis Ximenes, Spanish monk, who wrote on plants of Mex. in 1615). Olacæceae. Glabrous or tomentose shrubs or trees, one of which, X. americana, occurs native in S. Fla. and is a tropical fr. of minor importance. Branches usually thorny; lvs. alternate, entire, subcoriaceous, usually fascicled; frs. white, arranged in short axillary cymes or rarely solitary; calyx small, 4–5-toothed or -lobed, unchanged in fr.; petals 4–5, valvate, narrow, bearded inside; stamens twice the number of petals; ovary 3-celled at base or higher, ovules 3: drupe ovoid or globose, flesh pulpy.—About 5 species, natives of the tropical regions of the world. Here belongs the hog plum which grows wild throughout the tropics, and in the U.S. is native to Fla. south of Tampa Bay. The fr. is about an inch long, shaped like a plum, and the pulp is sweet and aromatic. The “stone” which encloses the seed is proportionately very large. The fr. is borne on a small tree, each branch of which ends in a thorn about ½ in. long. The edible frs. are generally eaten, but although it is fairly common in Fla. it is not cult. The species has been suggested by the American Pomological Society as worthy of cult. with a view to improvement.

americana, Linn. Hog Plum. Also called “mountain” or “seaside plum” and “false sandwood,” “wild olive” in Jamaica. Tropical fruit-bearing tree: lvs. 2–3 together, oblong, obtuse, short-petioled; peduncles 2–4-fl., shorter than the lvs.; frs. small, yellow; petals thick, lanceolate, rusty-hairy within: fr. yellow; nut white, globose. Tropics.—The “hog plum” of Jamaica is Spondias lutea. F. TRACY HUBBARD.†

XYLOBIUM (Greek, wood and life, in allusion to the substance on which the plants grow). Orchidaceae. Epiphytic herbs, grown in the warmhouse.

Stems short, with many sheaths, soon thickened into fleshy pseudobulbs, which are 1–2-lvd.: lvs. large or elongated, plicate-veined, contracted to the petiole: sepalae erect, simple, arising from the base of the pseudobulb; frs. racemose, medium-sized or rather large, very shortly pedicelled; bracts linear, usually rather long; sepalæ 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, ovoid: caps. oblong, erect.—About 30 species, natives of Trop. Amer.

bracteascens, Kränzl. (Maxillaria bracteascens, Lindl.). Pseudobulbs conical, elongated, sulcate: lvs. broad, folded: scape 3-sheathed; raceme elongated, few-fl.: sepalæ oblong-lanceolate, they and the similar but smaller petals dull yellow; lip reddish brown, 3-lobed. Peru.

brachystachyum, Kränzl. Pseudobulbs almost globose, slightly narrowed above, 1-lvd.: lvs. oblong, acute, 3-nerved, thick, shining, petiole sulcate, blade 10 by about 4 in.: raceme very short, few-fl.: dorsal sepal broad ovate-oblong; lateral ones much larger, outside dull purple; petals oblique at base, oblong above, dull purple outside, yellow spotted purple inside; lip simple, oblong-obovate, rather acute and slightly fiddle-shaped. Brazil. G.C. III. 40:302 (desc.).

dicolor, Nichols. (Maxillaria dicolor, Lindl.). Pseudobulbs clustered, oblong, compressed, 1–2 in. long, bearing a single lfr.: lfr. 12–15 in. long, oblong-lanceolate, plicate and acuminate at both ends: sepalæ erect, many-fl.: sepalæ and petals sulphur-colored or shaded with white; lip whitish, obsolescently 3-lobed, obtuse. W. Indies. B.M. 3981. B.R. 1549.

elongaturn, Hemsl. (Maxillaria elongata, Lindl.). Pseudobulbs cylindrical, elongated, about 6 in. long, 2-lvd.: lvs. lanceolate, 3-ribbed: scape erect, 2-sheathed, many-fl., infl. a dense oblong raceme: sepalæ and petals pale yellowish white, linear, acuminate; lip ovate-oblong, very fleshy, purplish brown. W. Indies.

leontoglossum, Benth. (Maxillara leontoglossa, Reichb. f.). Pseudobulbs fusiform, congre gated, 1-lvd.: lfr. petiolar, elliptic-lanceolate, acute, plicate: scape stout, bearing an oblong or cylindrical, dense and nodding raceme: frs. yellow, spotted with maroon; dorsal sepal oblong, lateral sepal oblong-lanceolate; petals similar to lateral sepalæ; lip oblong, lateral lobes narrow, midlobe rotundate fleshy and marked with purple-brown. Colombia. B.M. 7085.


X. zirnum, Hort., is offered in the trade.—X. peruanum, Hort., is also offered. F. TRACY HUBBARD.

XYLOPHYLLA ARBUSTULA, Swartz: Phylanthus speciosus.

XYLOPIA (from the Greek Xylopletron, bitter wood). Annonaceae. Shrubs and trees grown mostly for their fruits, and also for spices and other products.

The genus resembles other Annonaceae in having alternate distichous entire lvs., and fls. with 6 petals in 2 series, but distinguished by the form of the torus, or receptacle, which has a concavity in the middle including the carpels, surrounded by a ring of stamens borne on the convex portion of the receptacle; infl. instead of being extra-axillary or lfr.-opposed, as in many other genera of the family, consists of short-stemmed or sessile fls. growing from the axis of the lvs., either solitary or in clusters of 2 to several: calyx
with 3 valvate sepal connate for some distance from the base; outer petals elongate, thick, valvate, and connivent, or scarcely opening, and triquetrous above, inclosing the 3 inner linear petals, which are concave at the base; after anthesis the receptacle undergoes a transformation, its center becomes upsorced so as to form a dome with an orifice at its apex; through this orifice protrude the styles, while the ovaries 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. Carpels vary in number and the ovaries have a ventral placenta bearing an indefinite number of ovules primitively 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 ruminate 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 at the summit of the torus or even none at all. In the genus Pseudannona, treated by Baillon as a distinct genus, X. frutescens that was written ten years later (see Journ. Wash. Acad. Sci. 3: 16, 1913), both the corolla and the fr. differ radically from those of Xylophia. The inner petals form a diminutive acute triquetrous corolla over the essential parts, and the outer ones, much broader and longer, recall by their form and the thickness of their margin the fls. of certain species of Annona, while their few-seeded frs. are thick and fleshy, when mature suggesting the frs. of our common Asimina trifolia. It is intended here to describe only the species of economic importance.

Xylophia ethiopica, X. Eminii, X. aromaticus, X. carminativa, X. frutescens, and X. frutescensi are worthy of cultivation for the sake of their spicy fruits; while X. parvisia and X. nigricans of Ceylon are desirable for the exquisite perfume of their flowers, which like those of the ilang-ilang (Canangium odoratum) might be utilized as a source of an essential oil for use in perfumery. Propagation is possible either by seeds or by grafting and budding as in the case of other Annonaceae. Seeds should be sown as soon as ripe in shaded beds and the small seedlings should be transferred to pots and kept until ready for planting out, preferably in good, well-drained soil in sheltered situations.

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A. American species (Nos. 1–7).

1. Grandiflora, Aubl. (X. cubensis, A. Rich. X. longifolia, A. DC.). Malaguetta mado. Malaguntio grande. ZEMBE. Fruta del Burro. ACHON. Fig. 4018. Tree with younger branches rufous-tomentose near extremities: lvs. approximate, distinguish, elliptic-lanceolate, obtuse at the apex, usually obtuse at the base, puberulous above, tomentose and rufescent beneath, the blade 4 in. or more in length, the petiole about 3/4 in. long, grooved above, tomentose and rufescent: pedicels incurved, bracteate, villous, fergusinose: frs. 6, often 2 in. long, oblong, acute at the apex, shortly 3-parted; petals erect, the outer ones linear, acute, acutish, 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 parts; receptacle hallowed in the center, forming a cavity in which the ovaries 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, but more abundant in Cuba and the Caribbean islands, as Malaguetta bravii, or "wild meleguetta," and Guacima Maria, or St. Mary's guacima."—Varieties 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 (X. carminativa), are offered for sale in the pharmacopoeia, but catkins are large, each consisting of a volatile aromatic oil, having a pepper-like flavor, but more agreeable and delicate than pepper. Martin regards these frs. as worthy ofintro, into the pharmacopoeia, on account of their tonic and carminative properties.

2. Carminativa, R. E. Fries. (Uniona carminativa, Aruda da Camara. X. sericea, St. Hill.). PAO D'E MBERA. PINDAIBA. PIMENTA DE MACACO. A tree closely allied to X. grandiflora, but with the lvs. narrower in compression with their length, and with the apex more attenuate and the base more acute, but the latter varies and is sometimes rounded; fr.-blade clothed with appressed silky hairs longer than those of X. grandiflora, and usually smaller than the latter, but also varies in size; X. frutescens, a large, nearly round, long-acuminate fr., scarcely exceeding 1/8 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 containing 3 or 4 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 by their black color and rough surface. Ranges from Minas Geraes 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 stringy 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 Januarla, state of Minas Geraes by Messrs. Popoeneo, Shamel, and Dorsett, of the U. S. Dept. of Agric. during their recent mission to Brazil.

3. Frutescens, Aubl. Malaguetta hembra. Malaguntio chico. COUGNERECOU (Carib name). JEJERE COU (Cayenne). EMBERA. PINDAIBA (Brazil). Fig. 4018. A shrub or small tree, with slender, yellowish, branchlets pilose, reddish: lvs. oblong-lanceolate, acuminate at the apex, with the tip of the acumen obtuse or rounded, and the margins revolute, above glabrous, beneath silky with white, appressed, sericeous hairs: peduncles pilose, very short, bracteolate, solitary, or in 2's or 3's, growing from the axis of the lvs.: calyx pilose, with the divisions ovate acute; petals oblong, never opening widely, sericeous on the outside: frs. glabrous, aromatic. Endemic in Brazil, Venezuela, Guiana, Colombia, and Panama.—Collected at Gatun by Hayes, who states that "the negroes of the Isthmus use the red berries of this small tree as a substitute for pepper and for making coffee." Specimens in the National Herbarium were recently collected by Henry Pittier in the Canal Zone, and bear the common name "malaguetta hembra," to distinguish them from the fr. of the "malaguetta mado." The name malaguta, sometimes modified to malagueta, undoubtly comes from Afrik, being applied to the so-called "grains of paradise" (Anomomume melegeta, Roscoe), a famous spice of the west coast of Afr.

4. Muricata, Linn. (X. Jamaicaensis, 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 Xylopia, was based 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 Xylociperum, 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 Plukenet's _Xilopicos_, or _Lignum amarum_, of Barbados, commonly called bitter-wood.

5. discreta, Safford (_Unona discreta_, Linn. f. _Habzelia discreta_, A. DC.). _Petricobum_. A shrub or small tree with privet-like, or willow-like lvs. 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 Unona. (See Desmos, Vol. II, p. 991 of this work.)

6. aromatica, Baill. (_Habzelia aromatica_, A. DC. _Waria zeylanica_, Aubl.). _Maniguette_. _Bois d'Ecorce_. _Poivre des Nègres_. A tree with a trunk 20 ft. broad, or more, with a spreading crown and widely ovate-globose, more or less muricata, strigose (6 section species, him clusters: lvs. ovate or oblong- acuminate, glabrous, subsessile: fls. axillary, solitary or in pairs; calyx- divisions subrotund- ovate, acute, fleshy; petals 6, the 3 outer ones longer, ovate-oblong, on the outside vil- lous, cinerous, on the inside glabrous, violet- colored, the 3 inner ones smaller, glabrous, violet- colored, berries reddish, numerous (12–25 in a cluster), oblong, sub-terete, shortly stipitate, with a longitudi- nal seam down one side; constructed 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 _Unona concolor_, Wild., and may possibly be congenereic with Desmopesis or Unonopsis. The type, described by Aublet under the name _Waria zeylanica_, was collected in the forest of Timoutron, French Guiana.

**BB. Les. obtuse or rounded at the apex.**

7. obtusifolia, A. Rich. (_Habzelia obtusifolia_, A. DC.) _Guimba_. _Guaviica_. _Guavico de Sayana_. _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 lvs., which are quite obtuse or rounded at the apex and obovate or subpatulate in outline, coriaceous, pale green and glossy above and paler beneath, and about 1–1 ½ in. long: fls. axillary, soli- tary, very shortly peduncled, subtended by small scale-like bracteoles; calyx- divisions broad, subacute, and ciliate along the margin; outer petals narrow, linear, acutish, dilated and concave at the base, cov- ered 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 hol- low of the receptacle; numerous, but usually only 2–8 developing into fr.; the latter a cluster of three 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 yellow wood. Its local name Pico de gallo (cock's beak) is suggested by the form of its sharp elongated fl-buds.

8. parvifolia, Hook.f. & Thom. (_Paltonia parvifolia_, Wight. _Unona tripetaloldea_, Moon.). _Netawu_. _Attcketta_. 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 ¾ in., finely pubes- cent: 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, trignonous, expanded and hollowed at the base, covering the essential parts; stamens truncate; carpels 5, sunk in the center of the receptacle; ovules 4–6 in two rows: fruiting carpels 1–4, the short thin stalks, broadly ovoid, 1–1 ½ in. long, containing several smooth brown oblong seeds.—This species is common in the moist low country near Colombo, Ceylon. Its bark, especially 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

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4018. Xylopia.—a–c. _X. grandiflora_, showing flower-bud and leaf at a, section of flower with cavity in receptacle at b, fruiting branch at c, four-seeded fruits, d, e, f. _X. frutescens_, fruiting branch; g. _X. muricata_, type of the genus; h. _X. obtusifolia_, fruit and three leaves. (b nat. size; others x about ½.)
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- pionii*, with blunt ovoid fl.-buds.

**AAA. African species.**

9. *xthiòpica, A. Rich. (Unôna xthiòpica, Dunal. *Habátia xthiòpica, A. DC.*) Guinea Pepper. *Negro Pepper. Habb Selim. Grains of Selim. Akola. Bikuë.* A leafy tree of moderate height: lvs. coriaceous, 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-pedicilled; calyx with the sepals, broadly triangular and acute; petals on the outside fulvo-sericeous, linear, subconcave at the dilated base, the outer ones with thick margins, the inner ones narrower, triquetrous; 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 incurved, about 2 in. long, slightly constricted between the seeds, glabrous, vermilion-colored within; seeds 3-8, of medium size, ellipsoid, about ½ in. long and half as thick.—This species is endemic in W. Afr. where its fr. is used as a substitute for pepper. It was known to old authors under the name *Piper xthiòpicum.* Closely allied to this species and similarly used are *X. niamniaménis* of Cent. Afr., formerly brought by caravans across the Sahara to the shores of the Medit., and *X. Èminii*, Engler, of the Uganda. So precious were these spices held, not only for seasoning food but for use as carminatives and stomachies, that in certain districts of Afr. they are circulated as money.

W. E. Safford.

**XYLOSMA (Greek, *xylos,* wood, and *osme,* odor; alluding to the aromatic wood of some species). Syns., *Myroxylon, Hisingera. Placourtíceae.* 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, exstipulate; fls. small, in axillary racemes, usually dichous, 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.

**racementa, Miq. (Hisingera racementa, Sieb. & Zuc. *Myroxylon racementum,* Kuntze). Tung-Ching Tree. Small tree or shrub, unarmed or spiny, glabrous; lvs. ovate, acuminate, rounded at the base, serrate, 1½-2 in. long: fls. yellow, fragrant, scarcely ½ in. across, in axillary racemes ½-1 in. long; fr. globose, ½-¾ in. thick, black, 2-3-seeded. Aug., Sept.; fr. in Nov., Dec. Japan, Korea, E. China. S.Z. 1:88. Var. pubéscens, Rehd. & Wilson. Tree, to 80 ft.: branchlets pubescent: lvs. ovate to oblong-ovate, glabrous, 1½-3 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.

*Salmannii, Eichl.* Shrub, to 15 ft., glabrous, the sts. and older branches armed with stout branched spines: lvs. chartaceous, ovate to oblong-oblong, obtuse or obtusely acuminate, cuneate at the base, crenate-dentate, 1½-4 in. long: fls. greenish yellow, fascicled; sepals elliptic; disk of the pistillate fl. annular; styles 2, 2-parted at the apex: fr. black, 3-4-seeded. Brazil, Argentina, Paraguay.

X. *Aquítium,* Sprague. Lvs. holly-like or occasionally nearly oval, having paired of glands at base of blade, 2-4 in. long; racemes short, axillary, of very small fls.: styles 6-7. Habitat unknown, probably Polynesia or Austral.

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 mealyness 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 yams of Jamaica and the Isthmus of Panama, and other varieties of similar quality, such as the cush-cush of the Island of Trinidad. The Chinese yam or cinnamon vine, D. Batalas, is of excellent flavor, but on account of its deep-growing habit is very difficult to dig. Several kinds of yam are grown scatteringly in Florida. For further discussion, see Dioscorea.

ROBERT A. YOUNG.

YARROW: Achillea.

YELLOW-WOOD: Cladrastis.

YEY: Taxus.

YUCCA (Yuca, native name for the manihot or cassava, erroneously applied to the present plants by Gerarde). Liliaceae, tribe Yuccae. Bold stiff-leaved plants suitable for lawn planting, subtropical masting, and a few of them for flower-garden use. Acaulescent to arboreous endogens with fibrous evergreen sword-shaped lvs. usually pungent and often denticulate or fibrous on the margin: fls. white or shaded with cream or violet, cup- or saucer-shaped, usually pendant in large, usually erect panicles, opening at night and then somewhat sickishly fragrant; pollination rarely occurs except through the aid of a small white moth, Promuba yuccasella, found wherever yuccas occur wild on the continent, which deliberately gathers the pollen and thrusts it into the stigmatic chamber, its larvae feeding exclusively on the maturing seeds of these plants: fr. either capsule and erect or fleshy and hanging in the principal groups or sub-genera.—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. Bot. 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 yuccas are also figured. See Hesperoyucca, 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. filamentosae, 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. filamentosae 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

4019. Yucca glauca in Colorado.
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 (*Pronuba yuccasella*) that accompanies them when cultivated in the western states, but emerges from the pupa too late to pollinate *Y. glauca* and disappears too early for *Y. gloriosa*. See Rep. Mo. Bot. Gard. 3:99; 4:181, for additional discussion.

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 separated as *Clistoyucca arborescens*, Trelease; as it is not in cultivation, it need not be discussed further here except to say that *Clistoyucca* differs from *Yucca* in its very short style, fleshy incurved perianth, and spongy dry indehiscent fruit.

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| filifera, 6. | |

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**1. glauca**, Nutt. (*Y. angustifolia*, Pursh.). Fig. 4019. Acaulescent or with prostrate trunk: lvs. narrow, 3/4–3/2 in. wide, green-gray, narrowly white-marginated: inf. 3–6 ft. high, rarely branched: fls. greenish white. S. D. to N. Mex. B. M. 2236. F. E. 14, p. 34. G. F. 2:


YUCCA

AA. Lvs. not toothed, with marginal threads; fr. fleshy.


Ref. 5:283.

B. Fr. dry but indehiscent.


Ref. 5:283. With glaucous lvs. vey plicate, toward the end it is var. plicata, Carr. G.C. IV. 16, p. 511. 35.


Ref. 5:283.
ZALÁCCA (said to be the name of the genus in the Moluccas). Palmáceae. Stemless palms with creeping roots, adapted to the warmhouse. Lvs. elongated, equally pinnatisect; segms. alternate, fascicled or equidistant, lanceolate or oblong-lanceolate, straight or fal-cate, acuminate; rachis obtusely 3-angled, not produced into a spine; petioles rather terete, usually with spirally disposed prickles; sheaths strongly armed with compressed prickles; ligule none; spathes persistent, the lower ones sheathing the peduncle and branches, incomplete, the partial ones subtending the floriferous branchlets; spadices simple or fastigately branched, pendulous, floriferous branchlets catkin-like, rather short, remote or clustered, sessile or pendu-lous: fls. polygamous-dieicious, usually rose-colored: fr. globose, turbinate or ovoid, 1–3-seeded, usually beaked.—About 14 species, Assam and Malay. Two forms have been sometimes cult. Z. edíllés, Blume (Z. Blume-dana, Mart.). Lvs. copious, clustered, erect, clothed with long, often serrate prickles; pinnae linear-lanceolate, very long-acuminate, 1 1/2–2 1/4 ft. long, 1 1/2 in. broad, whitish beneath; petiole rather shorter than the rachis and armed with robust prickles: spadices drooping, long-branched: fr. fulvous-fuscosecent, pyriform, 2 1/4 in. long. Malay Archipelago. Var. Wallachíá, Mart. (Z. Wallachiana, Mart.), has lvs. 18–20 ft. long, clustered, nearly erect; pinnae fascicled in 2’s, 3’s, or 4’s, narrow-lanceolate, with a long and slender, cuspidate point, attenuated and reduplicate at base, flat, older ones 1 1/2 ft. long, 3–4 in. broad; petiole 4–6 ft. long, armed with robust, fuscous prickles; fr. ovate-pyriform, 1 1/2 ft. long. India, Burma, and Malay. G.C. 1873:1083.

F. TRACY HUBBARD.

ZALUZÁNIA (named for the Pole, Adam Zaluziansky von Zaluzian). Compositae. Hoary-tomentose or scabrous-pubescent shrubs or subshrubs: lvs. alternate, entire, dentate, lobed or many-cleft: heads pedicelled, heterogamous, arranged in corymbose leafy panicles: ray-fls. in 1 row, pistillate; disk-fls. perfect and fertile; involucre broadly campanulate; corolla yellow or perhaps white.—About 12 species, Mex. Apparently none in cult.

ZALUZIÁNSKAYA (after Zaluziansky, as indicated above, who wrote Methodus Herbariae, Prague, 1892). Including Nyctérinia. Scrophuláridaceae. More or less viscosous annual or perennial garden herbs, also grown in the greenhouse. Leaves, lowest opposite, upper alternate, usually few-toothed; floral lvs. smaller, bract-like, entire: fls. sessile, usually arranged in dense or interrupted terminal spikes; calyx ovate-tubular, shortly 5-toothed, 2-lipped or 2-parted; corolla persistent, tube elongated, finally split to the base; limb 5-lobed, entire or 2-eleft; stamens usually 4; caps. oblong, leathery or woody, septically dehisc. —About 36 species, natives of S. Afr. All the species mentioned here have their corolla lobes bifid.

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 salver-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 urge 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.


lychníde, Walp. (Nyctérinia lychníde, D. Don. Éripte lychníde, As. grécíde, 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 1/2–3/2 in. across, white inside, purplish or red outside. B.M. 2504; 8215 (the latter as Z. maritíma). B.H. 748. G.C. III. 42:162 (as Z. maritíma).—Usually acts much like an annual and is generally treated as such when cult.

bb. Duration annual: bracts oblong-lanceo-late: lvs. linear or the lower ones lanceolate.

capénis, Walp. (Nyctérinia capénis, Benth.). Differs from the above, as described by Bentham, in stature, duration, strict sts. and smaller lvs., but unfortunately Bentham does not give the height of the plant or color of the fls. According to R.H. 1851:221, the plant has white or lilac fl.-clusters on the same plant, each fl. having an orange eye. The spikes, according to Bentham, are commonly short and 4–8-fl., sometimes long and 15–20-fl. 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 3/2 in. across.

AA. Corolla-tube glabrous.

selagínoídes, Walp. (Nyctérinia selagínoídes, Benth.). Dwarf annual, branched at the base, 3–9 in. high, rarely 6 in., with spatulate lvs. and lvs. 3/4–1 in. long, color of fls. not stated by Bentham, but in R.H. 1896, p. 308 (same picture as Gm. 24, p. 80) 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 in the sun. This suggests the preceding species, and it is evident that the two must be dis-tinguished by technical characters until the colors can be verified. G.C. III. 56:173.—The plant once adver-tised in America as Nyctérinia selagínoídes is said to be a pink-fl. half-hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardly authentic.}

WILHELM MILLER.

F. TRACY HUBBARD.†
ZAMIA (name used by Pliny, meaning loss or damage, and first applied to barren pine cones, and transferred 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 compounded; pinnae broad or narrow, articulate at base, entire or serrate, parallel-veined; petiole smooth or spinulose: cones rather small for the order, glabrous, or rarely scurfy; fls. dioecious, 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 Cycas family, as constituted by Alphonse De Candolle (Prodr. 18, pt. 2, pp. 592-47). Other genera of horticultural interest and discussed in this Cyclopedia are Ceratopteris, Cycas, Dicoon, Encephalartos, and Macrozamia. The fls. of cycads are dioecious, without envelopes; the pistillate fls. are mere nake ovules inserted under scales in cones, and the staminate fls. are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not inclosed in a pericarp or ripened ovary) and are allied to the conifers. The fr. is a berry-like drupe. In Zamià the floral scales are peltate (and not horned) and form a cylindrical cone; the anthers are numerous, and the ovules pendulous in pairs. The foundation 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-pinnate evergreen leaves or fronds, the leaflets being thickened and usually broadened at the base, and jointed. Zamias are warm-house plants, to be treated like species of Cycas or Encephalartos, 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; petioles dilated and concave at the base, with several small prickles; lfts. about 10-12 pairs, opposite or alternate, obovate-lanceolate, entire on the lower half but serrate or jagged toward the top, acute or obtuse, scurfy beneath (as also the rachis); cone oval-conical, downy, pubescent, pale yellowish brown, the pistillate ones 4 in. or less long. Mex. B.M. 1969.

Lindenii, Regel. Trunk cylindrical, 2-4 ft. or more tall when well grown: petioles long, cylindrical, sparingly provided with many wool, the prickles short-conical and spreading; lfts. 20 or more pairs, glabrous or somewhat puberulous, nearly or quite opposite, sessile, long-lanceolate and acuminate, dentate-serrate toward the top. Ecuador. I.H. 22:195.

AA. Petiole not prickly.

b. Species growing beyond the limits of the U.S.

integrifolios, Ait. Trunk 12-18 in. tall, erect, globular or oblong: lvs. glabrous; lfts. alternate, 7-16 pairs, oblong to linear-lanceolate to lanceolate, mostly obtuse, entire or somewhat dentate toward the apex: cones oblong and obtuse, short-pediculed. W. Indies. B.M. 1851.—The Fla. plants, sometimes referred here, are apparently all Z. floridana and Z. pumila.

mexicana, Miq. Distinguished by De Candolle as follows: scales of the fl.-buds tomentose and also the petals at the base, by petioles 3-cornered, unarmored, glabrous, somewhat watery: lfts. of 9 or more pairs, subopposite, narrow-lanceolate, straight or slightly curved, acute or acutish, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex, Mex.—By Index Kewensis referred to Z. Loddegi, a species with prickly petioles.

psedo-parasitica, Yates (Z. Rotzeli, Regel). Distinguished as follows by De Candolle: trunk cylindrical: lfts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cupulidate at the apex, with 13 strong nerves which are twice bifurcate. Panama.—Grows on tree trunks.

angustifolia, Jacq. Foliage glabrous when mature; lfts. 5 in. long, 4-20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrulate or entire, the base not narrowed, 6-8-nerved: pistillate cone obovate but cupulidate. Bahamas, Cuba.

bb. Species native to Fla. floridana, DC. Coon. Comp. Figs. 4024-4027. Lvs. ovate or ovate-lanceolate; petiole triangular in outline, scurfy when young, tomentose at base, with scattered hairs above; lfts. mostly opposite, 14-20 pairs, glabrous above and with scattered hairs beneath, linear-falcate and somewhat twisted, narrow at the base and obtuse at the apex, the margin revolute and with a few obscure teeth: mature pistillate cones obovate, 5-6 in. (12-16½ cm.) long, markedly umbonate (projection on the scales), densely tomentose.—Abundant in Cent. Fla. on the east coast below latitude 26° 30', in open comparatively dry pine woods.

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 nonumbonate 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.

C. integrifolia, Versch., is Macrozamia spiralis.—Z. Dénisoni, Auth., is Macrozamia Pereskiifolia.—Z. globos, Hort.—Cycas Rumphii(?).—Z. pumila, Ait.—Encephalartos pungens.—Z. spinola, Lod.—Encephalartos Altensteini. L. H. B.

ZAMIOCULCAS (Zamia and Culex). Araceae. One species, sometimes grown in the warm-house for ornament and curiosity, it being one of the very few monocots with pinnate lvs. Z. zamifolia, Engler (Z. Loddegi, Schott. Calodium zamifolium, Lodd.), 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, obovate-lanceolate, acute, joined to the petiole and forming small tubers at the base after flowering; spathes contain at base with spreading or reflexed, blade, green, glabrous; spadix club-shaped, with female fls. below and male fls. on the longer upward part, whitish, about 1-1½ in. long and £ in. thick. B.M. 5985. L.B.C. 15:1408. Prop. by the fl.-tubers and by division.

4025. Staminate cone of Zamia floridana.

4026. Pistillate cone of Zamia floridana.

4027. Aggregate fruit of Zamia floridana. Cone not mature.
ZANNICHIELLIA named in honor of G. G. Zannichelli, a Venetian botanist. *Natareoides.* Honored Parent: *Zannichelia.* Slender branching herb, growing under water, of little horticultural value for ponds: lvs. mostly opposite, long and linear, thread-like, entire; stipules membranous, sheathing: fls. monoeccious, 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.; fr. flat, somewhat incurved, even, or occasionally more or less toothed on the back (not wing-margined), nearly sessile. Cosmopolitan in fresh or brackish water.

ZANONIA (Jacob Zanoni, 1615-1682, botanist of Bologna). *Cucurbitacea.* Under this genus, one species. It seems to be a so-called *Z. angustifolia,* Hook. f. It is native of Burma: climbing shrub with very fleshy 3-foliolate lvs.; lfts. oblong, entire: frs. small, white, dioecious, in compound panicles; corolla rotate, 5-parted, with obtuse segments; calyx rotate and 5-parted, with acute segments; male fls. with 5 stamens; females with a 1-celled elongate 3-4-styled ovary: fr. a mediumsized 3-valved caps.; seeds black, narrowed at base, with 2 flat curved horns at apex.

ZANTEDESCHIA (Francesco Zantedeschi, wrote on Italian plants in 1825). *Syn., Richardia.* Araceae. 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." Herbaceous plants with many long-petioled lvs., all from a thick rhizome: peduncles appearing with the lvs.: petioles 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. 4020): fls. many and small, naked, crowded, staminodes sometimes mixed with the ovaries: fr. a 1-3-celled berry.—Engler admits 8 species in his latest monograph (Das Pflanzenreicht., hft. 64, 1915), in Trop. and S. Afr. The common calla lily was long known in commerce as *Calla xhiriopca.* Later it was known as *Richardia africana.* It has been found that the genus *Calla,* as more closely defined, could not include it. The Richardia of Kunth, 1818, 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 and 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 xhiriopca*) has been a favorite for generations. 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 California 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°.

There are several varieties, all differing only in size, from those which grow 6 feet to "Little Gem"—1 foot. 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 luxuriantly when partly submerged; and also in bog-gardens, and on the margins of ponds, to give sub-tropical effects.

Although introduced to cultivation about 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, in 1891. E. H. Hammett, Wellesley, Massachusetts, and Joseph Taliby, 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. Taliby's experience is interesting and it may be valuable to the reader. He came near as long as the fr., which hangs 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 root, and the plants should 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 light and 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 may be have the very best. 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 1 1/2 to 3 inches in diameter. Larger sizes are quoted as "fancy" and command extra prices. Although they can be grown in almost any soil with some success, a cool climate is needed in California, and they do not thrive in a hot gravelly or stony soil. The lands near the coast, where sweated by the cooling sea-breeze, are productive of the best results, both in bloom and tuber. 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 receives considerable assistance from millipedes. Both these pests are a considerable nuisance to the California nurseryman and gardener.

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1. Réhmannii, Engler (Richardia Réhmannii, N. E. Br.). Pink or Rose Calla. Dwarf perennial: lvs. lanceolate to long-lanceolate, unequal-sided, light green and white-pellucid-dotted, petioled, equaling or exceeding the peduncle and spathe, the petiole without bristles: spathe about 4 in. long, erect, trumpet-shaped, with a ciliate tip 1 in. long; fr. an obovoid or depressed obtuse 1-2-celled berry. B.M. 7436.—In Natal, where it is native, the spathe are said to be dull rose without, rose-purple within, with a dark crimson blotch at the base inside. In cult. the spathes are white, with a faint rose tinge to the back and margins. Var. speciosa, Hort., is dwarfer and more robust than the type.

2. álbo-maculata, Baill. (Richardia álbo-maculata, Hook. f.). Spotted Calla. Fig. 4028. Petiole short without bristles; blade 12-18 in. long, white-spotted all over, hastate, 3-4 times longer than broad, acute, the basal lobes widely spreading, ovate-oblong, obtuse or acute, 3-4 in. long; spathe trumpet-shaped, 4-5 in. long, 2 in. wide, dull creamy yellow or milk-white with a blotch of crimson at the base. S. Afr. B.M. 5140. I.H. 7:255. F.S. 21:2258.—Will stand in the open in frosty regions with good protection for the roots. Not of much value except in botanical collections.

3. Nélsonii, Hort. Alliciae var. álbo-maculata: very vigorous and floriferous, reaching 3-4 ft., the scape overtopping the foliage: lvs. sagittate, bright green, sprinkled with pellucid dots or spots, as in Z. Elliottiana: spathe scarcely spreading, the limb short, very pale yellow with a purple blotch at the bottom.—Not recognized by monographs, and perhaps a synonym or a form of the former species. C. Cor specimen, white and bloom only in summer, after Z. Elliottiana is past.

4. melanoleuca, Engler (Richardia melanoleuca, Hook. f. R. Sprêngeri, Comes). Black-throated Calla. Scapes and petioles bristle below: lvs. 6-12 in. long, hastate-ovate-acuminate, the basal lobes obtuse, marked all over with oblong, white, translucent spots: spathe pale straw-colored, flaring and open from the base, the margins and cuspidate tip recurving, with an amply black-purple spot at the base with the spathe. B.M. 5765. Var. tropicalis, Engler (Richardia melanoleuca 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 bristle, triangular to ovate-oblong-ovate, on long ciliate at base, obtuse but subulate-pointed at apex, light green, with a few white or translucent spots, with undulate margins, about as large as those of Z. athioph-ia: spathe a rich yellowish yellow, lasting about two weeks, becoming greenish with age, not purple-blotched, about 6 in. long; berries about 1½ in. in size, mostly globose, green: tuber proliferous. Afr. probably in Trop. Transvaal. B.M. 7577. G. 46:446. G. N. W. 11: 553. R.H. 1904:136.

6. athiophia, Spreng. (Calla athiophia, Linn. Colocasia athiophia, Spreng. Richardia athiophia, Hort. R. africana, Kunth.). Compass Calla. LILY-OF-THE-NILE. Fig. 4029. Stout robust plant: lvs. smooth, the petiole without bristles; blade about twice as long as wide, broad or narrow but cuspidate at the apex, cor-bit-sagittate at the base, both lvs. and spathe varying greatly in size: spathe 3-10 in. long, white, creamy inside at the base, flat onward and narrowing to a cuspidate tip. S. Afr. B.M. 832. Gn. 33:584. Gn. W. 21:73.—Fragrant. Sports with double and triple spathe often occur. A.F. 5:83. Gn. 46, p. 447. See Fig. 4030.

Var. minor, Engler (R. nana compàcta, Hort.). Little Gem. Fig. 4031. Like the type, but only 12-16 in. high: spathe 3-4 in. long. Var. devoniensis, Hort. (R. devoniënsis, Hort.). Dwarf; freer bloomer than Little Gem, and more fragrant.

There are many forms of the calla lily in cult., a number of which have received Latin names. Some of these horticultural names are candidissimai, spathe large, pure white; gigantà, plant very large; Godfreyana, dwarf, white; grandiflora, spathe large; Childsiana, dwarf and more compact than type and more floriferous.

7. macrocráp, Engler (Richardia macrocràp, W. Wats. R. Pennlandii, Whyte, Calla Pennlandii, Whyte. Z. Pennlandii, Hort.). Erect perennial: lvs. ovate-cordate, acuminate-cuspidate, with an open sinus, basal lobes rounded; midrib thick: spathe golden yellow, broadly trumpet-shaped, its lower margins convolute one-third, flaring above, the subulate tip abruptly recurved, lanceolate to acute, slightly warty and with a black-purple blotch at the base within. Busuland, S. Afr. B.M. 7397.—Hooker writes (in B.M. 7397) that "R. Pennlandii is much the largest-leaved species, and is the only one with a deeply gambose yellow spathe within, which is much the largest and broadest of any." First flowered in 1892 by R. Whyte, Pentland House (Lee, England).

8. ochélis, Engler (Calla ochélis, Lindl. Richardia hastà, Hook. f. Z. hastà, Engl. R. Littùynchês, Dür. R. Schr. Z. Littùynchês, R. Z. Schr.). Dwarf, white with a leafless or almost leafless stem, in the middle of the Congo Yellow Calla. Petioles 12-18 in. long, usually or always bristle below; blades dull green, hastate-ovate, twice longer than wide, rather flaccid, 8-16 in. long, cuspidate at the apex, basal lobes separated by a narrow sinus or overbending and very obtuse: spathe cup-shaped, 4-5 in. long (with a tail 1 in. long), greenish yellow, the tip erect, black-purple at the base within, the lateral nerves usually rather prominent above. Cent. and S. Afr. B.M. 5176. G. 18:596.

Most of the garden forms have been named under Richardia rather than under Zantedeschia, and certain old lists R=the former and Z=the latter.—R. Àdami, Hort. Leichthin. Strong-growing, with lvs. sagittate, bright green, and somewhat exceeding the scape; spathé short and rather open, white, with a black or purple throat. Trop. Afr. Distributed by Max Leichthin (Germany) in 1898. There are hybrids of this and Z. Elliottiana.—Z. albo-maculata, Engler (R. angustá, Schott. Z. chloroleuca, Engler & Gilg.). Lvs. glabrous, without spots, the petiole without bristles; blade hastate, narrow, the basal lobes one-tenth the length of the spine one, 20 in. long, 3 in. wide at the base; petiole 4-5½ ft. long; spathe about 4 in. long, sulfur-yellow, red inside at the base. Angustá, Engler (R. angustá, Schott. Z. chloroleuca, Engler & Gilg.). Lvs. glabrous, with few white spots, the petiole without bristles; blade hastate, narrow, the basal lobes one-tenth the length of the spine one, 20 in. long, 3 in. wide at the base; petiole 4-5½ ft. long; spathe about 4 in. long, sulfur-yellow, red inside at the base. Angustá, Retzius, Hötst. (R. angustá, Retzius, Hötst. Z. anthérum, Retzius). This is another yellowish form, flowering: if-stalks bright green, marbled with white and rose; spathe very dark yellow, with small black blotch at the base.—Z. õrta, Hort.—Z. surafa. A distinct dwarf-habitated plant with a creamy white spathe, this being in the inside of the white spathe healthy and with a plant of good constitution." Gn. 55, p. 317, note.—R. Téytö, Hort., is Z. Elliottiana × R. aurata.

JARED G. SMITH.
L. H. B.
ZANTHORHIZA

(Greek, yellow root). Often spelled Xanthorhiza. Ranunculaceae. Shrubby plants cultivated mostly for their handsome foliage, which is much like that of Actaea, and which changes to a beautiful golden color in the autumn.

Leaves pinnate or bipinnate; fls. in drooping racemes or panicles; sepal 5, petal-like, deciduous; petals 5, smaller than the sepal, and 2-lobed; stamens 5–10; carpels 10, sessile, forming only 1-seeded follicles; ovule of each usually not maturing.—One species, E. U. S. from N. Y. to Fla.

The plants will grow readily in any good soil but usually prefer damp and shady places, although they often thrive in loose sandy soil. Propagated both by seed and root-division in autumn or early spring. The seeds should be sown in a well-prepared seed-bed as the young seedlings are rather delicate. If sown in early autumn they may be given partial shade to advantage. Old plants when divided are easily grown, and for this reason root-division is often preferred. Often not hardy in Massachusetts and extreme northern states.

**apifolia**, L'Her. SHRUB YELLOW-ROOT. Fig. 4032. Sts. of bright yellow wood, 1–20 ft. high; roots yellow, sending up suckers in spring; lvs. in clusters from terminal buds; lfts. about 5, cut-toothed or lobed, with wedge-shaped bases and entire sinuses; fls. small, dark or purple. April. Damp and shady places. A.G. 12: 289. Var. ternata, Huth. Lvs. only ternate; lfts. often more deeply lobed, the sinuses entire. Same distribution.

K. C. DAVIS.

ZANTHÓXYLUM (Greek, xanthos, yellow, and zylon, wood). Also spelled Xanthoxylum. Including Fagôra. Rutáceae. Ornamental woody plants chiefly planted for their handsome foliage and for their ornamental fruits.

Deciduous or evergreen shrubs, sometimes small-tose, or trees, with usually prickly branches; most parts, particularly the fls., emitting a strong aromatic odor when bruised; lvs. alternate, odd-pinnate, 3-foliolate or rarely simple; fls. dioecious or polygamous, small, in cymes or panicles; sepal, 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. brachyacanthum is considered valuable. The frs. of Z. piperitum 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 hardy 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. Rachis not or very narrowly winged.
b. Fls. before the lvs., in axillary fascicles.

c. SCHINIFOLIUM, Sieb. & Zucc. Shrubs 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-serrulate, ½–1¼ in. long; fls. minute, with sepal 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: 333.—Sometimes cult., under the name of the following; handsomer in foliage and harder.

c. PRICKLES IN PAIRS.

**piperitum**, DC. Shrubs or small tree, to 30 ft.; 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; fls. with simple perianth, in small corymbbs ½–1¼ in. across, on short lateral branchlets; style slender; fr. reddish, glandular-dotted. Japan, Korea, N. China. June; fr. in Sept. S.I.F. 1: 52.—The wood, according to Issa Tanimura, is dense and heavy with deep yellow grain; tree commonly cult. in Japan for ornament, 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 fragrant pepper.

**Bungei**, Planch. (Z. Bungeanum, Maxim.). Spreading shrub or small tree; prickles stout, flattened, very broad, ZANTHÓXYLUM 3537

4032. Zanthorhiza apiololia. (X½)
at the base: lvs. 3-5 in., rarely to 9 in. long, often with small prickles on the rachis and on the midrib of the leaf above and below; lfts. 7-11; ovate to ovate-oblong, crenately serrulate, glabrous, ½-2 in. long; fls. a corymb or panicle, mostly on short lateral brachythele: fr. reddish. June, July; fr. in Sept., Oct. N. and Cent. China.

AA. Rachis distinctly winged.

alatum, Roxbg. Shrub or small tree, glabrous, with stout spreading prickles in pairs; lvs. 3-8 in. long, with conspicuously winged sometimes prickly rachis; lfts. 5-11, elliptic-ovate to ovate-lanceolate, rarely obovate-oblong, acuminate, finely serrulate or nearly entire, 1½-5 in. long, the terminal one the largest: fls. in several lateral panicles, 1-2½ in. long, from the axis of last year's branches: fr. red, warty. Himalayas. Var. planispinum, Rehd. & Wilson (Z. planispinum, Sieb. & Zucc.). Lfts. 3-5, otherwise like the type. June; fr. in Sept. China, Korea, Japan. S.I.F. 2:34. R.H. 1913, p. 17. G. 35:213.—Only the variety seems to be cultivated.

Z. aplanothodes, Sieb. & Zuce. Tree, attaining 60 ft.; branches with numerous short prickles: lvs. 1½ ft. long; lfts. oblong-ovate, glabrous, glaucous beneath, 3-6 in. long; fls. and fr. in terminal corymb of Japan. This is called by Sargent one of the most beautiful trees of Japan.—Z. crispa-Herbst. Linn. (Z. carolina-sav., var. Foernich-Tree, Pernato-woon. Small very prickly tree. 30-60 ft. Occasionally 80 ft.; lfts. 7-17, ovate-lanceolate, pubescent beneath when young, 1-2½ in. long; fls. and fr. in terminal panicles. April, May, S. Va., to Fla. and Texas. 38:1. 1:29.—Z. gracile, Hemsl. Scandent shrub, to 12 ft. or more; rachis usually with hooked prickles; lfts. 6-15, coriaceous, petioled, elliptic to oblong-lanceolate, entire, glabrous above, often prickly beneath, ¾-4 in. long; fls. in axillary panicles 2-5 in. long, with sepals and petals; stamens long-exserted: fr. crowned, yellowish brown; seeds over ½ in. long. Cent. and W. China. This and the two following species have recently intro. from China.—Z. Pinae-kii, Maxim. Allied to Z. piperatum. Shrub, to 10 ft.; lfts. 7-15, ovate or obvate to oblong, slightly crenulate or nearly entire, quite glabrous, 1½-1 in. long; fls. in small corymb; style short: fr. warty, reddish. W. China.—Z. stenophyllum, Hemsl. Scandent shrub, to 6 ft.; rachis usually with many slender hooked prickles; lfts. 7-13, ovate-oblong to lanceolate, decurrent, glabrous, 1½-3 in. long; fls. in terminal loose corymb, 2-8 in. across, with petals and sepals; stamens long-exserted: fr. reddish, beaked; seeds ½ in. long. W. China. Has not proved hardy at the Arnold Arboretum.

ZAUSCHNERIA

Zauschneria (named for a professor of natural history at Prague). Onagraeaceae. 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-fusiform, obtusely 4-angled, 4-valved, many-seeded.—About 7 species. W. N. Amer.

californica, Presl. CALIFORNIA FUCHSIA. HUMMINGBIRD's TRUMPET. BALSAEAMA. Half-hardy perennial with the fl. of a fuchsia and the fr. of an epilobium: height ¾-2 ft.: lvs. linear to oblong, ½-1½ in. long, pubescent or tomentose: fls. scarlet or vermilion, the trumpet-shaped calyx ½ in. long; calyces-lobes ovate; petals obovate, spreading: fr. 4-valved, imperfectly 4-loculed. Calif. P. M. 15:192. 1847-8:241. Gn. 31: 28 and p. 29. R.H. 1849:141. Vari. splendens, Hort., is perhaps a little more luxuriant plant, otherwise not differing from the type. Vari. latifolia, Hook. Often nearly glabrous: lvs. broad-ovate to ovate-lanceolate, markedly feather-veined. B.M. 4493. F.S. 4:104.—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 hardiness. The plant is hardy in most parts of England.

4035. Ear or pistillate spike of maize. The husks are a kind of involucrum. Each kernel represents a flower. The 'silks' are styles.

4034. Indian corn.—Zea Mays.
CXVI. Viburnum tomentosum.
with slight winter covering. In favored spots it is considered to be a choice plant of pendent habit for the steep sides of rockeries and for naturalizing on old walls. In light and dry soils it spreads underground like the epilobiums. It is prop. by division, by cuttings made in autumn and wintered in a coldframe, or by seeds sown in early spring in mild heat. In Calif. the plant is considered objectionable on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.

Wilhelm Miller.

Zéa (an old Greek name for some common cereal, probably spelt), *Graminæ*. A large annual grass with monocious infl., the stamin- nate fls. being in the tassel at the top and the pistillate fls. in one or more ears in the axis of the lbs., each ear inclosed in several reduced lbs. or husks, the numerous styles protruding from the tip as the silk. As now limited the genus is founded on the single polymorphic cult. species, Zéa Mays, maize or Indian corn (Figs. 4034, 4035, 4036), whose origin is unknown but is suspected by some to be teosinte (*Zechlana 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 in the Andropogoneae. This grass is thought to have been not unlike the earless varieties of pod or husk corn (Zéa Mays var. *tunicata*, Figs. 4037, 4038). The chief distinction between pod corn and the ordinary varieties of maize is that the glumes of the pistillate spikelets are developed in pod corn and completely inclose the grain, while in ordinary maize the glumes are reduced to minute scales at the base of the grain. Collins has found that if plants of pod corn are isolated and bred among themselves for a few generations, there will usually result a still greater divergence from the ordinary type of maize. Plants will appear in which the lateral infullucence or ear is aborted while the terminal infullucence is greatly enlarged, containing both stamens and pistils. These may be back either in separate spikelets, in separate florets of the same spikelet, or in perfect florets. Plants of this earless type of pod corn possess no characters which would exclude them from the Andropogoneae. The constant recurrence of such plants among many varieties of corn Collins considers to be strong indication that some perfect-flowered grass has figured in the ancestry of maize. Harshberger (see G.F. 9:522; Contr. Bot. Lab. Univ. Penn. 2:231) after a study of teosinte-maize hybrids, showed that Zéa canina, Wats. (Figs. 4039, 4040), originally described as a wild species, is an early-generation hybrid between ordinary maize and teosinte. Harsh-

berger concludes that Indian corn is the result of a cross between teosinte and a race or variety of the same species produced by successive cultivation of the wild plant until its characters as a variety or race have become fixed. Collins holds that this conclusion does not take into consideration the evidence afforded by the podded varieties of maize. To explain maize as a hybrid Collins holds that the second parent must be assumed to be some plant radically different from teosinte, for only such a parent would account for the appearance of characters the very opposite of those which characterize *Zechlana*. 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 Zéa Mays are grown for ornament:


Var. gracillima, Koern. (Z. *gracillima* and Z. *minima*, Hort.). Very dwarf, slender form with green lbs., some times cult. in Eu. A var. *variegatæ* is also mentioned.


ZEBRINA (name refers to the striped leaves), *Commelínaceae*. One of the species, the wandering Jew, is a very common greenhouse plant, much used for baskets and for covering the ground underneath benches.

Differs from Tradescantia chiefly in the fact that the corolla is tubular (petals not free); stamens 6,
equal; fls. few, sessile, in 2 conduplicate bracts.—Two species, Mex. and Texas.

ZEBRINA, Schnizl. (Tradescantia zebrina, Hort. T. tricolor, Hort., in part. Cyanotis vittata, Lindl. Com- melina zebrina, Hort.) WANDERING JEW, in part. Fig. 4041. Trailing, half-succulent, perennial herb, rooting at the joints: lvs. lance-ovate, sessile, the fl.-sheath about ½ in. long and hairy at top and bottom and sometimes throughout its length; under surface of if. 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 flumi- nences, Fig. 3820, and sometimes with Com- melina 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 quadri-color, Voss. Tradescantia quadri- color and T. multicolor, Hort.). Lvs. with metallic green undertone and striped with green, red, and white. Handsome.

L. H. B.

ZELKÓVA (after the vernacular name Zelkous in Crete, or Selkwa in the Caucasus). Syn., Abelicea, and including Hemipléxia. Ulmaceae. Ornamental trees grown for their handsome foliage and attractive habit. Deciduous: lvs. alternate, short-petioled, pinnated, serrate, stipulate; fls. polygamous, the perfect ones solitary in the axils of the upper lvs., the staminate ones clustered in the axils 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 Aph- ananth and are chiefly distinguished by the connate sepal, the eccentric style and the 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, with rather small more 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 sown soon after ripening; also by layers and by grafting on Ulmus.

A. Fr. not winged: branches not spiny.


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A. Fr. not winged: branches not spiny.


4042. Zelkova serrata. (X ½)


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, ¾-3 in. long. April, May, Caucasus. Gn. 24, p. 371.

AA. Fr. with a small veining on one side; branches usually spiny.

Dávidii, Hemsl. Z. Davidíííia, Franch. Hemi-
boloea Dávidii, Planch.). Shrubby tree, the branches with axillary spines ½-4 in. long; lvs. oval to elliptic or elliptico-

oblung, acute, subcordate at the base, with 8-12 pairs of veins on each side, at first densely clothed with scattered hairs above, each leaving a dark circular depression, and with few scattered hairs on the veins beneath.

ZEPHYRANTHES (Greek, flower of the west wind). Syn. Atamóidea. Amaryllidaceae. ZEPHYR FLOWER. FAIRY LILY. Half-hardy tunicate-bulbous herbs, grown in the greenhouse, in window-gardens, and in the gar-

den for summer- and autumn-blooming.

Leaves narrow, usually contemporary with the fls.: peduncle elongated, slender, hollow; spathe membrane-

nous, tubular, apex bifid: fls. white, red, or yellow, soli-
tary in the spathe; perianth funnel-shaped, erect or slightly inclined, tube short or elongated, segments sub-
equal; 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 Amaryllideæ, 1888, where the following subgenera are made: Subgenus Zephyranthes proper. Fl. erect; tube short; stamens inserted near its throat. Subgenus Zephyríttes. Fl. slightly inclined; tube short; stamens inserted near its throat; style more declinate than in the other two sub-

genera. Subgenus Pyroliíh. 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 3 sections based on the color of the fl., 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. 38, p. 531.

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

4043. Zenobia pulverulenta. (×½)


Z. sinica, Schneid. Allied to Z. hirta. Tree, to 50 ft.; lvs. ovato-

oblung, rounded or broadly cuneate at the base, firm, crenat-

serrate, ¾-2 in. long. Cent. China.—Z. Verschaffeltii, Nichols. (Ulmus Verschaffeltii, Hort. Z. japonica Verschaffeltii, Dipp.). Shrub or small tree, allied to Z. ulmoides; lvs. oval or ovate, with 6-9 coarse triangular teeth on each side, rough above, with soft hairs beneath, 1½-2½ in. long. Origin not known, possibly from the Caucasus.

ZENOBIA (after Zenobia, queen of Palmyra, who lived in the third century; a fanciful allusion to her having been chained as was Andromeda, whose name is commemorated by a closely allied genus). ERICACEAE. Ornamental shrub grown for its handsome white flowers, and also for the foliage which is covered with a bluish white bloom in one form.

Deciduous or half-evergreen; lvs. alternate, short-
petioled, crenate or entire: fls. in axillary clusters forming terminal racemes on the upper part of last year's branches; calyx 5-lobed, with short valvate lobes; corolla campanulate, as broad as high, obtusely 5-lobed; stamens 10; anthers with 4 slender awns: caps. depressed-globose, obscurely 5-lobed, somewhat cari-

nate at the dorsal sutures, loculicidally 6-valved; seeds numerous, small, oval, angled.—One species in N. America closely allied to Andromeda and Pieris but chiefly distinguished by the open-campanulate fls. and 4-awned anthers.

Zenobia is a low bush with medium-sized short-
petioled leaves entire or nearly so and with handsome white nodding flowers in clusters along the upper part of last year's branches. It is hardy as far north as Massachusetts, and a very handsome shrub for borders of shrubbery, particularly when in bloom; the glau-

cous form is one of the most conspicuous shrubs with light-colored foliage. After flowering, the flower-bear-
ing part of the shoots should be cut off. Zenobia is also recommended for foraging. It thrives best in a sandy or peaty soil. Propagation is by seeds and by layers; also by cuttings of half-ripened wood in July placed
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.

INDEX.

**A.** Stamens inserted near the throat of the perianth-tube.
**B.** Fl. erect. (Subgenus *Zephyranthes* proper.)
**C.** Stigma triquetrous.
**D.** Ovary stalked.

**E.** Perianth white, often tinged with rose outside.
**F.** Length of perianth about 3 in.
**G.** Lea. channelled, bright green, shining, with acute margins
- **1.** *Atamasco*
- **2.** *Treatie*

**H.** Perianth rose-colored or crimson-purple.
**I.** The perianth 2½–3 in. long.
**J.** Spathé 1½–2 in. long; pedicel shorter than the spathe.
- **5.** *carinata*
- **6.** *Conzattii*

**K.** Perianth about as long as the spathe; spathe 1–1½ in. long.
**L.** Pedicel much longer than the spathe: spathe ½–3/4 in. long.
- **8.** *rosea*

**M.** Perianth yellow, often reddish outside.
**N.** Spathé much longer than the pedicel.
**O.** Pedicel much shorter than the pedicel.

**P.** Ovary sessile.
**Q.** Stigma capitulate, faintly 3-lobed.
**R.** Fls. somewhat inclined; style declinate. (Subgenus *Zephyritis*).
**S.** Perianth yellow inside, coppery red outside.
- **13.** *Andersonii*
- **14.** *cardinalis*

**T.** Stamens inserted at the middle of the perianth-tube. (Subgenus *Pyrolirion*).
- **15.** *auera*

**KEY TO THE SPECIES.**


3. **tubispatha**, Herb. Bulb globose, 1 in. diam.: lvs. narrow-linear, flaccid, bright green, sometimes 1 ft. long: peduncle slender, 6 in. long; spathe 1–1½ 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 Colombi.

4. **erubescens**, Wats. (*Amaryllis erubescens*, Horsford). Rare white-fl. 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 1889 and probably lost to cult.

5. **carinata**, Herb. (*Z. grandiflora*, Lindl.). Largest and choicest of the rosy-fl. species and said by Baker (1888) to be the commonest zephyranthes in cult.; however, the name *Z. rosea* is far commoner in American catalogues: a summer-blooming species with fls. 2½–4½ in. across, and about 3 in. long: bulb 1 in. thick, short-necked: ovary stalked: stigma triform. Jamaica,

4045. *Zephyranthes candida*. (X¼)


6. **Conzattii**, Greenm. Bulb globose, about 1 in. diam.: lvs. produced after the fls.: peduncle 6–9 in. high, slender; spathes about 1 in. long: perianth (dried) rose-colored or crimson-purple, tube short, segms. oblong-late, style declinate. Mex.

7. **Lindleyana**, Herb. Rare summer-blooming rose-colored species from the mountains of Mex., inferior to *Z. carinata* for general cult.: bulb globose, ¾ in.
ZEPHYRANTHES

4046. Zephyranthes candida above and one Z. Atamasco below.

ZINGIBER

3543

Subgenus PYROLIRION.


Z. Flava, Hort., with pure white lvs. is offered in the trade.—Z. floribunda, Hort., is a trade name.—Z. sulphurea, Hort., is offered in the trade.

ZICHA: Kennedy.

ZINGIBER (name ultimately derived from a Sanskrit word meaning horn-shaped; probably referring to the ginger root). Zingiberaceae. Ginger. Perennial herbs sometimes grown as greenhouse plants, and also for summer bedding in the southern United States for their decorative value; source of ginger.

Rhizomes horizontal, tuberous; sts. 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-fld.; calyx cylindrical, shortly 3-lobed; corolla-tube cylindrical, segms. lanceolate, upper concave; later staminodes none or adnate to the ovobovate-club-like anther-cells contiguous, crest narrow, as long as the cells; ovary 3-celled, ovules many, superposed; caps. oblong, finally dehiscing.—About 70 species natives of the Old World. Monographed by K. Schumann in Engler's Pflanzenreich, hft. 20 (IV. 46). 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 thick roots, large aromatic leafy 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,” cardamonal ginger from the green. Candied ginger is made from carefully selected succulent young rhizomes which are washed and peeled and then preserved in jars of syrup. Housewives often preserve their own ginger; it is important to have the hands protected 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 greenhouse
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.

Darcet., Hort.; also spelled d'Arcoys and d'Arcet. About 2-3 ft. high: lvs. lanceolate, 6-8 x 2-2½ in., bright shining green with a broad creamy white or often pink margin and oblique stripes of the same color: lvs. deep red, ball-like.—Intro. into Fla. This species is not treated by Schumann and is probably of horticultural origin.

LA. Margins of lvs. not colored.

b. Leafy st. different from the flowering st.: spike from the rhizome.

Mięga, 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 1-2½ in., membranaceous: spike elliptoidal, 2-3½ in. long: lvs. white; calyx tubular, acuminate; corolla-lobes lanceolate or oblong-lanceolate, lip ovate, entire, basal-lobes yellow; ovary silky: capsules somewhat ovate and 3-valved. 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-margined, rotundate.

d. Lvs. grass-like, scarcely 3⁄4 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 ¾ in. broad: spike elliptoidal, obtuse, 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 the tropics and intro. into S. Fla. 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, 3½-6 x 2-2½ in.: spike subglobose, dense, 2-3½ in. long; bracts obtuse, pale green, margins pubescent (sometimes, at least when older, red): calyx spathie-like, white; corolla-tube slender, lobes lanceolate, white, lip short, broadly suborbicular or subovate, pale yellow, tinted orange in the center (sometimes red-spotted), lateral lobes short, rotundate. India and Malaya. B.M. 2000.

c. Bracts red or at the beginning reddish green, later becoming obscurely red or rose, commonly acute.

d. Spike elongated cylindrical, 8 in. or more long, apex obtuse.

spectabile, 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 3½ in.: spike 8-12 in. long, a little over 2 in. diam., laxly cylindrical, apex rounded; bracts yellow, finally scarlet, apex obtuse: corolla yellowish white, dorsal lobe deep concave, broad, anterior narrower, linear-lanceolate, lip obvate, emarginate, 2-lobed, lemon-yellow, apex almost black, lateral lobes half as long as midlobe, ovate. Malay Penins. B.M. 7967.

d. 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 2½ in.: spike 3½ in. long, cylindrical, narrowed at both ends, dense, bracts lower obtuse, upper acute; lip yellowish reddish; corolla-lobes lanceolate, greenish, subacute; corolla Lobes red, oblong, acuminate; lip obvate, lateral lobes inconspicuous. China.—Once offered in Fla.


Annual, perennial, and subshrubby plants, mostly Mexican but ranging from Texas and even Colo. to Chile, probably 16-20 species: lvs. sessile, linear-lanceolate, glabrous above, pilose beneath, 12 x 2½ in.: spike oblong, obtuse, 7 in. long, bracts ovate, scarlet: corolla-lobes red, oblong, acuminate; lip obvate, lateral lobes inconspicuous. China. — F. TRACY HUBBARD.

The familiar zinnias (Figs. 4048-4050)
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 pleonissima. 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 pompoms and the Tom Thumbs. The pompoms, 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. Dorwinii. This group is said to resemble Z. elegans in size and color of flowers and to recede from Z. elegans in habit, being more branched and forming a broader and thicker bush.

Zinnias 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: hv. clasping, cordate-ovate or elliptic.

elegans, Jacq. YOUTH-AND-OLD-AGE. Figs. 4048-4050. Erect annual, a foot or more high, but varying from 3 in.

4049. Double zinnias—Z. elegans. (×½)

4050. Common garden zinnias, single and semi-double.—Z. elegans.
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. 1394 (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.

cc. Color orange: lvs. sessile, narrower, lanceolate.

Haageana, Regel (Z. mexicana, 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. 464. 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.

rr. Achenes longer, narrower, oblong, 3-4 lines long.

c. Color of rays yellow; disk yellow.

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 hirsute, with spreading hairs; somewhat corymbose or branched above: peduncles at maturity enlarged upward and hollow. Mex., Peruvian Andes.

cc. Color of rays red or purple.

d. Rays serebect 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, appressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B.M. 149.

dd. Rays revolute; disk dark-colored.

teniflora, 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.

WILHELM MILLER.

ZIZANIA (an old Greek name of some wild grain). Gramineæ. Tall aquatic grasses with lush sts., long blades, and large terminal panicles of monoeccious fls.: spikelets 1-fl., the pistillate upper portion of the panicle 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. aqüatica, 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

4051. Zinnia Haageana. (×3/8)

4052. Zinnia tenuiflora. (×3/8)

A. S. HITCHCOCK.

**ZIZIA** (named for I. B. Ziz, a Rhenish botanist). *Umbelliferae*. 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 fr. of each umbellet sessile; involucre 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.*


**Bebbi**, Brit. Distinguished from *Z. aurea* by the rays and by the fr., which is oval or broader, 1-1 1/4 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: lvs. 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. a subglobose to oblong drupe.—About 40 species distributed throughout the tropical and subtropical regions of both hemispheres, allied and very similar to **Paliurus**, but chiefly distinguished by the drupe-like fr. The fr. of *Z. sativa*, *Z. jujuba*, and *Z. lotus* are edible, and the first-named is cult. in China.

The jujubes are slender-branched shrubs or small trees with prickly branches, usually 2-ranked, small or medium-sized generally oval or oblong leaves and with small greenish or whitish flowers in axillary cymes followed by drupe-like sometimes edible fruits. They are not much cultivated in this country and none of the species is hardy North; the hardiest seems to be *Z. sativa* 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.

**Jujuba**, Lam. Fig. 4054. Tree, 30-50 ft. high: branches usually prickly; young branchlets, petioles and infl. densely rusty tomentose: lvs. 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, ½-3/4 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.

**sativa**, Gaertn. (Z. vulgaris, Lam.). Common Jujube. Shrub or small tree, attaining 30 ft., glabrous: prickly or unarmed; the longer prickle up to 1 ½ in. long: branchlets often fascicled, slender and having frequently the appearance of pinnate lvs.: lvs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes

4054. Jujube.—Zizyphus Jujuba. (x nearly ½)

Z. Giraldii, Sprenger. "A fine tree with a slender st. and compact crown and black elliptic fr., Z. S. Carolina. size recently been developed. The researches of the late Mr. R. A. Bailey, and the introduction of the United States Department of Agriculture, has introduced many of the best varieties, most of which are now fruiting at the Department experiment station, and are being distributed in the form of seed, either free or for sale. The Chinese varieties are much larger than those grown in Europe, but are somewhat inferior in flavor. In China orchards of hundreds of acres in extent were observed by Meyer in the vicinity of the cities. One variety has recently borne at the Introduction Garden in California,Coroutine ably a fine fruit of which is as large as an average hen's egg. Meyer says there are 300 or 400 varieties in cultivation by the Chinese. Some types are spherical and brown in color, others elongated and light mahogany-brown. Some sorts are eaten fresh and others are dried and kept indefinitely. The largest varieties when processed with sugar and honey make a delicious sweetmeat, comparable to a good quality of Persian dates. The Chinese ships in this country carry stocks of the dried and processed fruits which are much appreciated, not only by the Chinese, but by Europeans. Most of the varieties are armed with sharp stipular thorns, though occasionally thornless and seedless sorts have been produced. Besides Zizyphus Jujuba, which produces the best fruits, other species are useful in various ways. Z. joaeseiro of Brazil, according to Dorsett, Popoe, and Shamel, is a beautiful dense unbranched tree producing enormous crops of fruit which is greedily eaten by sheep, cattle, horses, and swine, and is of the advantage of thriving in the arid parts of the world. Z. Lycocarpus, of the shores of the Mediterranean, the fruit of which, though inferior to Z. Jujuba, is eaten by the people of its native country. Z. rotundifolia (Z. num- mularia) is a thorny shrub native of northwestern India where it is much used as a garden hedge. The fruit is small, but of pleasant subacid flavor. Z. rugosa, with an edible drupe, is harder than the last, ascending in Burma to 4,000 feet. Z. sativa is a small or medium tree of Syria and northern India, ascending the Himalayas to 6,500 feet, therefore quite hardy. Its fruit is the size of a large olive, acid, but used for pastes and pectoral lozenges. Z. Spinus-Christi is a bush used for hedges, so named from a notion that the crown of thorns was fashioned from the twigs. Z. Mistol is a small tree of Argentina with edible fruit with large stones.

The common jujube thrives in nearly all parts of the southwestern states and California and on all kinds of soil, except clay, and requires light irrigation. The trees are planted 15 to 20 feet apart and are given the usual orchard cultivation. On account of their beauty the trees are often planted in dooryards. Propagation is by seeds or offsets. The seeds are very hard and are often cracked before planting, otherwise they will be one or even two years in germinating. Seedlings have been known to blossom at one year, but four years is more usual. As established trees send up abundant sprouts, the usual method of propagation is by this means.

The trees are regular bearers and the crop is never cut off by spring frosts, as they do not bloom until July in the valleys of California. The fruit of the varieties ripens in October and November and if 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 sirup or glacing, the unbroken fruit, being slightly more acid, is preferred.

The jujube is well worth the attention of fruit-growers and when produced in sufficient quantities will find an extensive demand both for fresh and dried fruit.

The tree is of drooping habit, the branches, especially in autumn, bending down with the burden of fruit. Its dark, light green foliage renders it very ornamental, while its large, shining, dark purple fruit, the size and shape of a small olive, adds to its beauty in autumn. The fruit is dry and wrinkled when fully ripe and has a subacid flavor which is pleasing to most persons. In southern Europe it is used to a considerable extent as a table dessert and in winter as a dry sweetmeat. It is also used as a pectoral and is esteemed for throat troubles in the form of pastes, tablets, sirup, and the like.

The tree has been extensively cultivated in northern China for thousands of years and hundreds of varieties have been developed. Frank N. Meyer, an explorer sent out by the Office of Foreign Accl. and Introduction of the United States Department of Agriculture, has introduced many of the best varieties, and the Department has now fruiting at the Department experiment station, and are being distributed in the form of seed, either free or for sale. The Chinese varieties are much larger than those grown in Europe, but are somewhat inferior in flavor. In China orchards of hundreds of acres in extent were observed by Meyer in the vicinity of the cities. One variety has recently borne at the Introduction Garden in California,Coro...
CXX. Zinnia, Giant Yellow and Scarlet.
ZYGOCACTUS (cactus with zygomorphic flowers). *Epiphyllum* of horticulturists. *Cacteeae, Crab-Cacti.* 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: sts. flat and jointed, becoming rounded with age, bearing areoles only on the margins and more or less truncated ends, from which grow the new branches and the umbel-like flowers, which are barren and 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

ZYGOPETALUM

truncatus, Schum. (Epiphyllum truncatum, Haw.).

Crab Cactus, Christmas Cactus. Fig. 4055. Sts. much branched and hanging in large 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 much less wide recurved horns on either side of the truncation: areoles bearing a few short yellowish or dark-colored bristles, or sometimes none: fls. horizontal, growing from the truncated end of the youngest joints, strongly irregular, 2½-3½ in. long, in various shades of red: fr. pear-shaped, red, abscissed ½ in.

BRZL.

4055. Zygocactus truncatus. (×3/4)

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 or with allies of Cereus. A common basket- and rafter-plant.

For Epiphyllum Russelii and E. Gardneri, see Schlumbergera.


P. TRACY HUBBARD.


ZYGOPÉTALUM. (name referring to the united flower parts). Orchidaceae. Mostly epiphytic orchids of easy culture from Florida, Guiana, Rio de Janeiro, c.

Plants with numerous distichous lvs. sheathing a short st. which usually becomes thickened into a pseudobulb: lvs. membranaceous, venose or plicate: fls. solitary or in racemes, showy; sepals and petals nearly alike in form and color, often united to each other at the base; the lateral sepals 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. Mackai 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 wetted in freely 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° by day in winter, and in summer as low as possible with free ventilation during summer 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 old 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.

Mäckai, Hook. Fig. 4056. Pseudobulbs large, ovate: lvs. many, linear-lanceolate, 1 ft. long: scape 18 in. long, bearing 5 or 6 large fls.: sepals 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 Eulophia Mackiana). 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. Vars. supérbum, grandiflorum, mäjus are also advertised. Var. Chârlesworthii, Hort. Sepals and petals emerald-green, without purple markings. G.C. III. 51:83.

Gautierí, Lem. Pseudobulbs oblong-sulcate, 4 in. high: scape 2-3-ft.: fls. 3 in. across; sepals and petals green blotched with brown; labellum broadly reniform, deep purple at the base, white in front, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. L.H. 14:535. Gn. 49:118.—The lvs. are fasciculate, narrowly oblong, keeled, 12-16 in. long: infl. shorter than the lvs.

cc. Labelium pubescent.

crinatum, 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. Mackaii var. crinatum). — 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. caeruleum, Hort., has the veins deep blue. G.M. 46:153; 50:59. J.H. III. 46:197.

intermedium, Lodd. Lvs. ensiform, 1½ ft. long, 1½ in. wide; scape longer than the lvs., bearing 5-6 fls. each nearly 5 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. Mackaii are often cult. under this name.

dd. Petals uniformly colored.

Sedenni 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. 1850:417. Gt. 28:265. — A garden hybrid raised by Veitch.


HEINRICH HASSELERING.
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. Faboego, Linn., the Syrian bean-caper, with obovate lfts., copper-yellow fls., deep strong root and nearly or quite herbaceous top. S. W. Asia; Z. Morg-saina, Linn., with obovate obtuse lfts., long yellow petals, and shrubby habit, from S. Afr.; Z. spinosum, 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 synonyms, 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. | Page |
| 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, 2098; 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 |
| Cyclo. Amer. Hort. 1902 | 731 |
| 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 |
| Total | 5,372 |

| II. THE NUMBER OF PLANTS. The number of genera entered: Cyclo. Amer. Hort. 1902 |
|---|---|
| Volume I | 422 |
| Volume II | 709 |
| Volume III | 442 |
| Volume IV | 550 |
| Volume V | 449 |
| Volume VI | 639 |
| Supplement | 3 |
| Total | 3,214 |

| 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 | 1,901 |
| Volume V | 2,064 |
| Volume VI | 2,372 |
| Supplement | 102 |
| Total | 12,493 |
The number of minor species-entries in the main articles, in italic type:

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The number of species in the supplementary lists, at the end of the various articles, in small italic type (including all but cross-references):

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Total species accounted for . 20,602

The number of synonyms:

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Within the five years several horticulturists have passed away, whose biographies would have been proper subjects for entry in the Cyclopedia. 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 Cyclopedia 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.
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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 (1900–1902), whose name appears in the present work.
†Means contributor deceased since contribution was made for present Cyclopedia.

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CULTIVATOR'S GUIDE TO THE ARTICLES

The numerals refer to pages where the articles are not in the regular alphabetical sequence.

The articles in the Cyclopedia 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, Cactus, Cloves, Education, Experiment Stations, Extension Teaching, Gums and Resins, Herbarium, Horticulturists, Horticultural Literature, Names and Nomenclature, Sap, Saprophyte, Transpiration, Variegation, Xena, and many others; (4) geographical articles, comprising British North America, Island Dependencies, North American States.

The identificational and informational articles that appear for the most part, in regular alphabetical order. The cultural directions, however, are in part included in class articles of many kinds, inasmuch as they have only indefinite alphabetization. With each important generic entry, cultural directions will be found, as under Wisteria, Rhamnus, Ardisia, Pyrola, Ixora, Torenia, and the other, throughout the six volumes; aside from these directions, however, are many others of special importance and interest, and these others are here listed and classified in such a way that the cultivator may have the range before him and be aided in finding the advice he desires.

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:


Lawns; see under Landscape-gardening, 1816.

Lawn planting; see under Landscape gardening. Herbs, Planting, Arboriculture (see List No. 9, page 3664). Layering. Light for greenhouses. Lists of trees (under Arboriculture), herbs (Herb, Herbs), shrubs (Planting); also under Ferns, Orchidee, Palms, Machinery and implements (symposium).

Nuts. Orchids (symposium), comprising different parts; see also the culture under the alphabetical orchid entries. Orchard; see Fruit-growing. Packages. Palms (symposium), comprising different phases of botany and treatment, with list of leading palms and their culture. Park; see under Landscape gardening, 1801; also 2694. Perennials. Peramery-gardening. Pea. Planting (symposium), comprising more than twenty articles on special phases of the work, with lists of shrubs. Pollen. Pollination. Potting. Pruning. Railroad-gardening. Rock-gardening. Rustic work; see under Planting, 2677. Screens; see under Planting, 2670. Seaside planting; see under Planting, 2670. Seed and sedge (symposium). Shade-loving plants; see under Planting, 2695; 2700; under Herbs, 1472, 1473, 1474, 1475. Shade trees; see under Arboriculture.

2. Soil management; fertilizing; cover-crops.


3. Insects, diseases, birds, weeds; frost; means of control.


Spray-gardening. Storage. Subtropical gardening; see under planting, 2669. Succulents; see under Planting, 2666. Sun-loving plants; see under Planting, 2701; under Herbs, 1471, 1472, 1473, 1476. Tools and implements: see Machinery and implements, 2675. Transportation. Tree-moving; also under Arboriculture, 362. Vegetable-gardening. Village improvement; see under Planting, 2658. Vine; see under Planting, 2681, 2682, 2695, 2697-2700, 2705. Wall-gardening; see under Planting, 2680. Walks, paths and driveways. Water-gardening; see under Planting, 2680, also Bog-gardening, 519 and 2666; Aquarian; Aquatics; Nymphs, Victoria, and others. Watering.

Wild-gardens; see under Planting, 2663. Windbreak. Window-gardening and window-boxes. Winter-gardening; see under Planting, 2664. Winter protection; see under Planting, 2684. Woody plants; see under Planting, 2662; also Landscape gardening. Also articles on the different fruits, flowers, vegetables, trees, shrubs, ornamental plants, in regular alphabetical order.

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5. Marketing; transportation; inspection; exhibitions.

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6. Gardening; greenhouse; floriculture; florists' plants; flower-growing. (See List No. 9, on Landscape Gardening, etc.)

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Bog-gardening; also 2666.
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9. Landscape gardening; lawns and planting; herbs, shrubs, trees.

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ADDITIONAL SPECIES

The first volume of this Cyclopeda 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 to this date, as stated on page xi, that the Cyclopeda 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 Cyclopeda 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.

ABIES. Page 172.

Delaváyí, Franch. (Keteleiría Fôbri, Mast.). (After No. 11 in the treatment of Abies.) Tall tree, to 120 ft.: young branches yellowish or reddish brown, lustrous, usually glabrous: winter buds obtuse, resinous: lvs. 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 2¼ in. long; bracts usually slightly exerted. W. China. G.C. III. 39:212 (as A. Fargesi on p. 213).

Faxoníana, Rehd. & Wilson. (After No. 11.) Tall tree, to 120 ft.: young branches brownish villous: winter buds obtuse, very resinous: lvs. crowded, distichously spreading, linear, short-pointed or obtuse to emarginate, ½–1 in. long, silverly white beneath; cones ovoid or ovoid-oblong, usually truncate violet-purple, about 2½ in. long; bracts exerted. W. China.

recurváta, Mast. (After No. 11.) Tall tree, to 120 ft.: young branches pale yellowish gray, lustrous, glabrous: winter bud slightly pointed, very resinous: lvs. 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.

squamátta, 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: lvs. very crowded, ascending, mucronate or obtuse, often falcate, glaucous below 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.

ALEURÍTES. Page 245.

montáná, Wilson, is a new wood-oil tree recently intro. from China, and related to A. Fordii, but with the staminate and pistillate fls. tending to be in separate infl., the latter racemose and the fr. egg-shaped with 3 longitudinal and many transverse ridges.

AMPELÓPSIS. Page 275.

Watsoníana, Wilson (Vítia leecoides, Veitch, not Planch.). (After No. 10.) Tall climbing shrub, with slender forked tendrils, glabrous: lvs. simply pinnate; lfts. 5, stalked, ovate or ovate-oblong, acuminated, rounded at the base, remotely serrate, bright green above, glaucous beneath, 3–4½ in. long; fls. and frs. not known, but probably not much different from those of A. leecoides to which this species is closely related, but easily distinguished by the always simply pinnate lvs. with fewer and later lfts. Cent. China.

J.H.S. 28:295, figs. 95, 96, erroneously cited under A. leecoides on p. 278 of this work.

ANGÓPHORA. Page 288.

intermédia, DC. (Metrossédas floribunda, Smith, not Hort.). Tree, described by Bentham as having rough persistent fibrous bark, the parts nearly or quite glabrous: lvs. lanceolate to ovate-lanceolate, distinctly stalked, 2–4 in. or more long, sharply acuminate; fls. rather small, in loose corymb 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.

lanceolátta, Cav. Described in Calif. as a medium-sized white-fl. tree; by Bentham said to be “a tree of considerable size,” with bark deciduous in large smooth flakes, the parts glabrous or essentially so: lvs. lanceolate, acuminate, 3–5 in. long, distinctly petiolate, with numerous parallel pinnate veins: fls. in rather dense terminal clusters, larger and denser than in A. intermédia; calyx about 3 lines long, the teeth shorter and thicker than in A. intermédia. Austral.

AQUILEGIA. Page 339.

akíténsis, Huth. St. erect, branched above: radical and lower cauline lvs. twice ternate, uppermost cauline lvs. simple, narrowly lanceolate; sepals 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. Page 391.

splendens, Sweet (Convolvulus splendens, Hornem. Lettsomia splendens, Roxbg. Ipomoea splendens, Sims). Described by Clarke as "a large climber:" lvs. elliptic and acuminate, never cordate 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 corymbs; corolla tubular-campanulate, 1½ in. long, the plaits hairy outside; sepals tomentose, ovate and obtuse, 2½ in. long: caps, scarlet, papery. India. B.M. 2628.—Doubtful whether known in this country. The plant in cult. as Convolvulus splendens may be a form of the common morning-glory, Ipomoea purpurea.

BÉRBERIS. Page 487.

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. amurensis var. japonica, Rehd.

levis, No. 24. The species described under this name is B. atrocarpa, Schneid, (B. levis, Hort., not Franchet). The true B. levis is not in cult.; it has more closely serrate leaves, and purplish black slightly gloomy fr., while the fr. of B. atrocarpa is jet-black.

Sargentiana, No. 25. The plant described is the true species, but the shrub cult. under this name is often B. Juliana, Schneid., which seems slightly harder; it has the young branches yellowish and slightly grooved (terete and red while young in B. Sargentiana), shorter lvs. hardly exceeding 2½ in., firmer and less reticulate beneath, elliptic gloomy frs. crowned by a short style, on pedicles 3½-4½ in. long. B. aggregata, Suppl. List. (page 492). Add as a synonym B. brevicaulita, Hort., not Schneid.; the true B. brevicaulita is not in cult.

B. Wallachiana, Suppl. List. The species cult. under this name and described here is B. zanzibaronis, Hassk., to which B. Wallachiana var. latifolia, Hort., and also B. Knightii, Hort., B. macrophylla, Hort., and B. Wallachiana, Hort., not DC., must be referred as synonyms. The true B. Wallachiana, DC., has elliptic lvs. of firmer texture and is not in cult., while the true B. Wallachiana var. latifolia, Hook. f. & Thoms., belongs as a synonym of B. Hookeri, Lem.

BÉTULA. Page 497.

Var. Práftii, Burkill. (End of No. 3, B. utilis.) Lvs. nearly truncate at the base, more gradually acuminate, the secondary veins scarcely pilose, but the veins reticulate short-pubescent; scales of the catkins with very short lateral lobes. W. China.

álbo-sinensis, Burkill (B. utilis var. sinensis, Winkler). (After No. 3.) Tree, occasionally to 100 ft., with orange-red bark: branches glabrous, lustrous: lvs. ovate, acuminate, rounded at the base, sharply and doubly serrate, glabrescent beneath, with 9-10 pairs of veins, 1½-3 in. long: cones cylindric, 1½-1¾ in. long; braacts glabrous, scarcely ciliate, slightly glabular; lateral lobes rounded, much shorter than the linear-lanceolate middle one. Central and W. China. Var. septentrionális, Schneid. Branchlets distinctly glabular: lvs. beneath on the veins often silky and bearded. N. W. China.

Potaninii, Batal. (B. Wilsonii, Bean). (After No. 7.) Shrub, to 10 ft., usually with spreading and prostrate branches, in its native habitat often hanging down the cliffs: branchlets densely brownish pubescent: lvs. short-petioled, ovate, acute, rounded or cuneate at base, irregularly, often doubly serrate, with 13-20 pairs of veins, dark green above, densely brownish pubescent beneath, ¾-1¾ in. long: cones ¾ in. long: scales with the middle lobe at least twice as long as the rounded lateral lobes. W. China.

In B. pendula, No. 9, strike out var. Tauschii and its description and insert after the end of the paragraph:

japónica, Sieb. (B. álba var. japónica, Miq. B. péndula var. Tauschii, Rehd.). Tree: branchlets glabrous or more or less glandular: lvs. broadly or deltoid-ovate, acuminate, truncate or broadly cuneate, sometimes subcordate at the base, simply or doubly serrate, glabrous or puberulous beneath and sometimes bearded in the axils, 2½-3 in. long: cone cylindric, its stalk ¼-½ in. long: scales with the lateral lobes spreading or recurved, as long or longer than the middle one. Japan. S.I.F. 1:21. Var. szechúnica, Schneid. (var. mandshurica, Schneid). Tree with wide-spreading branches: lvs. rounded or broadly cuneate at the base, glabrous or nearly so, dull or flusht green above; lateral lobes of scales spreading, half as long as the lanceolate middle one. W. China.

BUDDLÉIA. Page 585.

Fárquharii, L. Barron (B. asiática x 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 composed of stalked, 3-7-flld. clusters. Raised by R. & J. Fárquhar & Co., Boston, in 1913. Gn.M. 21:153.

CALLISTÉMON. 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, 1-1½ in. long, pungently acute; midrib and nerve-like margins prominent but lateral veins inconspicuous: stamens ¾-1 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 péndulus. 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.

hybridus, DC. Described only from lvs. which are rigid, linear, almost pungent, and with marginal nerve. —Not recognized by recent authors. The plant offered in Calif. under this name is probably a garden hybrid from Eu.

C. robústus, and C. splendens are trade names used in Calif. for forms recently intro. from Eu. Their botanical status is unknown.

HARVEY MONROE HALL.

CÁSSIA. Page 680.

polyáantha, Moc. & Sessé. Branches angled: lvs. about 12-paired, glabrous, spreading; lfts. petiolulate, 4½-5¼ in. long, oval, mucronate; fls. paniculately sub-corymbose, 9 lines diam.; calyx-segms. broadly ovate, mucronate; petals unguiculate, obovate; pod compressed, acute at both ends, 2 in. long, 6 lines broad. Mex.—In Calif. said to be a spreading shrub blooming freely and continuously; yellow.

CÉLSIA. Page 709.

Arcturus, Jacq. Probably perennial, but sometimes perhaps annual or biennial, differing from C. cretica, among other things, in its long-pedicelled rather than
subsessile fls.: more or less woolly, especially below: Ivs. all alternate, canescent beneath, short-petioled, lyrate, the terminal segm. large and oblong-obtuse with cre- nate margins, the later segms. smaller and ovate; caul- line lvs. few, oblong and slightly clasping; fls. ver- banum-like, yellow, the five spreading lobes obtuse, purple-hairy stamens deflexed and ascending. Crete. B.M. 1962.

CENTAUREA. Page 712.

orientalis, Linn. (After No. 9.) Perennial, 3 ft., erect and branching, the branches sparsely and short-pubescent: Ivs. coriaceous, glabrous or roughish, pinnatisect into lanceolate or linear divisions: heads yellow-flld. (said to be a red-flld. form), large, ovate; bracts of involucre pale or colored at tip, the intermediate or outer ones ovate and prominently pectinate. Caucasian 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 Cyclopedia 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 Thun- berg, in describing his Pyrus japonica, had the spe- cies now called C. japonica. In the same way, therefore, the name C. japonica, Lindl., must replace the name C. Maulei, and the species called here C. japonica must bear the name C. lagenaria, Koidzumi (Cydonia lagenaria Loisel.); and C. cathayensis should be a variety of it: Var. cathayensis, Rehd. (C. cathayensis, Schneid.). Ivs. narrower, lanceolate, pubescent beneath while young; Ivs. young, glabrous; or roughish, pubescent. 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. Rehderiana, Crub (C. nutans var. thyrsoides, Rehd. & Wilson).


CÔCOS. Page 812.

schizophylla, Mart. Trunk, 6-9 ft. high: Ivs. 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 Fla. and Calif.

CÔRNU. Page 851.

Wåteri, Wang. (After No. 13.) Tree, to 40 ft.: branchlets nearly glabrous: Ivs. elliptic, acuminate, broadly cuneate at the base, sometimes nearly rounded, usually crisped at the margin, dark green above, pale green and with appressed hairs beneath, with usually 4 pairs of veins, 2-4 in. long: panicle corymbose, about 3 in. across: style club-shaped: fr. black, about 3/4 in. across. Cent. China.—This plant has been confused with C. Wilsoniana which is apparently not in cult, and is chiefly distinguished by the whitish under side of the Ivs. and the cylindrical style.

Hémsteyi, Schneid. & Wang. (After No. 14.) Shrub, to 20 ft.: branchlets appressed-pubescent at first, becoming glabrous and reddish brown or purple: Ivs. 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. 3/4 in. across, bluish black. W. China.

CRATÈGUS. Page 878.

coloradensis, A. Nels. (After No. 35.) Low tree, to 1.2 ft. with glossy, pubescent, or sparsely appressed pubescent: Ivs. usually glabrous, or ovate or oblong, usually 21/2 in. long: corymb glabrous; Ivs. young, pubescent: Ivs. 3-5, with purple anthers: fr. subglobose, 3/4 in. across, brown. Colo.

erythrophöda, Ashe (C. cernéns, A. Nels.). (After No. 35.) Small tree, to 15 ft.: branchlets glabrous, purplish brown, spiny: Ivs. elliptic-ovate or obovate, acute, abruptly narrowed at the middle, lustrous and sparingly pubescent above, particularly on the veins, glabrous: Ivs. 15-20, 10-12 in. long: corymb glabrous; Ivs. 5-8, with purple anthers: fr. subglobose, 3/4 in. across, brown. Colo.

saligna, Greene. (After No. 37.) Tree, to 20 ft., with spreading or drooping branches, spiny; branchlets bright red, glabrous: Ivs. rhombic-elliptic to rhombic- lanceolate, acute or sometimes rounded at the apex, cuneate at the base, slightly hairless and dark green above, paler green and glabrous beneath, 15-2 in. long: corymb glabrous: Ivs. 3-5, 2-3 in. long, acute, base rotundate, both surfaces scabrous: peduncules solitary to ternate, alternate: calyx viscid-pubescent, tube, ventricose below. Mex.—C. jorulensis, Hook. B. M. 5232 = C. micropetala.


CYNOGLÖSSUM. Page 930.

nervósum, Benth. Plant hairy-pubescent, to 3 ft., perennial: Ivs. many, nearly sessile, elliptic or oblong, acute, those on the st. 4 in. long and not prominently netted, the radical ones narrow-oblanco-andate and with several pairs of strong nerves: fls. deep cobalt-blue, about 3/4 in. across, in many lax axillary and terminal racemes which are 3-6 in. long; corolla broadly cam- panulate 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.

adenóphorus, Schrad. About 2 ft. high: culm glab- rous: Ivs. shorter than the culm, linear, carinate: umbel 9-14-rayed; umbellules 6-9-rayed; rays 10-20- spikely; spikelets linear-lanceolate, many-flled, 3 lines long, the infl. whitish green: fr. obovate, 3-angled punctate-scabrous. Brazil.—Useful for pots.
D. EMONOROPS. Page 951.

fissus, Blume. Lf.-segms. many and graceful, 6-8 in. long, lanceolate, subulate-acuminate, plicate, apex penicillate, often bifid; racis aculeata: spadix erect, contracted: fr. ovoid-globose, about the size of a small cherry. Borneo.—Foliage described as bronzey green.

DECKÉNIA (after Karl von der Decken, German explorer of East Africa, killed in 1864 by the Somalis). Sometimes misspelled Deckeria: but there is a genus name Deckeria which, however, is regarded as a synonym of Iriartea. *Palmaceae*. One species, by some referred to Acanthophoenix, from the Seychelles, now in the Royal Botanic Gardens. *D. obiliscus* 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; pinnae narrow, hairy beneath, briskly when young; midrib yellow: fls. monoeous, 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, 1/2 in. long and 3/4 in. thick, black turning to straw-colored.

DELPHINIUM. Page 975.

speciobum. The trade name may apply to a showy garden form of *Delphinium carolinianum* L. *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 segms. acute and cut, the lower segms. not divergent: spur incurved at the point, equaling the sepals; petals glaucescent; ovary tomentose. Caucasus region, Persia.—*D. speciosum* Lam., somewhat similar in growth and fls. to *D. cashmirianum*, but has larger infl. and the fls. have longer spurs; Himalaya.

DIÁNTHUS. Page 997.

marginatus. The trade name may represent a margined or edged form of one of the common annual garden *Dianthus*, *D. margaritatus*, Poir., it is a perennial of Europe, with linear-margined lvs. and white segms. to bright pink fls.; calycine 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; lvs. narrow; brown below, subulate above, longer than the several fls.;lemmas pubescent, a Jenless. Siberia.—Sometimes cult. as an ornamental.

EREMÚRUS. 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.

EUCALÝPTUS. Page 1152.

alba, Reiniw. (*E. Platypôdôs, F. V. MiL*). Related to *E. populíifólia*, but lvs. much more variable, from lanceolate to broadly ovate or almost orbicular, acute to cordate at base, mostly 8 in. long: umbels in the axis and at the angles of the fls.: pedicels short or almost none, angular: cap hemispherical, low: valves slightly protruding. Austral. Maiden, Crit. Rev. Eucal. 103, 106, 107.—Grown at Los Angeles.

EUPATÓRÎUM. Page 1166, after No. 22 (but lvs. in 3’s stalked).

serótûmus, 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-nerved, slender-petioled, sharp-serrate, the upper ones alternate: fls. 7-15 in the campanulate involucre, of which the bracts are obtuse or truncate. Munn., south and southeast.

EVÓDIA. Page 1155.

hupêchénus, Dode. (After *C. Henryl. ) Tree, to 60 ft.: lfts. 7-9, short-stalked, elliptic-ovate to elliptic-lanceolate, long-acuminate, rounded or rarely narrowly at the base, glaucous or pale green beneath and glabrous or nearly so except villous in the axils of the veins, 3-6 in. long: infl. slightly pubescent, 4-8 in. broad: fr. beaked, yellowish gray, slightly hairy. Cent. China.

FÍCUS. Page 1229.

ulmôfôlia, Lam. (*F. sinôsa, Miq.). Shrub, 9-15 ft. high: lvs. alternate, variable, very harsh, oblong, sub lanceolate, undulate or coarsely toothed, sometimes deeply and narrowly lobed, acuminate, base rounded, 3-nerved, 31/4-7 in. long, 21/4-31/2 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, leafy; petiole thick, 2-4 in long; stipules membranaceous, 4-6 in. long, 11/4-2 in. broad, obtuse, yellowish brown spots: fr. solitary or clustered, almost globose, pubescent. Natal and Zululand.—Used for the manufacture of native cloth and rough cordage.

GALÈGA. Page 1311.

bicolor, Hausskn. Perhaps a form of *G. officinális*: 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 whitish blue. Mesopotamia.

GÉNTIÁNA. Page 1323.

tibética, King. A Himalayan species of which no close relatives from that region are described in this Cyclopedia, 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, cuneate at base into a cylindric sheath, the uppermost sessile and whorled and forming an involucre to the infl.: fls. crowded in the uppermost axis, sessile; calyx tubular, membranous, 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 ellipsoidal.

HEILCHRÝSUM. Page 1450, after *H. arenárium*.

angustifôlia, DC. Subshrub, the many virgate st. appressed-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. 8, Eu.—said to be a good plant for edgings, with white foliage.

HIBISCUS. Page 1453.

The names *H. cruentus* and *H. Lambertianus* in lists are probably forms of *H. Rosa-sinensis*; however, the botanical species bearing these names may be described, as surely:

*cruentus*, Bertol. St. erect, unarmed: lvs. petioled, palmately 3-5-fid. 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-fid, much larger, about 1 in. long; caps. ovate. Guatemala.
HIBISCUS

Lamblétanxus, HBK. Herb: st. simple, 6 ft. high, acuteate, minutely pilose: lvs. petioled, ovate-lanceolate, acuminate, base rounded, serrate, hirsute and green above, below canescent-tomentose, 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 1655, after 1. hirta.

montaña. 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 obtuse, the inner ones acute: achene hairy: plant about 1-1.5 ft. high, the heads bearing many narrow yellow rays.

IRIS. Section Evansia, species 1–5, page 1669.

gracilipes. Gray. Rootstock slender and branched: lvs. 3–4, radical, linear and grass-like, but 1 ft. long: peduncle filiform, about the length of the lvs., 1–3-headed: fl. solitary and sessile in the scarios 1-lvd. spathe, lilae; tube exceeding the 3-angled ovary, the segments obovate-oblong, the outer lobes glabrous; crest yellow; stigma 2-fid, cut. N. Japan.—Small plant, about 8 in. high, flowering freely in May.

JUNÍPERUS. Page 1728.

chinensis var. procumbens, No. 11. Under this name apparently three different forms have been confused; these are:

chinensis var. japónica, Vilm. (J. japónica, Carr.). A dwarf shrub with foliage mostly of the juvenile type; of which many are in cult.: Var. japonica aërea, Bean (J. chinensis var. procumbens aërea, Beiss.). Of more spreading habit with a few long branches, the young growth golden yellow. Var. japonica aëreo-variegata, Bean (J. chinensis var. procumbens aëreo-variegata, Beiss.). Of more compact and upright habit, the young growth variegated with golden yellow.

chinensis var. Sargenti, Henry. A prostrate form with long spreading branches, descending, 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 4. 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 4. aquama6 from which it may be distinguished by the branches being glaucous-white on the edges of the pulvini.

LÂRIX. Page 1823.

The hybrid between Larix decidua and L. leptolepis mentioned under L. decidua has been named L. híbrida. Its lvs. are much like those of the L. leptolepis; the male branchlets are light brownish yellow and slightly gloomy.

LITHOCÁRPUS (literally stone fruit). Fagaceae. The article Pasanía (page 2479) is to be referred to this new entry, as Lithocarpus is the older name and is the tenth one under the rules (see note in Sargent, Pl. Wilson. III. 205). Of Lithocarpus the following species are known to be in cult:

gíebra, Rehd. (Pasánía gíebra, p. 2479).
Héryi, Rehd. & Wilson (Quercus Héryi, p. 2890).
thalássica, Rehd. (Pasánía thalássica, p. 2479).

LYSÍMÁCHIA. Page 1935.

japónica, Thumb. Annual: st. slender and decumbent, simple, villous or pubescent, the apex erect: lvs. opposite, petiolate, roundish and subcordate to ovate, obtuse, entire: fls. 1 or 2 in the axis, the peduncle shorter than the lvs. and reflexed in fr.; corolla 5-1n. or less across, the gland-veined dissected segments obovate. In moist places and about fields, Japan, China, India, to the Philippines.—Whether the creeping yellow-flld. plant listed under this name is the true L. japónica is apparently yet to be determined.

NEPHRéLÉPIS. Page 2131.

To supplement the original account of Nephrolepis, there are published herewith revised lists of varieties. The first list (A) represents the forms now growing in the living collection of the Brooklyn Botanic Garden (1916–1917). It may be accepted as accurate as far as it concerns the varieties of N. exaltata. With respect to the varieties of N. exaltata, no more than figures of accuracy can be given. The proper classification of the wild forms of Nephrolepis is one of the most difficult problems in fern taxonomy, and with the inclusion of horticultural forms the difficulty is increased. The second list of names represents those forms which it has not yet been possible to secure for cultivation at the Botanic Garden. They are listed here merely to make the list of named forms as complete as possible. Most of the list was published in "Horticulture," October 28, 1916, accompanied by names of originators.

Regarding the other forms, it may be said that for American florists the Exaltata group includes practically all forms of commercial value. All these would be classed as greenhouse forms. Most of the species and varieties other than Exaltatas are stave forms. A few, especially the forms of N. cordifolia (including N. tuberosa, a synonym), and N. pectinata, will stand as much cold as the Exaltatas varieties. Many of them are worth introducing in a collection, but in general they do not make the many-leaved bushy plants so much prized by the American grower.

It may be noted that a form of N. cordifolia is apparently invariably now being grown and offered in the United States as N. exaltata. The true N. exaltata is really a very different form, more like N. bosstonensis, but easily distinguished by its greater stiffness and fewer leaves. Another point of distinction between the Exaltatas group and the other is that, with the exception of N. exaltata itself, none of this group is spore-fertile. Microscopic examination shows no fertile spores, but does show apparently abortive sporangia. It is practically useless, therefore, to attempt to raise these from spores. Notwithstanding this statement, it may be noted that several widely separated raisings have been reported in which the sporelings showed great variation, and it is not at all impossible that a fertile variety might develop from any one of these forms. Practically all the forms of other species (not N. exaltata) are spore-fertile, and may be readily raised in this way. In fact most of the new horticultural varieties in Group AA are reported as having originated from spores.

Finally, in Group AA, there are listed below a number of names for which no plants have been yet secured. They are probably mostly if not all of English origin, and likely to fall in the group of varieties of species other than N. exaltata.
NEPHROLEPIS

A. Nephrolepis exaltata and its varieties.

exaltata: wild species, tropics generally.
bostoniensis.
Chilid.
Dreyeri.
Dwarf Boston.
Edmontoniensis. (English.)
falcata. (There is also an English falcata.)
Gretnai.
Giartasi.

BB. Forms with twice-pinnate foliage.

Anna Foster.
Baby Pienon (parentage uncertain).
Barrowsi.
Clarki.
duplex bernsteini.
Elmsfordi.
Fosteriana (same as Anna Foster).

BBB. Forms with thrice-pinnate foliage (sometimes producing 2-pinnate forms).

Clarki.
elegans.
elegans "improved."
elegantissima compacta.
elegantissima crista. (Eng."
exaltata cristata. (Eng.)
Calvestoni.
yeopodioïdes. (Eng.)
muscosa.
Piersoni compacta (ele-gantissima compacta).

BBBB. Forms with 5-pinnate foliage.

Amerpohli.
diving. (Eng.)
Goodi.
gracillimi (not certainly the original gracillima of Barrows).
magnifica.

AA. Nephrolepis varieties and species other than exaltata.

acuminata.
acuta.
Barteri.
Baueri.
biserrata.
biserrata (davallioïdes) fur-
cans.
biserrata furcanis minor (davallioïdes furcans minor).
biserrata var. (Undeter-
mined form).

(cordata compacta: cordifolia
compacta.
cordifolia compacta.
cordifolia gigantea.
cordifolia elegans.
cordifolia tessellata.
crispata congesta.
davallioïdes: biserrata.
davallioïdes furcans: biser-
rata furcans.
Duffii.
enfisola. (English.)
"exaltata = cordifolia."
"exaltata fursans" = biser-
rata furcans.
"exaltata grandiceps" = bis-
serrata furcans minor.
falcata. (English.)
Harrisi.
New York.
Randolphi.
Roosevelti.
Schultheisi.
splendidia.
Teddy. Jr.
viridissima.
Wagneri.
Wananakiri.

BB. Forms with twice-pinnate foliage.

Kingsessing.
Millisi.
Piersoni.
Piersoni "improved."
robusta.
Schilleri.
Scholzeli.
splendidia.
superbissima.

BBB. Forms with 4-pinnate foliage.

Marshalli. (Eng.)
Marshalli compacta. (Eng.
Neuberti.
puleherrima. (English.)
Rochfordi. (Eng.)
Smithii.
Wredli. (Eng.)

BBBB. Forms with 5-pinnate foliage.

Willmotae. (Eng.)

NELSONIA (according to the author, derived from a Greek word for Daphne). Syn., Darbyia, Santalaceae.

N. aestivalis shrub closely related to Buckleya and differing chiefly in its axillary fles of hairs at the base of the stamens, simple stigma, and in its globos fr. without enlarged persistent sepalas. It has no particular ornamental qualities, but is botanically interesting, as it is a parasitic shrub growing like Buckleya on the roots of trees, chiefly on those of pines and oaks. For cult, see Buckleya. The only species is N. umbellata. Ref. (Darbyia umbellulata, Gray. Buckleya umbellu-
lata, Hieron.). Glabrous shrub, 1-3 ft., spreading by suckers: lvs. opposite, short-petioled, oval or ovate to elliptic-oblong, acute or obtuse, usually narrowed at the base, bright green, 1-2½ in. long; fls. 4-merous, diminutive, apetalous, greenish white; small; the staminate slender-pedicelled in 3-9-fld., peduncled umbels; stamens 4, short; pistillate fls. solitary, on stalks ½-3½ in. long, with ovate calyx-lobes much shorter than the tube: fr. globose, about ½ in. across, purplish, bloomy, crowned by the remnants of the calyx-limb. May; fr. in June. Va. to Ga. and Ala. S.F. 7:75.

ALFRED REHDER.

NYMPHÆA. Page 2310.

ovatifolia. (After No. 4.) The plant called Nym-
phaea ovatifolia, as its introduction in 1916, is from newly imported African seed, and was first raised by E. T. Harvey, of Cincinnati. It is not the true N. ovati-
folia, Conard. The new plant has more oval lvs. than N. caru-la, and larger and paler fls. It is to be regarded as a form of N. carulea, 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. carulea. The new form here mentioned falls between N. magnifica 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 bluish at the end of the petals.” (Quotations from letters from Mr. Harvey.) Petals 20; stamens 102; carpels 21; sepal thickly marked outside with black lines and dots. Fl. 6-8 in. across. (Data from specimens furnished by Mr. Harvey.)

N. ovatifolia, Conard, Monogr. Nymph. 150, is from German E. Afr., apparently not in cult. Lvs. narrowly elliptic, with large irregular brown blotches above but plain green beneath; fl. deep blue, closed in dull weather.

H. S. CONRAD.

PASANIA. Page 2479.

The oldest and tenable name for this genus is Litho-
carpus, which is entered on page 3569. The species of Passania in the supplementary list of Quercus, page 2890, are also to go into Lithocarpus.

PAVONIA. Page 2489.

hostata, Cav. St. pubescent: lvs. short-petioled, orbicular to oblong, sometimes deltoid, sagittate or hastate, dentate, somewhat tomentose beneath, pubes-
cent above; stipules filiform; pedioles axillary and 1-fl., the involucre 5-bracted, the petals red-capped or veined at the base with purple. Brazil.—Offered in Calif., as a small purplish-fl.d shrub.

PELARGONIUM. Page 2532.

acerifolium, L'Her. One of the Pelargonium section, allied to No. 20, inserted here because Geranium citri-
odium 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, 3-4 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 searious. S. Afr.—Krauth, in his recent Monograph, keeps the species distinct.
PHILADELPHUS. Page 2551.
Add to P. inodorus: P. gloriosus, Beadle, is probably not specifically distinct from P. inodorus; it differs chiefly in the cup of the calyx being abruptly contracted at the base, not gradually narrowed into the pedicel.

PINÁNGA. Page 2636.
decora, Lind. & Rod. Unarmed; trunk tall; sheaths, margin of petioles and nerves at first brown; lig.-segms. tessile, broadly lanceolate, long-acuminate or sometimes with the apex bifid and rotundate. Borneo.
pátula, Blume. Trunk tall: lvs. unequally pinnate, 1–1 1/2 ft. long, 9–14 in. broad; segms. falcate-lanceolate, acuminate, the uppermost with their base equally or unequally attenuate: spadix erect or pendulous, 2–3-ft: fr. ellipsoidal, acute, obscurely striate. Sumatra.—Said to be a dwarf species as grown in pots and useful for conservatory. This and the above are recently listed.

PINUS. Page 2640.
After P. sylvestris var. pumila add: Var. Wálterei, Hort. (P. Wateriána, Hort.). Dense columnar form with steel-blue short lvs.

POTENTÍLLA. Page 2773.
Add to P. fruticosa: Var. parvifolia, Wolf (P. parvifolia, Fisch.). Lfts. usually 7, oblong-elliptic, glabrescent, 3/4–3/1 in. long: lvs. pale yellow, 3/4 in. across. Cent. Asia. W. China. Himalayas. It may here be remarked that var. Veitchii, Bean, can scarcely be considered a hybrid of typical P. fruticosa and var. dahuirea as formerly supposed, for it is now reported as common in Cent. and W. China, where var. dahuirea has not yet been found; it was intro. in 1902, while var. Friedrichsenii, Rehd. (P. Friedrichsenii, Spaeth) was raised about 1922. Spaeth's var. dahuirea of var. dahuirea; it differs from var. Veitchii in the yellowish lfts. with narrower outer sepals, narrower and larger lfts. and pale, not lustrous brown stipules.

PYCHARÓPHIΣ. Page 2856.
singapórénésis, Becc. (Dryophyllum singapórénésis, Hook. Pychospermá singapórénésis, Becc.). Trunk low, about 4 1/2 ft. high: lvs. about 5 ft. long or more, linear or linear-lanceolate, acuminate, about 8 in. long: spadices about 1 ft. long, simply branched from the base. Singapore.

RHODODÉNDRON. Pages 2938, 2942.
4. R. arbutifólium. Two species or hybrids are involved here. The synonyms R. oleifólium and R. Wilsonii should be eliminated. R. arbutifólium is probably a hybrid of R. ferrugineum and R. carolinianum. The lvs. are elliptic, not "to elliptic-lanceolate," and the size is 1 1/2–2 1/2 in. After R. arbutifólium insert:
latévirens, Rehd. (R. Wilsonii, Hort., not Nutt. R. Wilsonianum, Hort. R. oleifólium, Hort., not Franch. Probaby a hybrid of R. ferrugineum and R. minus. Very similar to R. arbutifólium, but of slenderer, looser habit, with narrower and longer ellipt-lanceolate lvs. of a brighter green. This plant is generally cult. under the name R. Wilsonii, while the preceding one is known in English gardens as R. arbutifólium.

austriáceum, Rehd. (Azalea austriácea, Small). (After R. calendulaceum, No. 35.). Shrub to 10 ft.: branchlets pubescent and usually glandular: lvs. oval or obovate to oblong-spatulate, acute or mucronulate, finely pubescent, ciliate, 1–3 1/2 in. long: fls. before the lvs., yellow or orange; calyx-lobes deltoid or triangular-lanceolate: corolla funnelliform, about 1 in. long, the tube densely villous and up to the limb; lobes broad, acute: calyx finely glandular-pubescent. Fls.

RÍBES. Page 2963.
In the Suppl. List under R. Culverwellii, strike out var. volvénæ 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. bulláta, Spaeth (S. bulláta, Hort.). Forms a compact subglobose bush.
Between Nos. 6 and 7 insert:
To No. 7, add the following variety: Var. calva, G. F. W. Mey. (S. alba × caruíla, Smith). Of pyramidal habit: lvs. larger at maturity glabrescent, more bluish-green above and more glaucous below.
After No. 7 insert:
hexáandra, Ehrlh. (S. alba × S. pentánda). Low tree; mature branchlets glabrous: lvs. lanceolate, green on both sides, silky at first, becoming glabrous: catkins like those of S. alba; stamens 4–6. In Eu., with the parents.

After Salix No. 17 insert several species and hybrids, as follows:
latísfolía, Forbes (S. Cártea x S. myrsínfolía). Shrub: branchlets pubescent: lvs. oval or obovate to oblong, usually acute, irregularly serrate, dark green and finally glabrous above, glaucous and silky below at first, finally glabrous: ovary thinly silky or partly glabrous. Occurs with the parents.

erdíngeri, Kerner (S. Cártea × S. daphnódeò). Tall, arborescent shrub: young branchlets short-pubescent, older branchles glabrescent: 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 pubescent with the parents. Var. crenámis, Rehd. (S. crenámis, Kerner). Close to S. Cártea: lvs. broader, more densely pubescent beneath: ovary silky.

Wummeríána, Gren. & Godr. (S. Cártea × S. purípëra). Shrub with upright branches: young branchlets sparingly short-pubescent, later glabrous, brown: lvs. oblong or obovate-lanceolate to lanceolate, acute, narrowed at the base, irregularly serrate, thinly silky-pubescent while young, later glabrous, dark green and lustrous above, glaucous below: stamens conuate at base; ovary grayish pubescent. Occurs with the parents.
cinérea, Linn. Large shrub or small tree, to 25 ft.: 1- and 2-year-old branchlets tomestose: stipules often persistent: lvs. obovate or elliptic, acute or rounded, narrowed or rounded at the base, irregularly serrate, pubescent on both sides, 1 1/2–2 1/2 in. long: catkins sessile, before the lvs.; staminate ovoid; filaments pilose, free; pistillate cylindrical, ovary pubescent; style very short or wanting. April. Eu., N. Afr., W. and N. Asia. Var. oleífóliu, Reichb. (var. angústísfolía, Döll). Leaf elliptic-lanceolate.

Lastádáìa, Hartm. (S. cinérea × S. lappónum. S. canéscens, Fries). Low or medium-sized shrub; young branchlets pubescent, older glabrous: lvs. obovate to oblong, acute or short-acuminate, narrowed at the base, irregularly serrate or entire, pubescent above, tomentose beneath: fls. before the lvs.; stamens sparingly hairy at the base; ovary pubescent; style to one-third as long as ovary. N. Eu. with the parents.
SALIX

sordida, Kerner (S. cinerea × S. purpurea, S. Pontederana, W. D. Koch, not Willd.). Tall upright shrub: young branchlets tomentose, later glabrous, brown or yellowish; lvs. elliptic to lanceolate, acute, cuneate or rarely obtuse at the base, irregularly serrate, pubescent while young, later glabrous above, glabrescent and glaucous beneath: catkins on short, often leafy stalks; stamens usually conuate one-half; ovary pubescent with short style. Eu. with the parents.

aurita, Linn. Shrub, 3–8 ft.: branches spreading, usually glabrous at maturity: stipules persistent, broad: lvs. short-petioled, obovate to elliptic, obtuse, usually rounded at base, irregularly dentate or nearly entire, pubescent on both sides or nearly glabrous above, glaucous beneath, 1–2, rarely to 3 in. long: catkins short-stalked or nearly sessile, a little before the lvs., the staminate broadly elliptic, with long filaments hairy at base; the pistillate cylinder; ovaries hairy; style very short or wanting. April. Eu., W. Asia to Altai Mts.

ambigua, Ehrh. (S. aurita × S. repens). Shrub, about 3 ft., with creeping at.: branchlets glabrous; lvs. elliptic to oblong-obovate, pubescent, later glabrescent above, about 1 in. long: catkins a little before the lvs.; ovary pubescent; style rather long. In Eu. with the parents.

ludicrens, White (S. aurita × S. phyllicifolia). Shrub: branchlets glabrous at maturity: stipules usually persistent: lvs. elliptic to narrowly obovate, crenulate, glabrous at maturity, glaucous beneath: catkins rather small, on leafy stalks, cylindrie; ovary pubescent. N. Eu., with the parents.

sequitaria, White (S. aurita × S. phyllicifolia × S. purpurea). Intermediate in general appearance between S. aurita and S. phyllicifolia: lvs. in shape like the former but with the nervation of the latter and nearly glabrous at maturity: stamens quite conuate; ovary pubescent with slender style. Observed in Eng land with the parents.

grandifolia, Ser. (? S. appendiculata, Vill.). Shrub, to 10 ft., with spreading branches: branchlets tomentose while young; stipules often conspicuous, semi- corolate: 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, 2–6 in. long: catkins before or with the lvs. on short stalks with small bract-like lvs.; stamens hairy below: ovary pubescent; style short. Higher mountains of Cent. and S. Eu.

neriifolia, Schlech. (S. grandifolia × S. purpurea. S. Pontederana, Schlech., not Willd. S. austratca, Kerner). Shrub, to 6 ft., with upright slender branches: young branchlets pubescent, later glabrous, greenish or brown: stipules rather narrow: lvs. obovate-lanceolate to lanceolate, acute, serrulate, glabrous at maturity, glaucous beneath and reticulate beneath, 2–3 in. long; catkins shortly united at base: lvs. filaments more or less connate; ovary stalked, pubescent, with very short style. Cent. Eu. with the parents.

myrsinifolia, Salisb. (S. nigricans, Smith. ?S. spadicea, Chaix). Shrub, to 12 ft.: branchlets hairy or glabrescent, dull: stipules often rather large, sub- corolate: lvs. varying from elliptic, or rarely suborbicular to oblong-ovate or broadly lanceolate, usually acute, rounded at the base, serrate 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 ¾ in.; pistillate cylinder; ovary stalked, usually glabrous, style slender. Eu., W. Asia to Kamchatka.—A very variable species.

tetráplá, Smith (S. myr-rínifóliá × S. phyllicifóliá). 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 stipules of S. myr-rínifóliá and the more shining and glabrous branches and lvs. and the smaller stipules of S. phyllicifóliá. Occurs in Eu. between the parents.

phyllicifóliá, Linn. (S. bicolor, Ehrh.). Upright shrub, to 3 or rarely 8 ft., with stiff and rather short branches: branchlets glabrous, polished: stipules 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; ovaries pubescent or sometimes glabrous, stalked; style rather long. N. and Cent. Eu., N. Asia.


After Salix, No. 24, insert three: stipuláriá, Smith (S. cinerea × S. visinális. S. holońeric, Willd. Shrub or small tree: branchlets long and stout, persistently pubescent: lvs. lanceolate to oblong-ovate, acute or acuminate, irregularly serrate or crenate, 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.

daphnoidés, Vill. Tall shrub, to 30 ft., rarely tree: branchlets yellowish or brownish, bloomy, glabrous: stipules cordate: lvs. short-stalked, lanceolate, acuminate, glandular-serrulate, glabrous, glaucous below, near the base; 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: Píperi, Bebb. Shrub, to 20 ft.: branchlets glabrous, dark brown: lvs. elliptic-oblong, obovate or oblongate, acute, undulate or nearly entire, glabrous, glaucous beneath, 4–6 in. long: catkins sessile or short-pedunculate; stamens united or free at base; ovary smooth; style rather long. Wash.

hastáta, Linn. Shrub, to 6 ft., young branchlets pubescent, older brown, brown: stipules often very large, obliquely ovate: lvs. elliptic or ovate, acute, glabrous, irregularly serrate, 1½–2½ in. long: catkins with the lvs., in leafy stalks; filaments glabrous; ovary glabrous, style rather long. Eu., N. and Cent. Asia.

glábra, Scop. Low shrub, to 4 ft., with short, stout branches: young branchlets glabrous, brown: lvs. broadly oval or obovate 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: Rétuéri, Moritzí (S. daphnoides × S. incáná, S. Wimmeri, Kerner). Tall shrub; young branchlets densely pubescent, older brown, glabrous, often bloomy: stipules small, lanceolate; lvs. lanceolate or narrowly
lanceolate, acute at both ends, serrulate, silky pubescent while young, glabrescent at maturity, dark green above, glaucous beneath, 1 1/2–3 in. long; catkins before the lvs., nearly sessile, cylindric; staminate 1–1 1/2 in. long; ovary short-stalked, glabrous, with short style. Cent. Eu., with the parents.

gracilistyla, Muq. (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 1–1 1/2 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 3/4 in. broad. Var. sericea, W. D. Koch. Lvs. silky when young, becoming glabrous. Here belongs the "Kecks Willow" (var. Keckstii, 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 x S. viminalllis. S. Forsy- diana, Smith). Small shrub: young branchlets short-pubescent, older glabrous; lvs. linear to lanceolate-oblong, acute or acuminate, dentate, pubescent while young, later glabrescent: catkins sub.sessile, sta-

mens 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 ovary or shorter, with short oval stigmas. Japan.

SOLÀNUM. Page 3155.

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 3/4 in. diam., rather deeply lobed; ovary puberulous: fr. red at maturity and about ½ 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 almon in Prunus rather than in Amygdalus, in which Linnaeus originally described it as Amygdalus communis, the new combination Prunus communis results. If Rubus leioborys of Koch is considered by Zabel to be only a form of R. aureum, the new combination R. aureum var. leioborys, Zabel, results.

To enable botanists and bibliographers to record and trace the different dispositions and property to understand the varying opinions 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 these were duly published in Rhodora, XVIII, 152-160 (July, 1916); these were largely in the genera Polyscias, Pyrus, Peonia, Passiflora, Prunus, Statice, Limonium, Saxifraga, Tropaeolum.

A list of several incidental scattered new combinations made in the Cyclopeda 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 in the use of varietal names, and in the compulsory shift of other names, may be traced by 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 the Cyclopeda in which no authority is given for varieties, "Hort." is to be understood.

The dates of the new combinations listed below are those of the publication of the six volumes: Vol. I, A-B, March 25, 1914; Vol. II, C-E, July 22, 1914; Vol. III, F-K, May 12, 1915; Vol. IV, L-O, Feb. 23, 1916; Vol. V, P-R, Oct. 4, 1916; Vol. VI, S-Z March 28, 1917. It will be seen that most of the combinations are in the latter part of the alphabet, and among the names of woody plants. No new species have been described in the Cyclopeda, and very few new varieties.

ALLAMANDA CATHARTICA, Linn., var. nobilis (T. Moore) Raffill, I. 247.

ALLAMANDA CATHARTICA, Linn., var. Schottii (Pohl) Raffill, I. 247.

ALLAMANDA CATHARTICA, Linn., var. Hendersonii (Boll) Raffill, I. 247.

AMARYLLIS BELLADONNA, Linn., var. pallida (Rehd.) Bailey, I. 271.

AMARYLLIS BELLADONNA, Linn., var. Parkeri (Hort.) Bailey, I. 271.

BRUNNELSA CALYCINA, Benth., var. eximia (Sehdelw.) Raffill, I. 551.

BRUNNELSA CALYCINA, Benth., var. floribunda (Hort.) Raffill, I. 551.

BRUNNELSA CALYCINA, Benth., var. macrantha (Lem.) Raffill, I. 551.

BRUNNELSA AMERICANA, Linn., var. pubescens, Raffill, I. 582.

CISSUS OLOGARCA (LEV. & VAR.) Bailey, II. 775.

FUCUS MAGELLANICA, Linn., var. Riccartonii (Hort.) Bailey, III, 1301.

HELENIUM AROMATICUM (Hook.) Bailey, III. 1443.

HELLEBRUS HELANTHIDES, Sweet, var. Pitcheriana (Fletcher) N. Taylor, III. 1452.

HERBA LAMIOCARPOS, Cav., var. californica (Kell.) Bailey, III. 1496.

HOSTA FORTUNI (Baker) Bailey, III. 1604.

HOSTA FORTUNI, Bailey, var. gigantea, robusta, argentee-variegata (Hort.) Bailey, III. 1904.

HOSTA LANCIFOLIA, Tratt., var. albo-marginata und tardiflora (Hort.) Bailey, III. 1905.

HOSTA LANCIFOLIA, Tratt., var. undulata (Otto & Dietr.) Bailey, III. 1605.

HOSTA longipes (Franch. & Sav.) Bailey, III. 1605.

LACTUCA BOURGEOI (Beiss.) N. Taylor, IV. 1766. (Malododium Bourgei, Boiss.)

LIRIOPE GRAMINIFOLIA, Baker, vars. minor and koreana (Wright) Bailey, IV. 1906.

LIRIOPE GRAMINIFOLIA, Baker, var. intermediarum (Maxim.) Bailey IV. 1909.

LITHOCARPUS DENSIFLORA (Hook. & Arn.) Rehd., VI. 3509.

LITHOCARPUS CORNEA (Lour.) Rehd., VI. 3509.

LITHOCARPUS GIBRARA (Thunb.) Rehd., VI. 3509.

LITHOCARPUS THALASSICA (Hance) Rehd., VI. 3509.

Maurandia Lophoperum, Bailey, new name, IV. 2013.

PERILLA FRUTESCENS, Brit., var. nankinensis (Deene) Bailey, V. 2555.

VAR. NANKINENSIS, Bailey, subvar. lacinata, macrophylla, variegate, microphylla (Hort.) Bailey, V. 2555.

PINUS SIGRA, Arnold, var. pindica (Formanek) Rehd.; var. pendula (Beiss.) Rehd.; var. pygmaea (Ritchie) Rehd.; var. prostrata (Beiss.) Rehd.; var. Mosei (Moser) Rehd.; V. 2541.

POTENTILLA FRUTICOSA, Linn., var. Friedrichsii (Spaeth) Rehd., VI. 3571.

PSEUDOTAXUS TAXIFOLIA, Brit., var. fretsi (Beiss) Rehd.; var. Moerheimii (Ruthe) Rehd., V. 2547.

PYRUS FUSCA, Raf., var. lepives (Nutt.) Bailey; var. diversifolia (Bong.) Bailey, V. 2576.

RHODODENDRON ODONTUM, Planch., var. amenum (Lindl.) Rehd. V. 2544.

RHODODENDRON CANDIDUM (Small) Rehd., V. 2543.

RHODODENDRON QUINQUEFOLIUM, Moore & Bisset, var. roseum, Rehd., VI. 2947.

RHODODENDRON INTREVIRIS, Rehd., new name, VI. 3571.

RHODODENDRON AUSTRINUM (Small) Rehd., VI. 3571.

RIBES SANGUNEUM, Pursh, var. albescens, Rehd., V. 2598.

RIBES ROSELLI, Regel, var. euentum, Rehd., V. 2962.

ROSA CAROLINA, Linn., var. villosa (Best) Rehd.; var. grandiflora (Baker) Rehd.; var. triloba (Baker) Rehd.; V. 2991.

ROSA SPINOSISSIMA, Linn., var. inermis DC., Rehd., V. 2995.

RUBUS ODORATUS, Linn., var. albiflora Bailey, V. 3024.

RUBUS PROCUMBENS, Muhl., var. roribaccus (Bailey) Bailey, V. 3065.

SALIX EREDINGERI, K. Kern., var. cremensis, Rehd., n. var., VI. 3571.

SYMPHORICARPUS ALBUS, Blake, var. ovatus (Spaeth) Rehd., VI. 3337.

TAXUS CUSPIDATA, Slebe. & Zucc., var. densa, Rehd., VI. 3316.

THUYA ORIENTALIS, Linn., var. belevierensys (Hort.) Rehd., VI. 3337.


VITEX SINENSIS, Muq., var. Hessei (Koehe) Rehd., VI. 3461.

VITEX NEGUNDO, Linn., forma multifida (Carr.) Rehd., VI. 3481.
FINDING-LIST

Of Latin or Latinized binomials commonly used in North American literature and commerce, with their equivalents in the Cyclopedia, together with usages that the cataloguer may desire to follow

(Including a few changes and corrections)

This List is compiled primarily for the aid of Cyclopedias users, particularly the nurseryman, seedsmen, propagator, planter, landscape architect, gardener, labeller, cataloguer, to place before him the commonest names in the catalogues and periodicals of North America and to give him the equivalents of these names. The information given in this List is all contained in the Cyclopedia; but it is more accessible when separated, being placed together in convenient form disconnected from keys and description and from names of plants known as yet only to collectors, students, and specialists. The attention of the consultant is called to the list of additional species beginning on page 3565, in the supplement to Vol. VI, representing trade names not in the body of the Cyclopedia.

The List represents practically the species now in the trade in North America in the usual temperate parts, although it does not pretend to be complete. It does not contain the many Latin names of horticultural forms that may appear in catalogues as species-names (the real species-name being omitted in parts of many trade-lists). Neither does it contain vernacular names: these will be found in alphabetic order in the Index to the Cyclopedia, beginning page 3611.

All generic entries are introduced by BLACK-FACE CAPITAL TYPE (name of the genus).

The species-names in black-face type are in all cases those used in the Cyclopedia.

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 italic 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, "Acanthophoenix 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

The American Joint Committee on Horticultural Nomenclature was established by the national organizations named below for the purpose of lessening the confusion, inconvenience, and losses which result to buyers and sellers of plants from the widespread use of different names for the same plant and of the same name for different plants.

The organizations participating, with list of committees, are as follows:


American Association of Park Superintendents.—Herman W. Merkel, Forester Zoological Park, New York City; John Dunbar, Assistant Superintendent of Parks, Rochester, New York; Theodore Wirth, Superintendent of Parks, Minneapolis, Minnesota.

American Society of Landscape Architects.—Frederick Law Olmsted, Brookline, Massachusetts; Sid. J. Hale, 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 representatives of the American Association of Nurserymen and of the Ornamental Growers Association organized as a Joint Committee in 1915, with J. Horace McFarland as Chairman and Harlan P. Keelsey as Secretary.

At a meeting August 1, 1916, in which the representatives of the American Association of Park Superintendents and of the American Society of Landscape Architects also participated, the same officers were continued and the name 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
consequent loss to the tradesman is obvious. For example, take the common Virginia creeper: We find this catalogued in 1916 under no less than six Latin binomials—Ampelopsis quinquefolia, A. virginica, Parthenocissus quinquefolia, P. virginica, Vitia hederacea, and Pseadera quinquefolia, while as common names we have Woodbine, American Woodbine, Virginia Creeper, American Ivy, Common Virginia Creeper, Virginian Creeper, Wild Woodbine, and Five-fingered Ivy. Today both American and foreign nurserymen and dealers in identification and labeling are liable to occur, given rise to confusion. When a confusion is not evident at first, either through ignorance or accident, sends out a comparatively unknown plant labeled with the name of some other little-known plant, the misapplied name is apt to follow the first plant and become established in trade.

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 Eucneget, 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.

When, however, a plant has been widely distributed under the name of some other plant, through a mere mistake in identification, and the plant whose name was mistakenly applied to the other is also in cultivation, there is serious confusion, which can usually best be settled by correcting the original mistake even if it has become widely accepted.

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 plant 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 justify their confusion into distinct species, and as to what are of varietal rank. These differences are inevitable and are independent of rules or other arbitrary decisions.

For example, Azalea is now classed under Rhododendron by some botanists, yet for trade reasons it seems inexpedient to catalogue the Azaleas as Rhododendrons.

The most important cause of changes in botanical nomenclature in recent years is the constant collection of new evidence as to the facts. This evidence is of two sorts: evidence found in botanical literature as to the first proper description and naming of each kind of plant, and evidence as to the structure and habits of the plants themselves. When any group of plants is studied more carefully and thoroughly than before, new facts are sure to be discovered which may alter the classification and nomenclature based on previous incomplete or insufficient knowledge.

Absolute and permanent fixity of botanical nomenclature, therefore, cannot be insured by any arbitrary agreement at this time.

Remedy for the confusion.

For the practical convenience of those who use plants or deal in them there can and ought to be, however, a list of standard trade names for plants in commercial use, to be arbitrarily retained without change for a period of several years, regardless of any changes in the practice of scientific botanists. It is the hope of the Joint Committee that provision will be made for a regular periodic revision of this standard list, perhaps at the same decennial periods adopted by the United States Pharmacopoeia Convention for revision of their standard list of drugs, which includes a large number of plant names. These revisions can bring the list into accord with changes which have become well established among botanists in the interval and the accepted changes can be made substantially at one time throughout the trade.

General adherence to the standard trade names as recommended by the Joint Committee will relieve horticulturists of the confusion directly chargeable to instability of botanical nomenclature and will remove the excuse for careless identification and mislabeling. No agreement about names will cure trouble unless everyone is careful in the identification and labeling of the plants so as to avoid "sending out the wrong plant under the right name."

While the Joint Committee realizes that its recommendations are somewhat arbitrary, existing conditions make this inevitable. "Trade value" and stability have been guiding influences. The Joint Committee is not constituted to pass on undecided or critical questions of botanical nomenclature.

For a clearer understanding of the situation, the Joint Committee urges all who are interested in this subject to read the discussion under "Names and Nomenclature" in Vol. IV, page 2098, of the "Standard Cyclopedia of Horticulture."

Basis of this report.

The Joint Committee has agreed that Latin names should conform so far as possible to good botanical usage, and that Bailey's "Standard Cyclopedia of Horticulture" should be the basis of our technical name-list.

Only weighty reasons, as in the case of exceptionally well-established names or of existing trade names plainly more appropriate for business purposes, have led the Joint Committee to recommend the retention of trade names differing from the Cyclopedia names. It is admitted that the Latin binomials as starred by the Joint Committee in the Finding-List are all too often at variance with the latest botanical usage. Subsequent revisions by botanists and the Joint Committee may make possible a more uniform standard list in which the botanists and the horticulturists will ultimately be brought together.

Common names.

As the work of the Joint Committee progressed it became increasingly evident that each cultivated plant should have a single and distinctive common name, which might readily become stable and fixed through acceptance by the horticultural interests of America.

The giving of an appropriate common name to a plant is permissibly much more arbitrary and the reasons for subsequently changing it less urgent than is often the case with Latin binomials. The giving of a common name is often quite possible to make
it 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 Cyclopeda 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 Cyclopeda name and the catalogue or writer for any reason does not wish to use it, the Joint Committee urges the use of the Cyclopeda 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 TETRAPERIA (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 contracted 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 Cyclopeda 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.
ACACIA, continued.
- *deabata: *A. deccurans deabata.
- *deccurans.
- *Drummondii.
- *Farnesiana.
- *floribunda: *A. longifolia floribunda.
- *Junipcrina.
- *lophantha: *A. lophantha.
- *melaxylon.
- *mollissima: *A. decurrens mollis.
- *Nenu: *Albizia Julibrissin.
- *nerifolia.
- *podalyriasfolia.
- *pravissima.
- *pubescens.
- *pycnanth.: *A. lancea.
- *saligna.
- *vericillata.

ACENA. A. microphylla.

ACALYPHA. *A. hispida.
- Macafeana: *A. Wilkesiana Macafeana.
- marginita: *A. Wilkesiana marginita, not A. marginata of botanists.
- mosai: *A. Wilkesiana musiaca.
- Sandert: *A. hispida.
- triumphe: *A. Wilkesiana triumphe

ACANTHOPANAX. *A. pentaphyllum (Aralia).
- *cinifolium (Aralia).
By some authors, the name Acanthopanax is considered to be masculine, the specific names to end in -us; but the prevailing practice with English and American botanists is to regard the Panax combinations as neuter. These names should be pronounced Achantop-anaax, Oreop-anaax, Tetrat-anaax, etc.

ACANTHOPHENIX. A. rubra (Areca).

ACANTHORHIZA. A. aculeata.

ACANTHUS. *A. latifolius: A. mollis latifolius.
- mollis.
- spinosus.

ACER. *A. campestre.
- *circinatum.
- *colchicicum: *A. cappadocicum.
- *dasyacarpum (Silver Maple): *A. saccharinum.
- *ginnala.
- *glabrum.
- *Heldreichii.
- *japonicum.
- *macrophyllum: sometimes used erroneously for A. japonicum macrophyllum.
- *monsseuolanum.
- *Negundo.
- *palmatum.
- *pennsylvanicum.
- *pictum.
- *platanoides.
- *polyrrhizum: *A. palmatum.
FINDING-LIST

ANCHUSA.

ANAGALLIS.

ANACHARIS.

AMSONIA.

AMORPHA.

AMMOMUM.

AMROPHALLUS.

AMPELOPSIS.

AMONUM.

AMORPHA.

AMMOMUM.

APLEXTRUM.

ANTIRRHINUM.

ANTHURIUM.

ANTHERICUM.

ANOMATHECA.

ANNONA.

ANGELONIA.

ANEMONE.

ANEMONE.

ANTHOLOGYON.

ARCHONTOPHISING.

ARBABAS.

ARBAPULTA.

ARGANIA.

ARAUKARIA.

ARECACEAE.

ARECACEAE.

ARENARIA.

ARETANTHAEAE.

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ARECIA. A. Baueri: Rhopalostylis Baueri.
  — Catechu.
  — luteascens: Chrysobalanus lanteri-s-cans.
  — sapida: Rhopalostylis sapida.
  — Verschaffeltii: Hyophorbe Verschaffeltii.
ARENARIA. A. cespitosa: A. verna cespitosa.
  — grandiflora.
  — montana.
ARENGA. A. saccharifera.
ARETHUSA. A. bulbosa.
ARGEMONE. A. grandiflora.
ARGYREIA. A. splendidens (page 3566).
ARISÈMA. A. Dracontium.
  — trilobum.
ARISTOLOCHIA. *A. elegans.
  — grandiflora.
  — macrophylla: in some cases probably designated A. brasiliensis macrophylla.
  — *Siphon: A. macrophylla.
  — Sturtianum: *A. grandiflora Sturtianum.
ARMERIA. A. alba: probably Staticie Armeria alba.
  — alpina: S. alpina.
  — cephalotes: probably S. pseudo-merici, but possibly S. mauritiana is meant in the trade.
  — dianthoidea: S. plantaginea leu- cantha.
  — formosa: S. pseudoamerica.
  — Laeuchea: S. Armeria Laeuchea.
  — maritima: S. Armeria.
ARNEBIA. A. cornuta.
  — *stragopurrpea.
  — erythrocara: *A. arbutifolia.
  — *melanocarpa.
  — nigra: *A. melanocarpa.
ARRHENATHERUM. A. bulbosum: A. elatum tuberosum.
ARTEMISIA. A. abrotanum.
  — Absinthium.
  — Dracunculus.
  — frigida.
  — lactiflora: a white-flowered form of A. vulgaris.
  — pedemontana: A. lanata.
  — pontica.
  — Purshiana.
  — sacrorum.
  — Steppelia.
  — vulgaris.
ARTOCARPUS. A. incisa (Bread-Fruit).
ARUM. A. crinatum: Helicodiceros muscivorus.
  — Dracunculus: Dracunculus vul- garis.
  — italicum.
  — maculatum.
  — palmaturn.
ARUNCUS. A. Aruncus: A. syl- vester (Spiras).
  — astilboideae, but the plant in culti- vation is Astilbe astilboideae.
  — sylvester (Spiras).
ARUNDINARIA (Bambusa). *A. au- ricoma.
  — *falcatu.
  — *Falconeri.
  — *fokia varigagis: probably *A. Fortunei.
  — *Hindsii.
  — *japonica.
  — *Simoni.
  — *Veitchii.
ARUNDO. *A. Donax.
ASARUM. A. arifolium.
  — canadense.
  — virginiurn.
ASCLEPIAS. A. Curassavica.
  — Hallii.
  — incarnata.
  — tuberosa.
ASIMINA. *A. triloba.
ASPARGUS. A. asparagoideaes (Myr- siphylhum. Florastrap Smile).
  — Cooperi.
  — Hatcheri: probably A. plumosus rostraturn.
  — madagascariensis.
  — medeoloides: A. asparagoideaes.
  — nana: A. plumosus nana.
  — officinalis (Edible Asparagus).
  — plumosus.
  — scandens.
  — Sprengeri.
  — tenuissimus: A. plumosus tenuis- simus.
ASPERULA. A. azurea: A. orient- talis.
  — hexaphylia.
  — odorata.
ASPHODELINE. A. lutea (Asphode- lus).
ASPHODELUS. A. albus.
  — luteus: Asphodeline lutea.
ASPIDISTRA. A. lurida.
ASPIDIUM. A. aehrostichoides: Poly- stichum acrostichoides.
  — aculeatum: P. aculeatum.
  — Brunii: P. Brunii.
  — cristatum: Dryopteris cristata.
  — Goldieanum: D. Goldieana.
  — marginale: D. marginalis.
  — munitum: P. munitum.
  — nobileboracense: D. nobileboracensis.
  — spinulonum: D. spinulosa.
  — Thelypteris: D. Thelypteris.
ASPYLENIA. A. acrostichoides.
  — angustifolium.
  — bulkferum.
  — ebenum: A. platyneuron.
  — Fílix-femina.
  — Goringianum.
  — Nídus-avis: A. Nídus (Neot- topteris).
  — platyneuron.
  — Thelypteris: Dryopteris Thelyp- teris.
  — thelypteroides: A. acrostichoides.
  — Trichomanes.
ASTER. A. acris.
  — alpinus.
  — Amelius.
  — amethystinus.
  — azureus.
ASTER, continued.
  — bessarabicus: A. Amelius bessarab- icus.
  — Chapmáni.
  — cordifolius.
  — corymbosus.
  — Curtisii.
  — decoris: A. laevis.
  — ericoides.
  — formosissimus.
  — grandiflorus.
  — himalayensis: A. hisalica.
  — laevis.
  — lilacinus.
  — longifolius.
  — Maackii.
  — macrophyllus.
  — Meza grande: possibly is Erigeron macranthus.
  — multiflorus.
  — nova-angliae.
  — novi-belgii.
  — patens.
  — punicicus.
  — ptarmicoides.
  — Shortii.
  — speciosus: A. alpinus speciosus, not A. speciosus of botanists.
  — spectabilis.
  — subcaeruleus.
  — tataricus.
  — Thomsonii.
  — Townehendii: A. Bigelovii.
  — Tradescantii.
  — trinervius.
  — turbinellus.
  — umbellatus.
  — undulatus.
  — versicolor.
ASTEILLE. A. Arendsii: hybrids of A. Davidii with other species.
  — astioldes (Spiraea).
  — chinenis.
  — Davidii (Spiraea).
  — grandis.
  — japonica.
  — simplicifolia.
ASTRAGALUS. A. alopecepusidens.
ASTRANTIA. A. major.
ATRIPLEX. A. hortensis (Orach).
ATROPA. A. Belladonna.
AUBRIETIA. A. Bougainvillei: A. deltoidea Bougainvillei.
  — deltoidea.
  — Eyrei: A. deltoidea Eyrei.
  — graeca: A. deltoidea graeca.
  — Hendersonii: A. deltoidea Hen- dersonii.
  — Leichtlinii: A. deltoidea Leicht- linii.
  — olympica: A. deltoidea olympica.
AUCUBA. *A. himalaica.
  — japonica.
AVENA. A. sterilis.
AZALEA. *A. amena: Rhododen- dron obtusum amena.
  — *arborescens: R. arborescens.
  — *canescens: R. canescens.
  — *laurinae: R. Morteri.
  — *Hinodescu: form of R. obtusum.
  — *
AZALEA, continued.

- *indica*: R. indicum.
- *japonica*: R. japonicum.
- *ledifolia*: R. ledifolium.
- *lutea*: R. calendulaceum.
- *mollis*: R. sinense; possibly sometimes misspelled as *R. japonica*.
- *nudiflora*: R. nudiflorum.
- *occidentalis*: R. occidentale.
- *pontica*: R. luteum.
- *rosmarinifolia*: R. ledifolium; *A.* ledifolia.
- *rustica*: R. Morteri var.: *A.* gandavensis.
- *sinensis*: R. sinense; *A.* mollis.

AZARA. *A.* microphylla.

BACCHARIS. *B.* halimifolia.

BACSTRIS. B. major.

BAMBUS'A. A. Alphonsei: probably B. Alphonse Kurri.

- *argentea*.
- *aurea*: Phyllostachys aurea.
- *aural-straia*.
- *auricoma*: Arundinaria auricoma.
- *fastuosa*.
- *Fortunei*: Arundinaria Fortunei.
- *Henonis*: Phyllostachys Henonis.
- *nigra*: Phyllostachys nigra.
- *palmata*.
- *Simeoni*: Arundinaria Simonii.
- *Veitchii*: Arundinaria Veitchii.
- *viminalis*: Phyllostachys vinsic-folia.
- *violetescens*: Phyllostachys violetes-cens.
- *vulgaria*.

BAPTISTIA. *B.* australis.

BARRA BAREA. B. praecox.

*B.* vulgaris.

BARTONIA. B. aurea: Mentzelia aurea, Baill. (M. Lindley is untenable under the rules).

BEGONIA. B. abo-picta.
- *argentea*: B. maculata.
- *corallina*.
- *Credneri*.
- *crispa*: B. manicata crispa.
- *Erdofii*.
- *gracilis*.
- *Haageana*.
- *metallica*.
- *Rex*.
- *rubra*: B. coccinea.
- *Sandersonii*: B. Digswelliana.
- *semperflorens*.
- *Thurstonii*.
- *Warscewiczii*: B. conchhefolia.

Trade names of horticultural begonias often appear in Latin form.

BELAMCANDA. B. chinensis.

BELLIS. B. perennis.

BENINCASA. B. cerifera: B. hispida.

BENZOIN. B. odoriferum: *B.* aestive (Laurus. Lindera).

BERBERIS (see page 3566). *B.* aggregate.
- *Aquilegium*: Mahonia Aquilegium.
- *brevipaniculata*: perhaps sometimes applied to B. aggregate.
- *buxifolia*.
- *canadensis*.
- *Darwinii*.
- *dictyophylla*.
- *dulcis*: B. buxifolia; sometimes the name for B. vulgaris dulcis.
- *fauciarcularia*: Mahonia pinnata.
- *Fendleri*.
- *filicifolia*, but often misspelled to B. Neubertii latifolia.

*B.* jailonica: *T.* orientalis Sieboldii; some of the stock in trade is perhaps *T.* orientalis gracilis.

*B.* orientalis: *T.* orientalis pyramidalis.

BLECHNUM. B. brasiliense.

BOGAINVILLEA. *B.* glabra.

BOGAINVILLEA. *B.* spectabilis lateritia.

BOUGAINVILLEA. *B.* glabra.

BOUGAINVILLES. *B.* spectabilis lateritia.

BOLTONIA. B. asteroides.

- *B.* rustica: *B.* microcarpa.

BORAGO. *B.* officinalis.

BORSCHCHIUM. B. obliquum.

- *ternatum*: B. obliquum.
- *virginicum*: B. virginianum.

BOUGAINVILLES. *B.* glabra.

BOUGAINVILLES. *B.* spectabilis lateritia.

BOUQUARDIA. B. Humboldtii.

- *Jacquini*: B. triphylla.
- *triphylla*.

BRACHYCHITON. B. diversifolium; also perhaps refers to B. popul- num.

BRACHYCOME. B. iheridifolia.

BRAHEA. B. filifera: Washingtonia filifera.
- *robusta*: W. filifera robusta.

BRASENA. *B.* peltata: B. Schreberi.

BRASSICA. *B.* acephala: B. oleracea acephala (Kale).
- *ala*: (Sinapis).
- *arvensis*: (Sinapis).
- *botrytis*: B. oleracea botrytis (Cauliflower).
- *Campestris*: B. oleracea botrytis (Cauliflower).
- *capitata*: B. oleracea capitata (Cabbage).
- *chinensis*.
- *japonica*: (Sinapis).
- *Napus*: (Rape).
- *oleracea*.

- *Pe-tsai*: (Brassica Pe-tsai, Bailey, was founded in 1894 on culti- vated material. Sinapis pekin- ensis, Lourier, 1790, one of the vernacular names of which is Pe-tsai, has been brought over into Brassica as B. pekinensis, Skeels. If B. Pe-tsai, Bailey, and B. pekinensis, Skeels, prove to be identical, the latter name must hold. More than one spe- cies may be involved.)

- *Rapa* (Turnip).
BRAUNERIA (the name under the American Code). B. angustifolia: Echinacea angustifolia.
— purpurea: E. purpurea.

BRAVOA. B. geminiflora.

BRIZA. B. geniculata: Eragrostis obtusa.
— gracilis: B. minor.
— maxima.

BRIZOPRYM. B. siculum: Desmazeria sicula.

BROMUS. B. brizeformis.
— macrostachys.
— madritensis.

BROUSSETONIA. *B. papyrfera.

BROWALLIA. B. elata: B. demissa.
— Jamestonii: Streptosenol Jamestonii.
— Roezlii: B. grandiflora.
— speciosa.

BRUCKENTHALA. *B. spiculifolia.

BRUNELLA. A pre-Linnanean spelling of Prunella (which see), and still widely used.

BRYONIA. B. laciniosa: Bryonopsis laciniosa.

BRYONOPSIS. B. laciniosa (Bryonia).

BUDGEUA. *B. asiatica.
— gloseosa.
— intermediaria.
— japonica.
— Lindleyana.
— magnifica: *B. Davidii magnifica.
— officinalis.
— variabilis: *B. Davidii.
— Veitchii: *B. Davidii Veitchiana.

BUPHthalum. B. cordifolium: B. speciosum (Telekia).
— salicifolium.

BUXUS. B. arborescens: *B. sempervirens arborescens.
— halauica.
— Fortunei: *B. japonica.
— Handsworhtii: *B. sempervirens Handsworthii.
— japonica.
— rotundifolia: *B. sempervirens rotundifolia.
— sempervirens.
— sufruticosa: *B. sempervirens sufragirica.

CABOMBA. C. viridifolia: C. caroliniana.

CACAIA. C. aurea: probably an Emilia.
— cocinea: Emilia crianea.

CÆSALPINIA. *C. Gilliesii (Poinciana).
— C. pulcherrima.

CALADUM. C. esculentum: Colocasia antiquorum esculenta.
There are many Latin-named varieties.

CALAMINTHA. C. alpina: Satureia alpina.

CALAMPELIS. C. scaber: Ecremocarpus scaber.

CALANDRINIA. C. grandiflora.
— speciosa: C. Menziesii.
— umbellata.

CALATHEA. Usually listed under Maranta, which see.

CALCEOLARIA (the application of the American Code transfers Calceolaria to Ionidium, one of the Violet family; the Calceolaria of florists then becomes Fagelia, and the leguminous Fagelia [Vol. III, page 1201] becomes Rolandsia). C. hybridra: C. herbohybrida.
— pinnata; some of the stock is probably C. scabiosifolia.
— purpurea.
— rugosa: C. integrifolia.
— scabiosaefolia.
— Veitchii.

CALENDULA. C. officinalis.
— pleuris: Dimorphotheca annua.
— Pongei: D. annus ligulosa.

CALIMERIS. C. incisa.

CALLA. C. ethiopica: Zantedeschia ethiopica.
— palastris.

CALLICARPA. *C. americana.
— japonica.
— purpurea: C. dichotoma (the tenable name, under the rules, rather than C. purpurea).

CALLIOPSIS. C. bicolor: Coreopsis tectoria.
— cardaminifolia: Coreopsis caraminifolia.
— Drummondii: Coreopsis Drummondii.
— lanceolata: Coreopsis lanceolata.
— marmorea: Coreopsis tectoria.
— nigra: Coreopsis tectoria atropurpurea.
— radiata: Coreopsis radiata.
— tectoria: Coreopsis tectoria.

CALLIKHOE. C. involucrata.
— pedata.
— verticillata: C. involucrata.

CALLISTEMON. *C. coccineus (page 3566).
— *Cunninghamii (page 3566).
— floribundus: *C. lanceolatus.
— hybridus (page 3566).
— lanceolatus (Metrosideros).
— robustus (page 3566).
— splendens (page 3566).
— viridifolia: probably C. salignus viridiflorus.

CALLISTEPHUS. C. chinensis (China Aster).

CALLITRIS. C. australis: C. rhomboidea.

CALLUNA. *C. vulgaris (Erica).

CALOCHORTUS. C. flavus (Cyebolothra).

CALONYCTION. C. aculeatum (Ipmoea Bona-Nox).

CALOPOGON. C. pulchellus (Limonium).

CALTHEA. C. palmatis.

CALYCANTHUS. *C. floridus.
— glaucus: *C. fertilis glaucus.

CALYCANTHUS, continued.
— macrophyllus: *C. occidentalis.
— praecox: Meratia praecox.

CALYPSO (under the American Code, Cyathecetra replaces this name). C. borealis: C. bulbosa, Oakes (C. borealis erroneously).

CALYSTEGIA. C. pubescens: Convulvulus japonicus.

CAMASSIA (Quamash under American Code). C. Cusickii.
— esculenta: C. Quamash.
— Leichtlinii.

CAMELLIA. *C. japonica.
— Sasangua.
— Thea: *Thea sinensis.

CAPANUARA. C. alliariaefolia.
— amabilis: C. phytotidocalyx.
— atlita: C. drabifolia.
— barbata.
— calycanthema: C. Medium calycanthema.
— carpatica.
— dahurica: C. glomerata dahurica.
— glomerata.
— grandiflora: Platycodon grandiflora.
— grandis: C. latiloba.
— Grosskellii.
— lactiflora.
— latifolia.
— longestyla.
— Lorei (Loreyi): C. ramosissima.
— macroantha: probably C. latifolia macranta, but perhaps also C. persicifolia macranta.
— macrostyla.
— Medium.
— mirabilis.
— nobilis. C. punctata.
— persicifolia.
— punctata.
— pyramidalis.
— rapunculoides.
— rhomboidalis.
— rotundifolia.
— Speculum: Specularia Speculum.
— Trachelium.
— turbinate: C. carpatica turbinata.
— Van Houttei.
— Vidalii.

CAMPHORA. C. officinalis: *Cinnamonum Camphora.

CAMPISI9 (Bignonia, Tecoma). C. chinesis: *Bignonia grandiflora.
— hybridra: *B. hybrida.
— radicans: *B. radicans.

CAMPTOSORUS. C. rhizophyllus.

CANNA. C. indica.
In garden Cannas the original species are scarcely distinguishable.

CANNABIS. C. gigantea: a form of C. sativa.

CAPSICUM. C. annuum.
— frutescentes.

CARAGANA. C. arborescens.
— Chamaigu.
— frutescentes: *C. frutex.
— *microphylla.

CARDAMINE. C. pratensis.

CARDIOSPERMUM. C. Halicaca-
CARDUUS. C. benedictus: Caicus benedictus.
CAREX. C. Fraseri. — Morrowii.
CARICA. *C. Papaya.
CARISSA. *C. grandiflora.
CARPENTERIA. *C. californica.
CARPINUS. C. americana: *C. caroliniana.
—Betulus.
— *Caroliniana.
CARUM. C. Carvi (Caraway).
CARYA. C. dentata. — Bungei
CARYOTA. C. Milli. — *C. Milli (Mockernut).
— amara: C. cordiformis: *H. cordiformis.
— cordiformis: *H. cordiformis.
— glabra (Pigmut) : *H. glabra.
— laciniosa (Shel bark Hickory): *H. laciniosa.
— ovata: *H. ovata (Shag bark Hickory).
— Pecun: *H. Pecun.
— sulcata: C. laciniosa: *H. laciniosa (Shel bark Hickory).
CARYOPHYLLUS. See Eugenia.
CARYOPTERIS. C. Masticanthus: *C. incana.
CARYOTA. C. mitis.
— sobolifera: C. mitis.
— urens.
CASIMIROA. C. edulis.
CASSANDRA. C. calyculate: *Chamseaphne calyculate.
CASSIA. C. artemisioides.
— corymbosa.
— floribunda: *C. corymbosa.
— laevigata.
— marilandica.
— polyantha (page 356).
— tomentosa.
CASTALIA. See Nymphaea.
CASTANEA. C. americana: *C. dentata.
— japonica: C. crenata.
— *Pumila.
— sativa: *C. sativa.
CASTANOPSIS. *C. chrysophylla.
(see also page 2891 for other species).
CASTILLEJA. C. indivisa.
CASUARINA. *C. Cunninghamiana.
— *Equisetifolia.
— stricta.
CATALPA. *C. biginiioides.
— Bungei: C. biginiioides nana (C. Bungei of botanists is a good species, apparently not in the trade although likely to appear).
— *Hybrida.
— *Koempferi: C. ovata.
CATALPA, continued.
— *Ovata.
— *Speciosa.
CATANANCHE. C. bicolor: C. careulce bicolor.
— careulea.
CAULOPHYLLUM. C. thalictroides.
CEANOTHUS. *C. americanus.
— *Azureus.
— *Hybrida.
— *Thysiflorus.
CEDREA. *C. sinensis.
CEDRONELLA. C. cana.
CEDRUS. *C. atlantica.
— *Deodara.
— *Libani.
CELASTRUS. C. articulatus: *C. orbiculatus.
— *Orbiculatus.
— punctatus: *C. orbiculatus punctatus.
— *Scandens.
CELOSIA. C. cocinea: C. cristata.
— cristata.
— Huttonii.
— spicata: perhaps a form of C. cristata, not C. spicata of botanists.
CELSIA. C. Arcturus (page 356).
CELTIS. *C. australis.
— crassifolia: *C. occidentalis crassifolia.
— *Mississippiensis.
— *Occidentalis.
— *Reticulata.
CENTAUREA. C. americana.
— babyonica.
— candidissima: C. Cineraria.
— Clementei.
— cyanus.
— dealbata.
— gymnocarpus.
— imperialis.
— macrocephala.
— montana.
— moschata.
— nigra.
— odorata: C. moschata.
— orientalis (page 3567).
— pulcherrima (Etheopappus).
— Ruthenica.
— suaveolens: C. moschata.
CENTAURIDIUM. C. Drummondii: Xanthisma texanum.
CENTRANthus. C. albus: name likely to apply to either-C. ruber albus or C. macrospHEN albus.
— macrospHEN.
— ruber.
CENTROSEMA. *C. grandiflora: C. virginianum.
CEPHALANTHUS. *C. occidentalis.
CEPHALARIA. C. alpina.
— tatarica.
CEPHALOTAXUS. *C. drupacea.
— *Fortunei.
— *Harringtonia (Taxus).
— pedunculata: *C. Harringtonia.
CESTRANTHIUM. C. Biebersteini.
— tomentosum.
CERASUS. C. avium: *Prunus avium.
— caproniana: *P. Cerasus.
— caroliniana: P. caroliniana.
— chinesis: *P. glandulosa and *P. japonica (Cherry-Almonds).
— ilicifolia: *P. ilicifolia.
— integrifolia: *P. Lymii.
— japonica: *P. subhirtella pendula
— Mahaleb: *P. Mahaleb.
— Pedus: *P. Pedus.
— Pennsylvanica: *P. Pennsylvanica.
— Rhexi: *P. Cerasus Rhexi.
— serotina: *P. serotina.
— Sieboldii: *P. Sieboldii.
CERATONIA. *C. Siliqua.
CERATOSTIGMA. C. plumbaginaeides (Plumbago).
CERCIDIPHYLLUM. C. japonicum.
CERCIS. *C. canadensis.
— *Chinesis.
— *Japonica: C. chinensis.
— *Siliquastrum.
CEROCARPUS. *C. parvifolius.
CEREUS. C. nycticus: Lycenecereus pteranthus.
CERINTHE. C. retorta.
CEREOPTERIS. C. sulphurea (Gymnogronnaga).
CESTRUM. *C. aurantiacum.
— *Elegans (Hrabothamnus).
— *Fasciculatum.
— *Nocturnum.
— *Parqui.
CHÆNOMELES. C. japonica (Chæ. Maulei): *Cydonia Maulei.
— lagenaria (the tenable name for the plant generally known as Chæ. japonica): Cy. Maulei now became Chæ. japonica. See page 3567.
— *Cydonia japonica.
CHÆRHYPHYLLUM. C. bulbosum (Turnip-rooted Cherhill).
CHÆMÆCERASUS. C. Albertii: *Lonicera spinosa Albertii.
— Macchi: *Lonicera Maackii.
CHÆMÆCYPRIS. *C. Lawsoniana (Cupressus).
— nuktensis: *C. nuktensis (Cupressus).
— *Obtusa.
— *Pisifera.
— *Sphæroidea: *C. thyoides.
CHÆMÆDAPHNE. *C. calyculate (Andromeda. Cassandra).
CHÆMÆLIURUM. C. luteum.
CHÆMÆPÆCE. C. diacantha: Circium diacantha.
CHÆMÆROPS. *C. camariensis: a form of C. humilis.
— *Elegans: a form of C. humilis.
— *Excelsa: *Trachycarpus excelsa.
— Fortunei: *Trachycarpus Fortunei.
— *Humilis.
— *Nepalensis: *Trachycarpus Martiana.
CHARIEIS. C. heterophylla (Kaulfussia).
CHAYOTA. See Sechiun.
CHEILANTHES. C. Fendleri.
CHEIRANTHUS. C. Allionii.
— Cheiri.
CHELONE. C. barbata: Pentstemon barbatus.
— glabra.
— Lyonii.
— obliqua.
CHENOPODIUM. C. Bonus-Henrici.
— Quinoa.
CHILOPSIS. *C. linearis* (the tenable name under the rules, C. saligna being replaced).
CHIMAPHILA. C. maculata.
CHIMONANTHUS. C. fragrans: *Meratia praecox.
CHIONANTHUS. *C. virginica.
CHIONODAXA. C. Luciliis.
CHILDANTHUS. *C. fragrans.
CHLORIS. C. barbata: C. polydactyla.
— elegans.
CHLOROPHYTHUM. C. comosum (Anthericum).
— elatum (Anthericum).
CHOSYA. *C. ternata.
CHORIZEMA. C. ilicifolia.
CHRYSALIDOCARPS. C. lutescens (Areea).
CHRYSANTHEMUM. C. arcticum.
— Bueridipianum: a strain of C. carinatum.
— coccineum (Pyrethrum).
— coronarium.
— corymbosum (Pyrethrum).
— frutescens.
— indicum.
— inodorum: Matricaria inodora.
— japonicum: C. indicum.
— Leucanthemum.
— maximum.
— multicauae.
— nipponicum.
— Parthenium.
— segutum.
— sinense: C. morifolium.
— Tchiheat挂钩 (Pyrethrum).
— tricolor: C. carinatum.
— uliginosum (Pyrethrum).
CHRYSOGONUM. C. virginianum.
CHRYSOPHYLLUM. C. Caimote.
CHRYSURUS. C. aureus: Lamarcia aurea.
— cynosorioides: L. aurea.
CIBOTIUM. C. Schiede (Cybotium).
CICER. C. arietinum.
CICHORIUM. C. Endivia (Endive).
— Intybus (Chicory).
CIMICIFUGA. C. americana.
— dahurica.
— japonica.
— racemosa.
— simplex: C. racemosa simplex.
CINERARIA. C. grandiflora and C. hybrida: forms or hybrids of Senecio cruentus (Florists’ Cineraria).
CINERARIA, continued.
— maritima: Senecio Cineraria.
— stellata: a race of florists’ cinerarias (offshoots of Senecio cruentus).
CINNAMOMUM. *C. Camphora (Camphora officinalis).
— *Cassia.
— *Loureiri.
— *zeylanicum.
CIRSIUM. C. diacantha (Chama-peuce).
CISSUS (often listed as Vitis. Pages 3482, 3483). *C. capensis.
— *discolor.
— *oblonga.
— *quadangularis.
— *rhombifolia.
— *striata.
CISTUS. *C. albidus.
— *ladaniferus.
— *laurifolius.
— *monspelesiensis.
— *salvifolius.
CITRULLUS. C. Colocynthis (Colo-cynthia).
— vulgaris (Watermelon).
CITRUS. C. amara: *C. Aurantium.
— *aurantifolia (Lime).
— *Aurantium (Sour or Seville Orange).
— *Bügarradia: *C. Aurantium.
— *deliciosa: *C. nobilis delicosa (Mandarin Orange).
— *grandis (Grapefruit).
— *Limonia (Lemon).
— *Medica (Citron).
— *nobilis (King Orange).
— *sinensis (Common Orange).
— *trifoliata: Poncirus trifoliata.
— *unahita: *C. nobilis unshiu (Satsum Orange).
CLADRANTHUS. C. arabicus (Anthemis).
CLADRASSTIS. C. amurenensis: *Maackia amurensis.
— *lutea.
— *tinctoria: *C. lutea (Virgilia).
CLARKIA. C. elegans.
— pulchella.
CLAYTONIA. C. caroliniana.
— virginica.
CLEMATIS. *C. apiifolia.
— *Armandii.
— *coccinea: C. texensis.
— *crispa.
— *Davidiana: *C. heraclea-folia Davidiana.
— *Douglasii.
— *elegantissima.
— *longipes.
— *florida.
— *Fremontii.
— *grata.
— *Henryii: C. Lawsoniana Henryi; a common horticultural variety, but not C. Henryi of botanists.
— *heraclea-folia.
— *indivisa.
— *integrifolia.
— *Jackmanii.
— *lanuginosa.
CLEMATIS, continued.
— *ligusticifolia.
— *montana.
— *orientalis.
— *paniculata.
— *patens.
— *recta.
— *serratifolia.
— *tangutica.
— tubulosa: *C. heraclea-folia.
— *Viera.
— *virginiana.
— *Vitalba.
— *Viticella.
CLEOME. C. gigantea: C. spinosa, not C. gigantea of botanists.
CLERODENDRON. *C. trichoto-mum.
CLETHRA. *C. acuminata.
— *alnifolia.
— *tomentosa.
CLEYERA. *C. japonica.
CLIVIA. C. miniata.
CNEORUM. *C. tricoccon (see Vol. V, page 2704).
COBÉA. C. flore-alba: probably refers to the white-flowered form of C. scandens; also known as C. alba.
— macrostemma: C. macrostoma.
— *scandens.
COCCINIA. C. indica: C. cordifolia.
COCCOLOBA. C. uvifera.
COCOS. *C. australis.
— *Bonnetii, not known botanically.
— *campestris.
— *Datil.
— *erosippha.
— *flexuosa.
— *multiflora.
— *plumosa.
— *schizophylla (page 3567).
— *Weddelliana.
CODIÉUM. The proper genus for the horticultural plants known as Croton.
COFFEA. *C. arabica.
COLCHICHUM. C. autumnale.
COLEUS. C. thyrsoides.
— Verschaffeltii: C. Blumei Verschaffeltii.
COLLETTIA. C. cruciata.
COLLINSIA. C. bartixia: probably C. bartixia-folia.
— bicolor.
— grandiflora.
— multicolor: C. bicolor multicolor.
— varna.
COLLOMIA. C. coccinea: Gilia coccineain.
— *grandiflora: Gilia grandiflora.
COLOCASSIA. C. antiquorum and var. esculenta (Caladium). See Taro, page 3311.
— neo-guineensis.
COLUTEA. *C. arborescens.
COMMELLINA. C. celeris.
— *Sellowiana: C. nudiflora.
COMPTONIA. *C. asplenifolia.
— *C. peregrina. *C. asplenifolia.

CONOCLINUM. *C. coelostomum. Eupatorium coelostomum.

CONVALLARIA. *C. majalis. (Lily-of-the-Valley).
— Polygonatum: probably Polygonatum officinale.

CONVOLVULUS. *C. aequalis. *C. japonicus.
— major: Ipomoea purpurea.
— mauritianus.
— minor: *C. tricolor.
— purpureus: Ipomoea purpurea.
— splendens: possibly Argyreia splendens (page 5560).
— tricolor.

COOPERIA. *C. Drummondii.
— pedunculata.

COPEOMA. *C. Bourbonii. *C. Baueri.
— Baueriana: *C. Baueri.

COPTIS. *C. trifolia.

CORCHORUS. *C. japonicus: *Cornus japonica.

CORDIA. *C. Francisci (not spelled Franci). *C. Lanata.

CORDYLINE (see Dracaena). *C. australis (Dracaena).
— indivisa (Dracaena).

COREOPSIS (Calliopsis). *C. auriculata: probably C. pubescens, but perhaps means C. auriculata, Linn.
— bicolor: *C. tinctoria.
— corona.
— Drummondii.
— floribunda: not identified.
— grandiflora.
— lanceolata.
— palmata.
— radiata.
— rosea.
— senecio: *C. major.
— tinctoria.
— verticillata.

CORNSUS. *C. alica.
— *alterifolia.
— *Amomum.
— *Bailey.
— *brachyphoda; but the plant in cultivation is probably sometimes C. controversa.
— *canadensis.
— *capitata.
— *cervinata: *C. rugosa.
— *elegantissima: probably *C. mas elegantissima.
— *florida.
— *Goucaltii: *C. alica Goucaltii.
— *Kousa.
— *mas.
— *mascula: *C. mas.
— *Nuttallii.
— *officinalis.
— *paniculata: *C. racemosa.
— *sanguinea.
— *sericea: *C. Amomum.
— *sibirica: *C. alica sibirica.
— *Spatheii: *C. alica Spatheii.
— *stolonifera.

CORONILLA. *C. Emerus.
— glauca.
— varia.

CORTADERIA. *C. argentea (Gynerium).
— *Jubata: *C. Quila.

CORYDALIS. *C. nobilis.

CORYLLOPSIS. *C. picata.

CORYLUS. *C. americana.
— atropurpurea: *C. Avellana atropurpurea.
— *Avellana.
— *maxima.
— *pendula: *C. Avellana pendula.
— *rostrata.

CORYNOCARPUS. *C. Invaginata.

CORYPHA. *C. australis. Livistona australis.

COSMODIUM. *C. Burridgeanum: Thelesperma hybridum.

COSMOS. *C. bipinnatus.
— diversifolius (Biden). *C. sulpureus.

COTINUS. *C. americanus: *Rhus cotinoides.
— Coggyria: *Rhus Cotinus.

COTONEASTER. *C. acuminata.
— angustifolia: *Pyracantha angustifolia.
— buxifolia: the plant usually sold under this name is *C. rotundifolia lanata, not C. buxifolia of botanists.
— crenulata: *Pyracantha crenulata.
— Davidiiana: *C. horizontalis.
— *foveolata.
— *Franceti.
— *frigida.
— *horizontalis.
— *Integration.
— *microphylla.
— *pannosa.
— *salmifolia.
— *Simonsii.
— Wheelerii: the plant cultivated under this name is probably either C. racemiflora orbicularis or C. rotundifolia lanata.

COYLEDON. *C. secunda: Echeveria secunda (but equally correct as Cotyledon).

CRAMBE. *C. cordifolia.
— maritima.

CRANIOLARIA. *C. annua (Mar-tynia).

CRASSULA. *C. coccinea: Rochea coccinea.

CRATÆGUS. *C. arvensisana.
— *Arnoldiana.
— *Barryana.
— *Carrieri.
— *Coccinea: several species may pass under this name; it is difficult to know to what species the Linnean name C. coccinea should apply.
— *coloradensis (page 5567).
— *cordata: *C. Phenoprym.
— crenulata: *Pyracantha crenulata.

CRATÆGUS, continued.
— *Crus-galli.
— *Cuneata.
— *Eliiangeriana.
— *Glandulosa: *C. rotundifolia.
— *Lalandii: *Pyracantha coccinea Lalandii.
— *macrantha.
— *mollis.
— *monogyna.
— *nigra.
— *nitida.
— *Oxyantha: also misapplied to C. monogyna.
— *Purpurea.
— *Punctata.
— *Pyracantha: *Pyracantha coccinea.
— *tomentosa.

CRESCENTIA. *C. Cujete (Cala-bash).

CRINUM. *C. amabile.
— asiaticum.
— *Fimbriatum.
— Kirkii.
— longifolium.
— Moorei.
— Powellii.

CROCOMOSA. *C. aerea.

CROCUS. *C. biflorus.
— susianus.
— vernus.

CROTO. *C. Andreanum: Codiaeum variegatum Andreanum.
— Bergei: Codiaeum variegatum Bergmanii.
— Cronkitei: Codiaeum variegatum Cronkitei (proper spelling is not Cronkitei).
— *Edmontones: Codiaeum variegatum Edmontonesen.
— Eversianum: Codiaeum variegatum Eversianum.
— *Fuscoata: Codiaeum variegatum Fuscoata.
— *Indomitata: Codiaeum variegatum *Indomitata.
— *Maculatus: Codiaeum variegatum Maculatus.
— *Musaciu: Codiaeum variegatum Musaciu.
— *Punctatus: Codiaeum variegatum *Punctatus.
— *Reedii: Codiaeum variegatum Reedii.
— *Superbus: Codiaeum variegatum *Superbus.
— *Thomsonii: Codiaeum variegatum Thomsonii.


CRUCIANELLA. *C. stylosa.

CRYPTOGRAMMA. *C. acrostichoides.

CRYPTOMERIA. *C. elegans: *C. japonica elegans.
— *japonica.
CUCUMIS. C. acutangulus: Luffa acutangulus.
— Anguria (Gherkin).
— erinaceus: C. dipaceus.
— flexuosus: C. Melo flexuosus.
— grossulariiformis: C. Anguria.
— Melo (Melon).
— odoratissimus: C. Melo Dudaim.
— perennis: Cucurbita foetidissima.
— sativus (Cucumber).

CUCURBITA. C. foetidissima (Cucumis).
— maxima.
— moschata.
— Pepo.
CUNNINGHAMIA. C. sinensis: *C. lanceolata.

CUPHEA. C. compacta: C. miniatia compacta.
— eminens: C. micropetala.
— hyssopoifolia.
— miniata.
— platycentra: C. ignea.
— purpurea.
— Roetii: C. Hookeriana (page 3567).
— striolosa: C. cynanea, not C. striolosa of botanists.
— tricolor: C. jorullensis (page 3567).

CUPRESSUS. *C. arizonica.
— *Benthamii.
— *clegans: *C. Benthamii Knightiana.
— *excelsa: *C. Benthamii.
— *fusiformis.
— *glauca: either C. Goveniana glauca or C. Lusitanica.
— *Goveniana.
— *guadalupensis.
— horizontalis: *C. sempervirens horizontalis.
— Knightiana: *C. Benthamii Knightiana.
— Lambertiana: *C. macrocarpa Lambertiana.
— Lawsoniana: *Chamaecyparis Lawsoniana.
— *lusitanica.
— *Maackiana.
— *macrocarpa.
— majestica: *C. torulosa majestica.
— nutkaensis: *Chamaecyparis nutkaensis.
— pyramidalis: *C. sempervirens stricta, Ait. (rather than C. sempervirens fastigiate).
— *sempervirens.
— *torulosa.

CYBOTIUM. C. Schiedei: Cibotium Schiedei.

CYCAS. C. revoluta.

CYCLAMEN. C. europaeum.
— giganteum: C. persicum giganteum.
— hederafolium: probably C. persicum, but possibly C. neapolitanum.
— latifolium: C. persicum.
— persicum.
— repandum.

CYCLOBOTHRA. C. flava: Calochortus flavus.

CYCLOPHORUS. C. Lingua (Niphobolus).

CYDONIA. C. alba: Chamaemeles lagenaria var. (page 3567) (C. japonica of literature): *Cydonia japonica alba.
— *japonica: Chae. japonica but more correctly Chae. lagenaria (page 3567).
— *Maule: Chae. Maulei of literature but more correctly Chae. lagenaria umbilicata: *Cy. japonica umbilicata.
— *oblonga (Quince).
— *umbilicata: Chae. japonica umbilicata, but more correctly Chae. lagenaria umbilicata: *Cy. japonica umbilicata.
— *vulgaris: *C. oblonga.

CYMACHUM. C. acuminatifolium (Vincetoxicum).

CYNA. C. Cardunculus (Caro-
— * D. Scylmus (Artichoke).

CYNOGLOSSUM. C. linifolium: Omphalea linifolia.
— nervosum (page 3567).

CYPERUS. C. adenophorus (page 3567).
— alternifolius.
— esculentum (Chufa).
— Papyrus (Papyrus).

CYPHOMANDRA. C. betacea.

CYPRIPEDIUM. C. acaule.
— *hirutum: C. regium (known also as C. spectabile).
— *parviflorum.
— pubescens.
— Regium.
— *spectabile: C. regium (C. spectabile is not tenable).

CYRTOMIUM. C. caryotidenum.
— falcatum.
— Fortunei.
— Rochfordianum; a variation of C. falcatum.

CYSTOPTERIS. C. bulbifera.
— *fragilis.

CYTISUS. C. albus. Name applied to different plants; likely to be C. leucanthus or C. multiflorus, or possibly C. purpureus albus, C. praecox or C. scoparius albus.
— *alpinus: *Laburnum alpinum.
— *Andreamas: *C. scoparius Andreanus.
— *canariensis.
— *candida: *C. monspessulanus.
— *fragrans.
— *hispanicus: *Genista hispanica.
— *multiflorus (Genista).
— *nigericanus.
— *praecox.
— *racemosus; but the plant in cultivation is perhaps C. maderei magniflorus.
— *schiapkoi: *C. leucanthus schiapkoi.
— *scoparius.
— *siliquiflorus.
— *triflorus.

DACYLLIS. D. glomerata.

DÆMONOROPS. D. fissus (page 3568).

DAHLIA. D. arborea: D. excelsa.
— *cocinea.
— *excelsa.
— *Jurezi.
— *variabilis: D. rosea.

DALIBARDA. D. repens.

DAPHNE. *D. Cneorum.
— *Fioniana: *D. oleoides Fioniana.
— *Genkwa.
— *Mezereum.
— *Todora.
— *oleoides.

DAPHNYPHYLLUM. *D. macro-

DARLINTONIA. D. californica.

DASYLIRION. D. acrotiche.
— glaucophyllum.
— grammifolium.
— *Pary: Nolina Paryi.
— quadriquetalum: D. longissimum.
— serratifolium.
— Wheeleri.

DATURA. D. arborea (Brugmansia).
— cornigera.
— cornucopia: D. fastuosa.
— *humilis.
— meteloides.
— sanguinea.

DAUCUS. P. Carota (Carrot).

DAVALLIA. D. tenuifolia: Odonto-

DECKENIA (Deckeria). D. nobilis (page 3568).

DECUMARIA. *D. barbara.

DEERINGIA. D. celosioides: *D. baccata.

DELPHINHIO. D. Ajacis.
— *Barbouvi: D. hybridum Barbouvi.
— Brunonianum.
— cardanale.
— *cardiopetalum.
— *casimirianum.
— *caucasicum.
— *chinense: D. grandiflorum chinense.
— *Consolidat.
— *elatum.
— *formosum.
— *grandiflorum.
— *hybridum.
— *Masckianum.
— *Moerheimel.
— *nudicaule.
— speciosum (page 3568).
— *Zalii.

Many Delphinium names, as D. belladonna, are of garden forms.

DENDRUM (American Code name).
— *D. buxifolium: *Leiophyllum buxifolium.
— *prostratum: *L. buxifolium prostratum.

DENDROCALAMUS. D. latiflorus.

DENDROMECON. D. rigidum.

DENDROSPANAX. *D. japonicum (see note under Acanthopanax).

DENNASTDITA. D. cicutaria (Sito-

— punctulobula (Dicksonia).

DENTARIA. D. diphylla.

DESMAZERIA. D. siculo (Brizo-

pyrum).
FINDING-LIST

DESMODIUM. *D. bicolor: *Lespedeza bicolor.
— *japonicum: *L. japonica.
— *penduliflorum: *L. formosa, Koehne (L. Sieboldii not tenable under the rules).

DEUTZIA. *D. candidissima: *D. rubriflora.
— *D. scabra candidissima.
— *D. setchuenensis corymbiflora.
— *D. laciniatus: *D. glacialis.
— *D. marginatus: *D. deltoides.
— *D. cruenta: *D. cruentus.
— *D. Fortunei: *D. formosa.
— *D. rubriflora: *D. superbus.
— *D. diadematus: *D. chrysantha.
— *D. Caryophyllus splendens.
— *D. Carethianorum: *D. densis.
— *D. multiflorus: *D. carthusianorum: *D. densis.
— *D. names: *D. carthusianorum.
— *D. chinensis: *D. carthusianorum.
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— *D. chinensis: *D. carthu
ECHEVERIA (see Cotyledon). E. agavoides: Cotyledon agavoides (but equally correct as E. agavoides).
—metallica: E. gibbiflora metallica.
—secunda (Cotyledon).
ECHINACEA (Brauneria). E. angustifolia.
—intermedia: E. purpurea serotina.
—purpurea.
ECHINOCACTUS. E. viridiflorus: Echinocereus viridiflorus.
ECHINOCEREUS. E. viridiflorus (Echinocactus).
ECHINOCACTUS. E. viridiflorus.
ELEODENDRON. E. orientale (Aralia Chabrieri).
ELUSINE. E. barcinonensis: E. tristachya.
—coracana.
—indica.
ELODEA. E. canadensis (Anacharis).
ELSHOLTZIA. E. cristata.
—Stauntonii.
ELYMUS. E. arenarius.
—giganteus (page 38).
—glauces.
EMILIA. E. sonchifolia: E. flammea (Cacalia).
EMMENANTHE. E. penduliflora.
ENKIANTHUS. *E. campanulatus.
—japonicus: *E. perulatus.
EOMECON. E. chionantha.
EPHEDRA. *E. altissima.
EPIGAEA. *E. repens.
EPILIBIUM. E. angustifolium.
—hirsutum.
EPIMEDEU. E. alpinum.
—colchicum: E. pinnatum colchicum.
—diphyllum: Aceranthus diphylus.
—macranthum.
—Musschianum.
—niveum: E. macranthum niveum.
—violaceaum: E. macranthum violaceum.
EPIPACTIS. E. pubescens: Goodyera pubescens.
EPHYLLUM. E. Makayanum:
—Sclumbergera Russeliana.
—truncaturn: Zygocactus truncatus.
ERAGROSTIS. E. abyssinica.
—amabilis (Poa).
—elegans: E. interrupta.
—geniculata (Briza).
—maxima.
—minus.
—obtusa.
ERANTHIS. E. hyemalis.
EREMURUS. E. haimalis.
—robustus.
—turfestanicus (page 356).
ERIANTHUS. E. Ravenae.
ERICA. *E. carnea.
—*ciliaris.
—*cinerea.
—*Macannii: supposed to be a hybrid of E. ciliaris × E. Tetralix.
—*mediterranea.
—*melanthera.
—*persolutes.
—*stricta.
—*Tetralix.
—*vagans.
—vulgars: "Calluna vulgaris."
—"Wilmoreana": "E. Wilmorei."
ERERONER. E. alpinus.
—arauantacus.
—belchthofolius: E. pulchellus.
—glabellus.
—glauces.
—grandiflorus: E. speciosus grandiflorus, not E. grandiflorus of botanists.
—intermedius: not identified.
—muconatus (Vittadinia).
—multiradiatus.
—speciosus (Stenactis).
—umbellatus: not identified.
ERINUS. E. alpinus.
ERIOBOTRYA. *E. japonica (Loquat. Photinia).
ERLANGEA. E. tomentosa.
ERODIUM. E. cicutarium.
—Manescavi.
—moschatum.
ERYNGIUM. E. alpinum.
—amethystinum.
—caelestinum: unknown botanically; possibly E. amethystinum.
—giganteum.
—hybridum.
—maritimun.
—Oliverianum.
—planum.
—yuccafolium: E. aquaticum.
ERYSIMUM. E. arkananum: E. asperum arkananum.
—ochroleucum.
—Perotakasium.
—pulchellum.
ERYTHEA. E. armata.
—Brandegeei.
—edulis.
—elegans.
ERYTHRÆA. This genus should take the name Centaurium: names little known in the trade.
ERYTHRINA. E. Crista-galli.
ERYTHRÔNION. A. albidum.
—americanum.
—californicum.
—citrum.
—giganteum: E. grandiflorum.
—grandiflorum.
—Hartwegii.
—Hendersonii.
—purpurascens.
—revolutum.
ESCALLONIA. E. Berteriana: *E. pulverulentum.
—leucantha.
—montevidensis.
—Philippiana: *E. virgata.
—rosea: not known botanically.
—rubra: *E. rubra glabriuscula, not E. rubra of botanists.
—*virgata.
ESCHSCHOLTZIA. E. alba: a white form of E. californica.
—aurantaca: a form of E. californica.
—californica.
—crococ: E. californica crocea.
—maritima: the cultivated plant is a form of E. californica, not E. maritima of botanists.
—tenuifolia.
—Thorburnii: a form of E. californica.
EUCALYPTUS. *E. alpina.
—*amygdalina.
—*angulosa: *E. incassata angulosa.
—*bicolor.
—*Bosistoana.
—*botryoides.
—*coajapeta: *E. odorata.
—*calophylla.
—*citrirodor: *E. maculata citrirodor.
—*coriacea.
—*cornuta.
—*corynocalyx.
—*crebra.
—*diversicolor.
—*flacifolia.
—*globulus.
—*Gunnii.
—*hempelhio.
—*incassata.
—*Lehmannii.
—*lecucyylon.
—*macroryncha.
—*maculate.
—*mellidora.
—*Muelleriana.
—*obliqua.
—*occidentalis.
—*pauiciflorum: *E. coriacea.
—*odor.
—*piperita.
—*polyanthemos.
—*resinifera.
—*robusta.
—*rostra.
—*rudis.
—*siderophloia.
—*sideroxylon.
—*Stuartiana.
—*tereticornis.
—*viminalis.
—*virgata.
EUCHARIDIIUM. E. grandiflorum.
EUCHARIS. E. amazonica: E. grandiflora.
EUCHLAENA. E. mexicana.

EUGENIA. *E. apiculata (Myrtus).
— E. aromaticus (Clove); by some recent botanists separated as Caryophyllus aromaticus.
— jambolana; by some recent authors separated as Syzygium jambolanum.
— Jambos.
— Michelia: *E. uniflora.


—the true E. Sieboldiana is not introduced; the plants cul. under this name are E. Bungeana semipersistentes, E. patens, or E. yedoensis.
— Leav. to E. radicans vegetus.

FABIANA. *F. imbricata.

FAGOPHYRUM. F. esculentum (Buckwheat).
— tataricum (India-Wheat).

— *sylvatica (European Beech, purple-leaved and weeping forms).

FARFUGIUM. F. argenteum: Ligularia Kaempferi argenteus.
— grande: L. Kaempferi aureo-maculatus.

FATSIA. *F. japonica (Aralis).

FELICIA. F. amelloides (Agathaea).

FENZIA. F. dianthoides: Gilia dianthoides.

FERULA. F. communis.

FESTUCA. F. elatior.
— glauca.

FICUS. *F. altissima.
— Carica (Fig).
— *elastica.
— luteecva: *F. diversiloba.
— *macrophylla.
— *pandurata.
— *pumila.
— *repens: *F. pumila.
— *rubiginosa.
— ulmifolius (page 3568).
— utilis (page 3568).

FILARIA (misspelling). See Filiopeta.

FILIPENDULA (see Spirea and Ulmaria.) F. camtschatica.
— hexapetala.
— purpurea.
— rubra.
— Ulmaria.

FITTONIA. F. argyronoea.

FORSYTHIA. F. Fortunei: *F. suspensa Fortunei.
— intermedia.
— Sieboldii: *F. suspensa Sieboldii.
— suspensa.
— *viridismissa.

FRAGARIA. F. chiloensis.
— indica: Duchesnea indica.
— mexicana.
— vesca.
— virginiana.

FRANCOA. F. ramosa.

FRAXINUS. F. alba: *F. americana.
— *americana.
— aurea: *F. excelsior aurea.
— *excelsior.
— *lanceolata.
— *lentiscifolia: *F. rotundifolia.
— *mandschurica.
— *nigra.
— *oregona.
— *Pennsylvaniaica.
— *pubescens: *F. pennsilvania.
— *quadrandulata.
— *rotundifolia.
— *sambucifolia: *F. nigra.
— *virdis: *F. lanceolata.

FREESIA. F. alba: F. refracta alba.
— refracta.

FREMONTIA. *F. californica.

FRITILLARIA. F. Imperialis.
— liliacea.
— meleagris.

FUCHSIA. F. conica: F. magellanica conica.
— globosa: F. magellanica globosa.
— gracilis: F. magellanica gracilis.
— hybrid: F. speciosa.
— magellanica.
— procumbens.
— Riccartoni: F. magellanica Riccartoni.
— speciosa.
— triphylla.

FUNKIA. F. alba: Hosta plantaginea.
— aurea: variegated forms of various species of Hosta.
— caerulea: H. caerulea.
— Fortunei: H. Fortunei, commonly cultivated as F. Sieboldiana.
— gigantea: H. Fortunei gigantea.
— grandiflora: H. plantaginea grandiflora.
— japonica: usually H. plantaginea, but may be H. lancifolia.
— lanceolata: H. caerulea.
— lancifolia: H. lancifolia.
— erecta: H. caerulea.
— robusta: H. Fortunei robusta.
— Sieboldiana: H. Sieboldiana, but much of the stock is H. Fortunei.
— subcordata: H. plantaginea.
— undulata: H. lancifolia undulata.
— variegata: variegated forms of various species of Hosta.

GAILLARDIA. G. amblyodon.
— aristata.
— grandiflora: G. aristata.
— kermesina: a form of G. aristata.
— Lorenziana: a form of G. pulchella pieta.
GAILLARDIA. *G. maximinum: *G. aristata.
— *picta: *G. pulchella picta.
— *versicolor: *G. pulchella versicolor.
GALANTHUS. *G. nivalis.
GALAX. *G. aphylla.
GALEGA. *G. biolurita; probably a form of *G. officinalis (page 3568).
— *Hartlandii: *G. officinalis Hartlandii.
— *officinalis: *G. officinalis.
GALERCHUS. See Orchis.
GALIUM. *G. boreale.
GALTONIA. *G. chilensis.
GARDENIA. *G. mangostana (Maungosteen).
GAYLORD. *G. floridana: *G. jasminoides.
— *Fortunei: *G. jasminoides Fortunei.
— *G. diodora: *G. jasminoides.
— *Veitchii: probably a form of *G. jasminoides.
GARRYA. *G. eliptica.
GAULTHERIA. *G. procumbens.
— *Shallon: *G. procumbens.
GAULTHRUS. *G. autumnale.
GARRA. *G. Lindheimeri.
GAYLUSCIA. *G. frondosa: *G. resinosorum: *G. baccatum.
— *ursina: *G. resinosorum.
GAZANIA. *G. longisepala: *G. splendens.
GELSEMIUM. *G. sempervirens.
GENISTA. *G. aetnensis.
— *ala: *Cytisus multiflorus.
— *Andreaea: *C. scoparius Andreaea.
— *canariensis: *C. canariensis.
— *fragrans: *C. fragrans.
— *hispanica (Cytisus).
— *jubaea: *Spartium junceum.
— *monosperma: *C. racemosa.
— *racemosa: *C. coerulea.
— *scoparia: *C. scoparius.
— *tibetica (page 3568).
— *tinctoria.
GENTIANA. *G. acaulis.
— *Andrewsii: *G. acaulis.
— *aculeatula: *G. acaulis.
— *crinita: *G. acaulis.
— *cruciata: *G. acaulis.
— *lutea: *G. acaulis.
— *scabrum: *G. acaulis.
GERANIUM. *G. album: applies probably to *G. ibericum album, *G. pratense album or *G. maculatum album.
— *armenum: *C. armenum.
— *botryoides: *Pelargonium acerifolium.
— *collinum: *Pelargonium acerifolium.
— *Freemontii: *Pelargonium acerifolium.
— *grandiflorum: *Pelargonium acerifolium.
— *ibericum: *Pelargonium acerifolium.
— *Londinii: *G. collinum.
— *maculatum: *G. ibericum platypetalum.
— *pratense: *G. ibericum platypetalum.
— *sanguineum: *Pelargonium acerifolium.
— *zonale: *Pelargonium acerifolium.
GERARDIA. *G. hybrida.
GERBERA. *G. Jamesonii.
GESNERIA. *G. macrantha: *G. cardinalli.
GEUM. *G. atrosanguineum: probably a form of *G. chiloense.
— *sanguineum: *G. chiloense.
— *atrosanguineum: *G. chiloense.
— *Heldreichii: probably a form of *G. montanum.
— *japonicum: *G. montanum.
— *miniatum: *G. chiloense miniatum.
GILLIA. *G. chilensis.
GILLENIA. *G. stipulata (Porteranthus).
— *trifoliatana.
GINKGO (Salisburia). *G. biloba.
GLADIOLUS. *G. burchlewensis.
— *Childii: *G. burchlewensis.
— *gandavensis.
— *Kunderdi: *G. burchlewensis.
— *nanceanus: *G. burchlewensis.
— *primulinus: *G. burchlewensis.
— *princeps: *G. burchlewensis.
The cultivated forms of *Gladiolus are not clearly referable to botanical species.
GLAUCIUM. *G. luteum: *G. flavum.
GLECHOMA. *G. scutata: *G. paniculata.
GLOBAESIA (Gladiolus). *G. japonica.
— *sinensis.
— *triaenanthus: *G. japonica.
GLOBULARIA. *G. trichosantha: *G. rotundifolia.
GLORIOSA. *G. Rothschulidiana: *G. superba.
GLOXINIA (the florists' Glaxinia is Sinningia speciosa) *G. crapei-
— *foia: *Leptosiphon crapei-
— *foia: a strain of *S. speciosa.
GLYCINE. *G. Soja (Soybean).
— *sulphurea: *G. sulphurea: a strain of *G. sulphurea.
— *Piper.
GLYCINE. *G. Soja (Soybean).
— *sulphurea: a strain of *G. sulphurea.
— *Piper.
— *sulphurea: *G. sulphurea: a strain of *G. sulphurea.
GLYCINE. *G. Soja (Soybean).
— *sulphurea: *G. sulphurea: a strain of *G. sulphurea.
— *Piper.
— *sulphurea: *G. sulphurea: a strain of *G. sulphurea.
— *Piper.
IPOMÉA (continued).
— *hircinum.
— *Kalmianum.
— *lobocarpum.
— *Moserianum.
— *patulum.
— *prolificum.

HYPOCHERIS. *H. uniflora.

HYPOXIS. *H. erecta: *H. hisruta.

HYSSOPUS. *H. officinalis.

IBERIS. *I. afinis: *I. pectinata.
— amara.
— corfolia: *I. satutilis corfolia.
— coronaria: *I. amara coronaria, not *I. coronaria of botanists.
— gibraltarica.
— fucunda: *Ethionema coridifolium.
— odorata.
— pectinata.
— satutilis.
— sempervirens.
— Tenoreana.
— umbellata.

ILEX. *I. Aquifolium.
— *Cassine.
— *corallina.
— *crenata.
— *Dahoon: *I. Cassine.
— *decidua.
— *glabra.
— *monticola.
— *opaca.
— pyrmaidalis: *I. Aquifolium pyramidalis.
— *serrata.
— *verticillata.
— *vomitoria.

ILLICUM. *I. anisatum.

IMPATIENS. *I. Balsamina (Garden Balsam).
— glanduligera: *I. Roylei.
— Holstii.
— platypetala.
— Roylei.
— Sultani.

INCARVILLEA. *I. Delavayi.
— grandiflora.
— variabilis.

INDIGOGERA. *I. floribunda: *I. Gerardiana.
— *tintoria.

INULA. *I. britannica.
— ensifolia.
— glandulosa.
— grandiflora.
— montana (page 3569).
— Oculus-Christi.
— Royleana.

IOCHROMA. *I. fuchsioide.
— *lanceolatum.

IONOSPIDUM. *I. acuale.

IPOMÉA. *I. Batatas (Sweet Potato).
— Bona-nox: Calonyction aculeatum; sometimes apparently applied to a strain of *I. Tuba.
— coccinea: Quamoclit coccinea.
— grandiflora: probably *I. Tuba, but perhaps sometimes applied to *I. hederacea grandiflora or Calonyction aculeatum.
— hederacea.

IPOMÉA, continued.
— Learii, but the trade plant may be erroneously *I. mutabilis.
— limbata: *I. hederacea limbata.
— mericacana: *I. hirsutula.
— Nil: *I. hederacea.
— nootkifora: Calonyction aculeatum.
— pandurata.
— paniculata: *I. digitata.
— purpurea (Convolvulus).
— Quamoclit: Quamoclit pinnata.
— rubro-varieca: *I. tricolor.
— setosa.
— Tuba.

IPOMOPSIS. *I. elegans: Gilia coronopifolia.

IRENE (see Achyranthae). *I. Herb-stit.
— Lindenii.

IRIS. *I. aisiatica: *I. pallida.
— atropurpurea: probably *I. atropurpurea; perhaps also applied to a color form of *I. pumila or *I. germanica.
— aurea.
— Cengiali.
— cristata.
— cuprea: *I. fulva.
— cyanescens: *I. reticulata cyanescens.
— dalmatica: *I. pallida dalmatica.
— flavescent.
— florentina.
— fowidiussim.
— germanica.
— gracilipes (page 3569).
— gramineae.
— Kaempfer: *I. lavigata.
— lavigata.
— longipetala.
— macrantha.
— missouriensis.
— ochroleuca: *I. orientalis.
— orientalis.
— pallida.
— plicata.
— Pseudocorus.
— pumila.
— reticulata.
— sibirica.
— spectabilis: *I. Xiphium.
— stylosa: *I. unguicularis.
— verna.
— versicolor.
— virginica: *I. versicolor.
— Wilsonii.
— xiphioidea.
— Xiphium.

ISMENE. *I. calathina: Hymenocalis calathina.

ISOLEPIS. *I. gracilis: Scirpus cernus.

ITIA.* *I. virginica.

IXIA. *I. crateroides: I. speciosa.
The Ixia names are difficult to identify with the botanical species; apparently *I. colonumellaris and *I. maculata and others, enter into them.

IXORA. *I. coccinea; sometimes miss-applied to *I. chinesis.
— Colei: *I. coccinea.
— Dixiana: *I. coccinea.
— Fraseri: *I. coccinea.
— javanica.

JACARANDA. *I. mimosaefolia: *I. ovalifolia.

JACOBÉA. *I. elegans: Senecio elegans.

JACOBINIA. *I. coccinea.
— magnifica: *I. carnea.
— pauciflora (Libonia).

JAMESIA. *J. americana.

JASMINUM. *J. azoricum.
— *fruticans.
— *gracilimum.
— *grandiflorum.
— *humile.
— *liquiustrifolium: *J. rigidum.
— *nudiflorum.
— *officinalis.
— *primulinum.
— *revolutum: *J. humile.
— *rigidum.
— *Sambac.

JUBÉA. *J. spectabilis.

JUGLANS. *J. ailanthifolia: *J. Sieboldiana.
— *californica.
— *cinerea.
— *cordiformis: *J. Sieboldiana cordiformis.
— japonica: the cultivated plant is probably either *J. Sieboldiana or *J. regia.
— *sira.
— *procervariens: *J. regia. ferrillis.
— *regia.
— *Sieboldiana.
— *Sieboldii: *J. Sieboldiana.

JUNCUS. *J. effusus.

JUNIPERUS. *J. argentea: *J. chinensis albo-variegata.
— aurora: the name is applied to both *J. communis aurora and *J. chinensis aurora.
— bermudiana: *J. barbadensis.
— *californica.
— canadensis: *J. communis depressa.
— *chinensis.
— *communis.
— *communis montana.
— *excelsa.
— hibernica: *J. communis hibernica.
— *horizontalis (see *J. Sabina, below).
— *japonica: *J. chinensis japonica (page 3569).
— *macrocarpa.
— *monosperma.
— *nana: *J. communis montana.
— neoborinensis: *J. macrocarpa.
— oblonga: *J. communis oblonga.
— *pachyphleia.
— *Pfitzeriana: *J. chinensis Pfitzerriana.
— *phonicea.
— *procumbens: the cultivated plant is perhaps *J. chinensis Sargentii (page 3569).
— *prostrata: *J. horizontalis.
— *rigida.
— *Sabina (J. horizontalis is sometimes cultivated under this name).
— *scopolorum.
— *sibirica: *J. communis montana.
— *sinensis: *J. chinensis.
— *squamata.
JUNIPERUS, continued.
— stricta: *J. excelsa stricta.
— suaveca: *J. communis suaveca.
— tamarissifolia: *J. Sabina tamarissifolia.
— virgiana.

JUSSLEA. J. longifolia.

KADSkRA. *K. japonica.
KALANCHE. K. flammea.
KALMIA. *K. angustifolia.
— glauca: *K. polifolia.
— latifolia.

KAULFUSSIA. K. a m elloid es: Charisies heterophylla.

KENNEDY. K. cereus: probably *Hardenbergia Comptoniana.
— Comptoniana: *H. Comptoniana.
— ovata: *H. monophylla.

KENTIA. K. Belmoreana: Howeia Belmoreana.
— Canterbureyana: Hedyscepe Canterbureyana.
— Forsteriana: Howeia Forsteriana.
— Macquarrii: Pychosperma Macarthurii.
— Sandersonia.
— Wendlandiana: Hydrastiele Wendlandiana.

KERRIA. *K. japonica (Corchorus).

— cornalis.
— foliosa.
— Macowanii.
— nobilia: T. Uvaria nobilis.
— Pitzieri.
— Saundersii.
— sulphurea.
— Uvaria (alboidees).

KOCHIA. K. trichophylla.

KŒVERTERIA. *K. pan culata.

LABURNUM. *L. alpinum (Cytisus).
— vulgaris: L. anagyroides (Cytisus).
— Watereri (Cytisus).

LACINMIRA. L. pumila: Liatris spicata montana.
— pycnostachya: Liatris pycnostachya.
— spicata: Liatris spicata.

LACKEYALIA. L. luteola.
— Nelsonii.
— pendula.
— quadrifolior.
— tricolor.

LACTUCA. L. sativa (Lettuce).

LAGENARIA. L. leucaha.
— vulgaris: L. leucantha.

LAGERSTROEMIA. *L. indica.

LAGUNARIA. *L. Patersonii.

LAGURUS. L. ovatus.

LAMARCIA. L. a urea (Chrysurus).

LAMIAUM. *L. album: L. maculatum.
— purpureum: probably L. maculatum rather than the true L. purpureum.

LANTANA. *L. delicatissima: probably L. Sellowiana.
— hybridra: dwarf garden forms of L. Camara.
— Sellowiana.

LAPAGERIA. L. alba. L. rosea.
— alboflora.
— rosea.

LAPEREYROUSIA. L. cruenta (Anomathaea).

LARIAX. *L. americana: *L. laricina.
— decidua: *L. europaea.
— europaea: L. decidua.
— hybridra (puge 3569).
— Kaempferi: *L. lepotelepis.
— laricina.
— lepotelepis.

LASIANDRA. L. macrantha: Tibouchina semidecandra.

LASTREA. L. dilatata: Dryopteris spinulosa dilatata.
— Filzix-mas: D. Felix-mas.

LATANIA. L. borbonica: L. Commersoni; stock usually Livia stona chinensis.

LATHYRUS. L. grandiflorus; also applies to L. latifolius grandiflorus.
— latifolius.
— magellanicus.
— niger (Orobus).
— odoratus.
— vernus (Orobus).

— caroliniana: P. caroliniana.
— caucasia: *P. Laurocerasus caucasica: *L. officinalis caucasia.
— colica: *P. Laurocerasus colica: *L. officinalis colica.
— lusitanica: *P. lusitanica.
— officinalis: P. Laurocerasus officinalis.
— rotundifolia: *P. Laurocerasus rotundifolia: *L. officinalis rotundifolia.
— versastellens: P. Laurocerasus versastellens: *L. officinalis versastellens.

LAURUS. L. Benzoin: *Benzoin officinalis.
— nobilis.

LAVANDULA. *officinalis: L. vera.
— L. Spica.

LAVATERA. L. alba: L. trimestris alba.
— arboea.
— rosea: L. trimestris.
— splendens: L. trimestris splendens.
— trimestris.

LAYIA. L. elegans.

LEDUM. *L. grælandicum.
— latifolium: *L. grælandicum.
— palustre.

LEIOPHYLLUM (Dendrium). *L. buxifolium.

LEONOTIS. L. Leonurus.

LEONTOPODIUM. L. alpinum (Gnaphalium).

LEPACHYS. L. columnaris (Obeliscaria).
— pinnata.

LEPARGYREA. See Shepherdia.

LEPIDIUM. L. sativum (Cress).

LEPTOSIPHON. L. androsacea: Gilia androsacea.
— aurea: G. micrantha.
— carminea: G. micrantha.
— densifloru: G. densiflora.
— hybridra: G. micrantha.

LEPTOSPERMUM. L. flexuosum (Agonis).
— *levigatum.

LEPTOSYNE. L. maritima.

Stillmani.

LESPEDEZA. *L. bicolor (Desmodium).
— japonica. *D. japonicum.
— Sieboldii: L. formosa, Koehne (L. Sieboldii is not tenable under the rules: *D. penduliflorum.

LEUCENA. *L. glauca.

LEUCOCRINIUM. L. montanum.

LEUCOJUM. L. aestivum.
— verum.

LEUCOTHŒ. *L. Batesi (Andromeda).
— *racemosa.
— *recurva.

LEYCESTERIA. L. elegans: *L. formosa.

LITRIS (Lacinia). L. elegans.
— ligulistylis.
— punctata.
— pycnostachya.
— scoriosa.
— spicata.

LIBOCDERUS. *L. chilensis.
— *decurrens.

LIBONIA. L. floribunda: Jacobinia pauciflora.

LICUALA. L. grandis.

LIGULARIA. L. clivorum (Senecio).
— Kaempferi (Farfugium. Senecio).
— Wilsoniana (see Senecio, page 3153).

LIGUSTRUM. *L. acuminatum.
— amurens: but misapplied to L. sinense.
— chinen: *L. sinense.
— cotaceum.
— Iboeta.
— *japonicum.
— *lucidum.
— *macrocarpum: *L. acuminatum macrocarpum.
— macrophyllum: *L. lucidum.
— marginatum: probably L. vulgar argenteo-marginatum or aureo-marginatum.
— medium: *L. acuminatum.
— *nepalense.
— *ovalifolium.
— *Ouhibi.
— Regelianum: *L. Iboeta Regel.
— *sinense.
— spicatum: the cultivated plant is probably L. Massalongianum, L. japonicum, L. lucidum or L. nepalense.
— *vulgare.

LILIM. L. auratum.
— Batemannii.
— Bloomerianum: L. Humboldtii.
— Bolanderi.
LINARIUM, continued.
- Brownii.
- canadense.
- candidum.
- reticulatum.
- chalcedonicum.
- colchicum: L. monadelphum.
- columbianum.
- concolor.
- croceum.
- dauricum.
- elegans.
- exsculetum: L. testaceum.
- giganteum; applies also to L. longiflorum giganteum.
- Grayii.
- Hansoni.
- Henryi.
- Humboldtii.
- japonicum.
- Kelloggii.
- Krameri: L. japonicum.
- Leichtlinii.
- longiflorum.
- maculatum: L. medioides, L. candidum maculatum or L. chalcedonicum maculatum.
- magnificum: L. speciosum magnificum or L. Humboldtii magnificum.
- maritimum.
- Martagon.
- Maximowiczii.
- myriophyllum: L. regale.
- pardinum.
- Parryi.
- parviflorum.
- parvum.
- philadelphicum.
- puberulum: L. Humboldtii puberulum.
- rubellum.
- rubescens: L. washingtonianum rubescens.
- Sargentiae.
- speciosum; perhaps sometimes misapplied to L. candidum speciosum.
- superbum.
- Sviobotianum: L. monadelphum Sviobotianum.
- tenuifolium.
- testaceum.
- Thomsonianum: L. roseum.
- Thunbergianum: L. elegans.
- tigrinum.
- umbellatum; probably L. dauricum, but may be true L. umbellatum.
- Wallichianum.
- washingtonianum.

LIMNANTHEMUM. L. indicum: Nyphoides indicum.
- lacunonem: N. lacunorum.
- nephrophydis: N. peltatum.

LIMNANTHES. L. Douglasii.

LIMNOCARIS. L. Humboldtii.

LIMODORUM. L. pulchellum: Calopogon pulchellus.

LIMONIUM. See the names under Statice.

LINARIA. L. alba: perhaps L. Cymbalaria alba or L. bipartita alba.
- bipartita.
- Cymbalaria.

LINARIA, continued.
- hepaticaefolia.
- macedonica.
- maroccana.
- reticulata.

LINDELOFIA. L. longifolia.

LINNIA. L. australiacum.
- coccineum: L. grandiflorum coccineum.
- flavum.
- grandiflorum.
- Lewisii.
- narbonnense.
- perenne.

LIPARIS. L. lilifolia.

LIPPIA. L. citriodora (Aloysia. Verbenae).
- repens: L. canescens.

LIQUIDAMBAR. *L. Styraciflua.

LIRIODENDRON. *L. Tulipifera.

LISANTHUS. L. Russelianus: probably Eustoma Russelianum, although true L. Russelianus is sometimes cultivated.

LITCHI. L. chinensis (Nephelem). LITHOCARPUS. See page 3569.

LIVISTONA. L. australis (Corypha).

LOBELIA. L. cardinals; stock is sometimes 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. tenuior.
- speciosa: L. Erinus speciosa, not L. speciosa of botanists.
- syphilitica.
- tenuior.
- Tupa.

LOMARIA. L. ciliata: Blechnum Moorei.

LONICERA, continued.
- *fragrantissima: sometimes also used for L. Standishii.
- *fuchsioides: *L. Brownii fuschoides, not L. fuchsioides of botanists.
- *gigantea: either L. etrusca pubescens or L. etrusca superba.
- *glauca: *L. dioica.
- *grandiflora: *L. tatarica grandiflora.
- *Halliana: L. japonica Halliana.
- *Heckrottii.
- *Henryi.
- *involuta: *L. japonica.
- *Ledebourii.
- *Maackii (Chamaecerasus).
- *Morrowii.
- *muendeniensis.
- *muscaviensis.
- *notha.
- *oblongifolia.
- *Periclymenum.
- *pilata: *L. pyrenaica.
- *Ruprechtiana.
- *segreziensis.
- *sempervirens.
- *silenus: *L. Standishii.
- *spinosa (Chamaecerasus). Name sometimes applied to *L. spinosa Albertii.
- *Standishii.
- *Sylvanum: *L. prolifera.
- *tatarica.
- *thibetica.
- *trichosantha.
- *virginalis: L. tatarica virginalis.
- *Xylosteum.

LOPHOSPERMUM. L. scandena: Maurandia Lophospermum.

LOTUS. L. Bertholetii.
- corniculatus.
- Jacobaeus.
- peltokryphon: L. Bertholetii.

LUCUMA. L. mammosa.
- nervosa.

LUFFA. L. acutangula (Cucumis).
- cylindrica.

LUNARIA. L. biennis: L. annua.

LUPINUS. L. albus.
- arboreus.
- Crucihshankii: L. mutabilis Crucihshankii.
- Hartwegii.
- hirsutus.
- luteus; but also L. arboreus luteus.
- mutabilis.
- nanus.
- perennis.
- polyphyllus.
- subcarnosus.
- tricolor: L. Dunnettui.

LYCHNIS. L. alpina.
- chaliceana.
- Cali-rosa (Agrostemma. Viscaria).
- Coronaria.
- diurna: L. dioica.
- Flos-cuculi.
- Flos-Jovis (Agrostemma).
- fulgens: probably a form of L. coronata rather than the true L. fulgens.
LYCHNIS, continued.
--- grandiflora: L. coronata.
--- Haageana.
--- plevislina: L. Flos-cuculi plevislina.
--- Sieboldii: L. coronata Sieboldii.
--- splendens: L. Viscaria splendens.
--- vespertina: L. aiba.
--- Viscaria (Viscaria).

LYCIIUM. *L. barbarum; the plants cultivated as L. barbarum and L. europeum are usually L. halimi-
folium or L. chinense; the true species (L. barbarum and L. europeum) are probably not grown
in this country.
--- chinense.
--- europeum.
--- halimifolium.

LYCOPERSICUM. *lycopersicum.

LYCOPERDICUM. L. esculentum (Tomato).
--- pimpinellifolium.

LYCOPODIUM. L. clavatum.
--- complanatum.
--- dendroides: L. obscurnum.
--- lucidulum.

LYCORIS. L. squamigera (Amaryl-
lis Hallii).

LYGODIUM. *lygodium.
--- americanum.
--- palmatum.
--- scandens.

LYONIA. *L. ligustrina: Xolisma
ligustrina.

LYONOTHAMUS. *L. floribundus.

LYSICHITON. L. barystachys.
--- ciliata: Sieronema ciliatum.
--- clethroides.
--- Fortunei.
--- japonica (page 3569).
--- Nummularia.
--- punctata.
--- thyrsiflora.
--- vulgaris.

LYTHRUM. L. alatum.
--- roseum: L. Salicaria roseum.
--- Salicaria.
--- virgatum.

MAACKIA. *M. amurensis (Clad-
straetis).

MACADAMIA. M. ternifolia.

MACLURA. M. aurantiaca: *M.
ponifera: Toxylon poniferum.

MAGNOLIA. *M. amunensis: *M.
Soulangeana.
--- superba: M. grandiflora.
--- Alba superba.
--- Alexandrina: M. Soulangeana
Alexandrina.
--- atryparpurpurea: probably a form of
M. liliflora.
--- conspiciu: M. denudata.
--- cordata: *M. amunisata cordata.
--- denudata.
--- Fraserni.
--- fusoca: *Michelia fusca.
--- gaura.
--- gloriosa: *M. grandiflora gloriosa.
--- grandiflora.
--- Hallana: *M. stellata.
--- hypoleuca.
--- Kobus.
--- Lennii: *M. Soulangeana Lennii.
--- liliflora: *M. obovata.

MAGNOLIA, continued.
--- macrophylla.
--- Norbertiana: *M. Soulangeana
Norbertiana.
--- obovata: M. liliflora.
--- parviflora.
--- purpurascens: M. liliflora: *M. obo-
vata.
--- rustica: *M. Soulangeana rustica.
--- salicifolia; sometimes misapplied
--- to M. grandiflora angustifolia.
--- Soulangeana.
--- speciosa: *M. Soulangeana spe-
iosa.
--- stellata.
--- stricta: *M. grandiflora exoni-
sis.
--- Thompsonianana.
--- tripetala.
--- Watsonii.
--- Yulan: M. denudata: *M. con-
spicua.

MAHONIA (Odostemon under Ameri-
can Code). *M. Aquifolium.
--- Fortunei.
--- japonica.
--- nervosa.
--- pinnata.
--- repens.

MAIANTHEUM (Unifolium under
American Code). M. bifolium
(Smilacina).

MALCOVMA. M. maritima.

MALOPE. M. grandiflora: M. trifida
grandiflora.
--- rosea: M. trifida rosea.

MALUS. *M. angustifolia: Pyrus
angustifolia.
--- Arnoldiana: Pyrus pulcherrima
Arnoldiana.
--- atrosanguinea: P. atrosanguinea.
--- baccata: P. baccata.
--- cerasiformia: P. cerasifera: *Malus
cerasifera.
--- coronaria: P. coronaria.
--- crataegifolia: P. florentia: Malus
florentina.
--- Dawsioniana: supposed hybrid of P.
fusea and P. Malus (see page 2970).
--- denticulata: unidentified; probably
Malus prunifolia Rinki.
--- florentina: P. florentina.
--- floribunda: P. pulcherrima.
--- fusca: P. fusca.
--- Halliana: P. Halliana.
--- iovensis: P. iovensis.
--- Niedzwetzkyana: P. Malus Niedz-
westkynza.
--- Parkmanii: P. Halliana Park-
mani.
--- prunifolia: P. prunifolia.
--- Ringo: P. prunifolia Rinki:
Malus prunifolia Rinki.
--- Sargenti: P. Sargenti.
--- Scheideckeri: P. pulcherrima
Scheideckeri.
--- Sieboldii: P. Sieboldii: *M.
Toringa.
--- Souillardii: P. Souillardii.
--- spectabilis: P. spectabilis.
--- sylvestris: P. Malus.
--- Toringa: P. Sieboldii.
--- Zumi: P. Zumi.

MALBA. M. Alcea.
--- crispa.
--- minuta: Spharalcea cispatina.
--- moschata.

MALVAVISCUS. M. arboreus
(Aehania).

MAMMEA. M. americana.

MANDEVILLA. *M. suaveolens.

MANETTIA. M. bicolour: some of the
stock is probably M. inflata.

MANGIFERA. M. indica.

MANIHOT. M. utilisissima (Cassava).

MARRA. M. Closeonii.
--- Goveniana: unknown botanically.
--- illustris: Calathes illustris.
--- insignis: C. insignis.
--- Kerchoveana: M. leuconeura Ker-
choveana.
--- Makoyana: M. Makoyana.
--- Massangeana: M. leuconeura
Massangeana.
--- rosea: probably C. roseo-picta.
--- Sanderi: probably C. Sanderiana.
--- Vandenbeckei: C. Vandenbeckei.
--- vittata: C. vittata.

MARRUBIUM. M. vulgare (Hore-
hound).

MARSHALLIA. M. trinervia.

MARTINEZIA. M. caryotsefolia.

MARTYRIA. M. Craniolata: Cranio-
laria annua.
--- formosa: M. fragrans.
--- lutea.
--- probosciidea: M. louisiana.

MATRICARIA. M. opensia: M.
Chamomilla parthenioides.
--- grandiflora: M. inodora plevis-
limata, not M. grandiflora of
botanists.
--- parthenoides.

MATTEUCCIA. M. Struthiopteris
(Onoeles).

MATTHIOLA. M. bicornis.
--- incana.

MAURANDIA. M. antirrhiniflora:
Antirrinum maurandiiodes.
--- Barclayana.
--- Emergyna: a color form of M.
Barclayana.
--- Lophophorum (Lophophorum).

MAYTENUS. *M. Boaria.

MECONOPSIS. M. integrifolia.

MEDICAGO. M. arboarea.
--- sativa (Alfafa).
--- stubillata.

MEDINILLA. M. amabilis: M.
Teysmannii.
--- magnifica.

MELELEUCA. M. alba: *M. armil-
aris.
--- decussata.
--- ericifolia.
--- hypericifolia.
--- incana.
--- Leucadendron.
--- oppositifolia: *M. hypericifolia.
--- Wilsonii.

MELIA. *M. Azedarach.
--- umbraculifera: *M. Azedarach
umbraculiformis.
FINDING-LIST

NICOTIANA. continued.
- colossea: N. tomentosa.
- Sandera.
- sylvestris.
- Tabacum (Tobacco).
- tomentosa.

NIEREMBERGIA. N. frutescens.
- gracilis.
- rivilarius.

NIGELLA. N. damascena.

NIPHOBOLUS. N. lingua: Cycophorus Linguus.

NOLANA. N. atriplicifolia: N. paradoxa.
- grandiflora: N. paradoxa.

NOLINA. N. Beldingii.
- longifolia.
- Paryi (Dasylirion).

NUPHAR. N. advena.

NYCTERINIA. N. capensis: Zulu-rzsianska capensis.
- selaginoides: Z. selaginoides.

NYMOPHA (Castalia). N. alba; sometimes applied to a white form of N. gigantea.
- Bissetii.
- cærulea; but may sometimes be N. capensis.
- candidissima: N. alba candidissima.
- capensis.
- Daubeniana.
- Deaniana.
- dentata: N. Lotus dentata.
- devoniensis.
- flava: N. mexicana.
- flavo-virens.
- gigantea.
- Gladstoniana.
- gracilis: probably N. flavo-virens, possibly form of N. gigantea.
- kewensis.
- Laydekeri.
- Marticaceae: a race of hybrids.
- mexicana.
- odorata.
- ovalifolia (page 3570).
- pulcherrima.
- pygmaea: N. tetragona.
- Richardsonii: N. tuberosa Richard-sonii.
- Robinsonii.
- rubra-rosea.
- Sturtvanti.
- tetragona.
- tuberosa.
- zanibariensis: N. capensis zanibariensis.

NYMPHOIDES. N. indicum (Lin-nanthemum).

NYSSA. *N. aquatica.
- multi flora: *N. sylvatica.
- *sylvatica.

OAKESIA. O. sessilifolia (Uvularia).

OBELISCARIA. O. pulcherrima: Lepachys columnaris pulcherrima.

OCIMUM. O. Basilicum (Basil).

ODONTONEMA (page 3342). O. Schomburgkianum (Thyrsacanthus).

ODONTOSORIA. O. chinensis (Davallia).

GENOTHERA. O. acaulis.
- biennis.
- bistorta.
- brachycarpa.
- cespitosa.
- Drummondii.
- Fraseri: O. glauca Fraseri.
- fruticosa.
- glauca.
- Lamarkiana.
- macrocarpa: O. missouriensis.
- Pilgrimi.
- rosea.
- serrulata.
- speciosa.
- tetraptera.
- Whitneyi: Godetia grandiflora.
- Youngii: O. fruticosa Youngii.

OLEA. *O. europaea (Olive).
- fragrans: *Osmanthus fragrans.

OMPHALODES. O. linifolia (Cy-noglossum).

ONOCLEA. O. sensibilis.
- Struthiopteris: Matteuccia Struthiopteris.

ONOPORDON. O. tauricum.

ONYCHIUM. O. japonicum.

OPLISMENUS. O. hirtellus (Pani-cum).

- glabratus: *P. glabrat us.
- intermedius: *P. intermedius.
- monogynus: *P. monogynus.
- opulifolius: *P. opulifolius.
- pubeescens: *P. malvae cens.
- Ramaleyi: P. bracteatus or P. intermedius.

OPUNTIA. O. arenaria.
- Camanichica.
- Ficus-indica.
- humilis.
- phacantha.
- polyantha.
- Rafnesnesii: O. humilis.
- vulgaris.

ORCHIS. O. spectabilis: Galeorchis spectabilis (doubtfully separable from the genus Orchis; under that genus it is O. spec-tabilis).

OREDOXIA. O. regia (Roystonea regia).

ORIGANUM. O. Majorana (Sweet Marjoram).

ORNITHOGLALUM. O. arabicum.
- pyramidalae: O. arbonense pyramidalae.
- umbellatum.

OROBUS. O. lathyroi des: Vicia por- boideas.
- niger: Lathyrus niger.
- vernus: 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.

OSTRYA. O. virginica: *O. virginiana.

OTHONNA. O. crassifolia.

OUVIRANDRA. O. fenes tralis: Aponogoton fenes tralis.

OXALIS. O. Acetosella.
- alba: a white form of either O. lasiandra or O. variabilis.
- albiflora: O. variabilis.
- Bowiei.
- cernua.
- Deppei.
- lasiandra.
- rosea; but O. enneaphylla rosea is perhaps sometimes meant.
- tropozoloides: O. corniculata autopurpurea.
- validivienisa.
- violacea.

OXYDENDRUM. *O. arboreum (Andromeda).

PACHISTIMA. *P. Canbyi.

PACHYSANDRA. *P. terminalis.

PÆONIA. P. alba: probably P. decora alba.
- albiflora.
- amonoglycorrhiza: P. officinalis albo-plena.
- arborea: P. suffruticosa.
- chinensis: P. albiflora sinensis.
- edulis: P. albiflora.
- festivis: either P. albiflora festiva or P. officinalis festiva.
- Humei: P. suffruticosa Humei.
- lutea.
- 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 Paeonia, as P. amabilis, atrorubra, bicolor, candidissima, chrysanthemum, Delachii, delicatissima, elegantissima, formosa, fragrantissima, gigantea, grandiflora, nigricans, papaveriflora, Pottsi, prolifera, pulcherrima, purpurea, rosea, Thorbeckii, triumpans, umbellata, and others.

PALAFOXIA. P. Hookeriana: Polyp- teris Hookeriana.

PALIURUS. *P. Spina-Christi.

PANAX. P. grecilimimum: Dizygote theca Veitchii gracilimimum.
- monstrosa: Polycias Guilfoylei monstrosa.
FINDING-LIST

PHILOSTACHYS (see Bamboo).

PINUS, continued.

— *heterophyllum.

— *Horyana.

— *Castillonis.

— *Henonis.

— *marliacea.

— *mites.

— *nigra.

— *Quillot.

— *rufociliol.

— *Veitchii.

— *violcens.

— *viridis.

PHILLYREA. *P. angustifolia (Filiaire).

— *decora (Filiaire).

— *latifolia.

PHILODENDRON. P. giganteum.

— spectabile.

PHLEBODIUM. P. aureum (Polypodium).

PHLEUM. P. pratense (Timothy).

PHLOMIS. P. tuberosa.

PHLOX. — *nivosus.

— *latifolia.

— *decora (Filaria).

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.

— *dactylifera.

— *ardens.

— *Hibernica.

— *vllosa.

— *P. canariensis.

— *dactylifera.

— *nivosus.

— *Zeyheri.

— *serrulata.

— *rupicola.

— *Roebelii.

— *zeylanica.

— *pumila.
POLYPTERIS. P. Hookeriana (Palafoxia).
POLYSCHIAS. P. Balfouriana (Aralia).
- Filifolia (Aralia).
- Guilfoylei (Aralia. Panax).
POLYSTICHUM (see Aspidium). P. acrostichoides.
- aculeatum.
- angulare.
- Braunii.
- cristatum.
- munitum.
- Tuss-sinense.
PONCIRUS. P. trifoliata: *Citrus trifoliata.
PONTEDERIA. P. cordata.
POPULUS. *P. acuminata.
- alba.
- angustifolia: *P. fortissima.
- aurea: *P. Van Geerit aurea, a form of *P. serotina.
- balsamifera.
- Bolleana: P. alba pyramidalis.
- canadensis: *P. deltoides.
- candelicans.
- canescens.
- carolinensis (*Carolina Poplar).
- Eugenei, P. angustata (Hybrid *Carolina Poplar), and probably others; a group of hybrids in need of further study.
- deltoides.
- Eugenei (Carolina P., in part)
- fastigiata: *P. nigra italica.
- fortissima.
- Fremontii.
- gracca: 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. tremuloides pyramidalis.
- *Sargentii.
- *Simoni.
- *tremula.
- *tremuloides.
- suaveolens; but the plant in cultivation is *P. Maximowiczii.
PORTERANTHUS (name under American Code). P. stipulacea: Gillenia stipulata.
PORTULACA. P. albiqora: P. grandiflora albiflora.
- aurea: P. oleracea.
- grandiflora.
- oleracea (cultivated form).
- Thelussonii: P. grandiflora Thelussonii.
- Thorburnii: P. grandiflora Thorburnii.
POTENTILLA. P. atrosanguinea.
- formosa: P. nepalensis.
- fruticosa.
- grandiflora.
- MacNabiana.
- O'Briana.
POTENTILLA, continued.
- pyrenaica.
- rupestris.
- Russelliana: hybrid.
- *tridentata.
- Veitchii: *P. fruticosa Veitchii.
POTHOS. P. argyraea: Scindapsus pictus argyraeus.
PRIMULA. P. acaulis.
- Auricula.
- carulesa.
- coshermiana: P. denticulata cachemiriana.
- chinensis: P. sinensis.
- cortusoides.
- Frostael: probably a garden form of *P. acaulis.
- denticulata.
- elatior.
- farinosa.
- fimbrigata: P. sinensis fimbrigata or P. obonica fimbrigata.
- Forbesii.
- grandiflora: applied to large-flowered forms of different species.
- japonica.
- kewensis.
- lutea: P. Auricula.
- malacoides.
- obonica.
- officinalis: P. veris.
- Polyantha.
- pulvuferenta.
- rosea: P. obonica rosea or P. japonica rosea.
- Sieboldii.
- sinensis.
- veris.
- verticillata.
- vulgaris: P. acaulis.
PRITCHARDIA. P. pacifica (Stylo-
- loma pacifica; see page 3279).
PRUNELLA (see Brunella). P. grand-
- flora.
- Webbia.
PRUNUS (see Amygdalus, Cerasus, and Laurocerasus). *P. alle-
- ganiensis.
- *americana.
- *Amygdalus: P. communis: *Amygdalus communis.
- angustifolia.
- *Armeniaca (Apricot).
- *avium (Sweet Cherry).
- *Besseyi (Sand Cherry).
- caroliniana: *Laurocerasus caro-
- liniana.
- *cerasifera.
- *Cerasus (Sour Cherry).
- Davidiana: *A. Davidiana.
- *demissa.
- *domestica (Common Plum).
- *fruticosa.
- *glandulosa (Cherry-Almond).
- *hortulan.
- *ilicifolia.
- *integriifolia: *P. Lyonii.
- *japonica (Cherry-Almond); also applied to P. subhirtella penda, one of the Japanese flowering cherries.
- *Lannesiana (Japanese Flowering Cherry).
PSIDIIUM. *P. Cattleyanum.  
*Friedrichsthalianum.  
*Gusjava.

PTELEA. *P. aurea. *P. trifoliata aurea.  
*trifoliata.

PERTERIUM (doubly separable from Pteris). *P. aquilinum (Pteris).

PTERIS. *P. adiantoides: not known botanically.  
*aguilina: Pteridium aquilinum.  
*aragrya: a form of P. cretica.  
*cretica.  
*hastata: Pellea viridis.  
*interanta: Pt. heterophylla interanta.  
*Mayil: Pt. cretica Mayil.  
*nobilis: P. cretica nobilis.  
*Ouardarid: Pt. serrulata Ouardarid.  
*Rivertoniana: a form of Pt. cretica.  
*serrulata.  
*Sieboldii: a form of Pt. cretica.  
*tremlula.  
*Wilsonii: Pt. cretica Wilsonii.  
*Wisnietii: a variation of Pt. cretica.

PTEROCARYA. *P. franziifolia.  
*stenoptera.

PTEROSTYRAX. *P. corymbosa. 
*hispida.

PYROPHYS. *P. singaporensis.

PYCHOSPERMA. *P. Alexandrea: Archontophoenix Alexandrea.  
*Cunninghamii: A. Cunninghamii.  
*elegana: A. Alexandrea and A. Cunninghamii: the palm cultivated in California under this name is recently named Loroma amethystina (see Seaforthia, page 3123).  
*singaporensis: Ptychorrhis singaporensis (page 3571).

PUERARIA. *P. Thunbergiana: P. hirsuta (Dolichos).

PULMONARIA. *P. angustifolia.  
*azurea: P. angustifolia azurea.  
*maculata: P. officinalis.  
*saccharata.

PUNICA. *P. Granatum.  
*Legrellii: a form of P. Granatum.  
*nana: *P. Granatum nana.

PYRACANTHA. *P. angustifolia (Cotoneaster). 
*truncata.  
*coccinea.  
*crenulata (Cotoneaster).  
*Lalandii: *P. coccinea Lalandii.

PYRETHRUM. *P. aubertiflorum: a variation of Chrysanthemum aubertiflorum.  
*augeum: C. Parthenium augeum.  
*corymbosum: C. corymbosum.  
*hybridum: C. coccineum.  
*parthenifolium: C. Parthenium.  
*roseum: C. coccineum.  
*selagoideae: C. Parthenium selagoideae.  
*Tschatchewii: C. Tschatchewii.  
*ulginum: C. ulginum.

PYROSTEGIA. *P. venusta: *Bignonia venusta.

PYRUS. *P. americana: *Sorbus americana.

PYRUS, continued.  
*angustifolia: *Malus angustifolia.  
*arbutifolia: *Aronia arbutifolia.  
*Arnoldiana: *P. pulcherrima Arnoldiana.  
*Cherry.  
*Dasiphora: *Sorbus Dasiphora.  
*baccata: *Malus baccata.  
*cerasifera: *M. cerasifera.  
*communis (Pear).  
*coronaria: *M. coronaria.  
*Dawsoniana (hybrid): *M. Dawsoniana.  
*floribunda: *P. pulcherrima: *M. floribunda.  
*fusca: *M. fusca.  
*Halliana: *M. Halliana.  
*ioensis: *M. ioensis.  
*Niedzwetzkiana: P. Malus Niedzwetzkiana: *M. Niedzwetzkyana.  
*nigra: *Aronia melanocarpa.  
*Parkmanii: *P. Halliana Parkmanii: *M. Parkmanii.  
*prunifolia: *M. prunifolia.  
*pulcherrima: *M. floribunda.  
*quinquefolia: Sorbus hybrida: *S. quinquefolia.  
*Sargentii: *M. Sargentii.  
*Scheideckeri: *P. pulcherrima Scheideckeri: *M. Scheideckeri.  
*serotina (Japan Pear).  
*Sieboldii: *Malus Toringo.  
*Sonora: *Sorbus domestica.  
*Soulardii: *Malus Soulardii.  
*spectabilis: *Malus spectabilis.  
*Toringo: *P. Sieboldii: *M. Toringo.  
*Zumi: *M. Zumi.

QUAMOCIT. *P. coccineum.  
*Quercus. *Q. acuta.  
*Agriphila.  
*Alba.  
*aquatica: *Q. nigra.  
*Banisteri: *Q. Illicifolia.  
*bicolor.  
*Cerris.  
*coccinea.  
*Concordia: *Q. Robur Concordia.  
*cuspidata: Casanopsis cuspidata (see Vol. V, page 2891).  
*dentata: but sometimes applied to C. gladiolifer.  
*Douglasii: *P. Douglasi.  
*Duosessilae: *Q. Robur Duosessilae.  
*Falcata.  
*ferruginea: *Q. marilandica.  
*Garrania.  
*Glauc.  
*Flex.  
*Illicifolia.  
*Imbricaria.  
*Kelloggii.  
*Laurifolia.  
*lobata.  
*lyrata.  
*Macrocarpa.
QUERCUS, continued.

- *marilandica.
- *Michauxii (Basket Oak): Q. Primus.
- *montana (see Q. Primus, below).
- *nigra.
- *obtusiloba: *Q. stellata.
- *pallustris.
- *pannonica: *Q. conferta.
- *pectinata: *Q. Robur pectinata.
- *pedunculata: *Q. Robur.
- *Phellos.
- *platanoides: *Q. bicolor.
- *Primus (Basket Oak); applied in the trade to the *Chestnut Oak only, which is Q. montana of the Cyclopeda but for which others retain the name Q. Primus and apply Q. Michauxii to the Basket Oak: *Q. Michauxii.
- *pyramidalis: *Q. Robur fastigiata.
- *Robur.
- *rubra.
- *sempervirens: *Q. virginiana.
- *Suber.
- *tintoriera: *Q. velutina.
- *velutina.
- *virginiana.

RADICULA. R. Armoracia (Horseradish). Preferably Roripa Armoracia.

RAJANIA. R. pleioneura.

RANUNCULUS. R. scoticusfilius.
- *acris.
- *amplexicaulis.
- *asiaticus.
- *bulbosus.
- *gramineus.
- *repeans.
- *speciosus: R. bulbosus.

RAPHANUS. R. sativus (Radish).

RAPHILEOPSIS. *R. indica.
- *japonica: *R. umbellata.
- *ovata: *R. umbellata ovata.

REHMANNIA. R. angustata.

REINWARDTIA. R. trigyna (Lignum).

RESEDA. R. odorata.

RETINOSPORA, but properly spelled Retinspora. (There is no such genus, the plants referred to it being all juvenile states of the genera Chamaecyparis and Thuja.)

The American Joint Committee has starred the names of the plants under Thuja and Chamaecyparis, but recognizes the value of retaining Retinospora as a trade name for these forms as indicated by stars in parentheses below (*). It is preferable to use Retinospora as a common name in connection with the correct starred botanical name.

- (*erioides: *Thuja occidentalis erio
des; perhaps sometimes applied to Chamaecyparis thy
ides erioides.
- (*filioides: *C. obtusa filicoides.

RETONOSPORA, continued.
- (*filicoides: *C. obtusa filicoides.

RHODEN-DENDRON. R. arbore-
cens: *Azalea arborecens.
- *arboreum.
- *arbutifolium.
- *calendulaeum: *A. lutea.
- *canadense: *Rhodora canadensis.
- *canescens: *A. canescens.
- *canarienseum.
- *cataviense.
- *ferrugineum.
- *hirsutum.
- *indicum: *A. indica.
- *japonicum: *A. japonica.
- *ledifolium: *A. ledifolia.
- *luteum: *A. pontica.
- *maximum.
- *Morteri: *A. gandavensis.
- *myrtifolium, but also R. Kotschyi.
- *nudiflorum: *A. nudiflora.
- *obtusum amomum: *A. amomum.
- *obtusum Hinogidir: *A. Hinogidir.
- *occidentale: *A. occidentalis.
- *poniculum.
- *poukhanense yodogawa: *A. yodogawa.
- *precox.
- *punctatum: R. minus.
- *racemosum.
- *roseum: R. maximum roseum.
- *sinense: *A. mollis.
- *Sminrovii.
- *Vaseyi: *A. Vaseyi.
- *viscosum: *A. viscosa.

RHODORA. *R. canadensis: Rhododendron canadense.

RHODOTOPOS. *R. kerrioides.

RHOPALOSTYLIS. R. Bau
eri (Areca).
- *sapid (Areca).

RIHIUS. R. ailanthofoia: possibly R. ailanthofoia, which is Pircsma quassioideae.
- *aromatica: *R. canadensis.
- *canadensis.
- *Copallina.
- *cotinoides: Cotinus americanus.
- *Cotinus: C. Coggygia.
- *gabra.
- *Osebekii: *R. javanica.
- *tribolata.
- *Typhus.

RHYNCHOSPERMUM. R. jasminoides: *Trachelospermum jasminoides.

RIBES. *R. alpinum.
- *aurum: the fragrant plant cultivated as R. aureum is *R. odoratum.
- *cereum.
- *Cynosbati.
- *floridum: *R. americanum.
- *glandulosum.
- *Gordonianum.
- *inermis.
- *longifolium: *R. odoratum.
- *nigrum (Black Currant).
- *odoratum.
- *prostratum: *R. glandulosum.
- *sanguineum.
- *saxosum: the plant in the trade under this name is *R. inermis.
- *vulgare (Red and White Currants).

RICHARDIA. R. ehliopia: Zante-deschia ethiopica.

RICINUS. R. bourbonensis: R. com-
munis borboniensis.
- *camboagensis: R. communis cam-
bogensis.
- *communis.
- *hybridus: R. communis hybridus.
- *macrocarpus: R. communis mac-
caropus.
- *macrophyllus: R. communis ma-
crophylus.
- *panormitans: R. communis pan-
ormitans.
- *philippinensis: R. communis philippinensis.
- *purpureus: R. communis pur-
perseus.
- *sanguineum: R. communis san-
guineum.
- *zanibarensis: R. communis zan-
zibarensis.

The common Castor-bean plant, R. communis, gives rise to many marked forms, some of them having received Latin names.

RIVINA. R. humilis.

- *Decaisneana: *R. Pseudacacia Decaisneana.
- *hispidula.
FINDING-LIST

ROBINIA, continued.
— inermis: probably *R. Pseudacacia inermis or *R. Pseudacacia umbraclifera, but sometimes possibly used to designate R. hispida macrophylla.
— Kelseyi.
— *non-mexicana.
— *Pseudacacia.
— semperflorens: *R. Pseudacacia semperflorens.
— *viscosa.

ROCHEA. R. coccinea (Crassula).

RODGERSIA. P. podophylla.

tabularis.

ROMNEYA. *R. Coulteri.

RORIPA. A. Armoracia (Horse-radish. Radicula).


ROSA. *R. arkansana; the material cultivated under this name may be R. heleniophila.
— Banksiae.
— *blanda.
— *bracteata (McCartney Rose).
— canina.
— carolina: *R. humilis.
— *corinna; the plant usually cultivated under this name is R. pusilla.
— *cinnamonemea.
— *coriifolia.
— *Engelmanni: *R. acicularis Engelmanii.
— *Fendleri: *R. Woodsii Fendleri.
— *gymnocarpa.
— *humilis: R. carolina.
— *laevigata (Cherokee Rose).
— *lucida: R. virginiana.
— *macrophylla.
— *multiflora.
— *mitida.
— *nutkana.
— *palustris: *R. carolina.
— *rubiginosa.
— *rubrifolia.
— *rugosa.
— *Saget: *R. acicularis Bourgeauiana.
— *setigera.
— *spinosissima.
— *virginiana: *R. lucida.
— *virginiaca.
— *Woodii.

ROSARUM. *R. officinalis.

ROSTONEA. See Oreoedoxa.

RUBUS. *R. allegheniensis (High-bush Blackberry).
— *argutus (High-bush Blackberry).
— *canadensis; if trade plant is a dewberry, it is probably R. procumbens.
— *cratmgirofolius.
— *deliciusus.
— *dumetorum.
— *eligrifolius.
— *hispidus.
— *idus.
— *ilecebrosums.
— *lacinatus.

RUBUS, continued.
— *leucodermis.
— *Linkianus.
— *neglectus.
— *occidentalis.
— *odoratus.
— *palatana.
— *phonicolasius.
— *procumbens (Eastern Dewberry).
— *roseaeflorus (this name is sometimes applied to the strawberry-raspberry, R. ilicelobus).
— *strigosus.
— *trivialis (Southern Dewberry).
— *ursinae: *R. vitifolius.
— *willosus: *R. procumbens when dewberry is meant,*R. allegheniensis when high-bush blackberry is meant.
— *vitifolius (Western Dewberry).

RUDBECKIA. R. amplexicaulis.
— bicolor.
— *californica.
— *fulgida.
— *hirta.
— *californica.
— *maxima.
— *Erdingeri.
— *fragilis (Brittle Willow).
— *glabra.
— *glabra filicifolia: *S. gracilistylostica.
— *glabra tillifolia: *S. gracilistylostica.
— *gracilistylostica.
— *grandifolia.
— *hastata.
— *hexandra.
— *klothanaica: *S. stipularis.
— *attachilis.
— *inermis.
— *irratora (Colorado Willow).
— *japonica (Japanese Weeping Willow).
— *laurifolia: *S. pentandra.
— *longifolia.
— *lucida.
— *ludifolius.
— *ludifolius.
— *myrsinifolia.
— *myrtilloides.
— *nigra.
— *nigriceps: *S. myrsinifolia.
— *pentandra.
— *petiolaris; but misapplied to S. incana.
— *Petkothi: *S. blandia.
— *phyllicifolia.
— *Piperi.
— *podoteranana: *S. sordida.
— *purpurea.
— *regalis (Royal Willow): S. alba splendens.
— *repens.
— *rosamarinifolia: *S. incana, not S. rosamarinifolia of botanists.
— *rubens.
— *sacramentana: probably a form of *S. fragilis.
— *sericea.
— *sesquiteria.
— *Sieboldiana.
— *Sieboldia: probably *S. elegantisima.
— *sordida.
— *stipularis.
— *vivinalis (Osier Willow).
— *vivellina (Yellow Willow).

SALICORNIA. S. avara (Osier Willow).
— *grandiflora: S. sinuata.
— *sinuata.

SALIX, continued.
— *amygdalina.
— *appendiculata: *S. grandifolia.
— *aurita X phyllicifolia: *S. ludifolius.
— *bajonionica (Weeping Willow).
— *bajonionica: *S. ludifolius.
— *bicolor: *S. phyllicifolia.
— *blanda (Wisconsin Weeping Willow).
— *britzensis: *S. vitellicina britzensis.
— *bullata: *S. fragilis bullata (page 3571).
— *carls: *S. alba caiva.
— *Caprea.
— *cinerea.
— *cordata.
— *daphnoides.
— *discolor.
— *dulora: *S. blanda.
— *Elaegnos: *S. incana.
— *elegantissima (Thurlow’s Weeping Willow); probably also applied otherwise.
— *Erdingeri.
— *fragilis (Brittle Willow).
— *glabra.
— *glabra filicifolia: *S. gracilistylostica.
— *glabra tillifolia: *S. gracilistylostica.
— *gracilistylostica.
— *grandifolia.
— *hastata.
— *hexandra.
— *holothele: *S. stipularis.
— *humilis.
— *incana.
— *irratora (Colorado Willow).
— *japonica (Japanese Weeping Willow).
— *laurifolia: *S. pentandra.
— *longifolia.
— *lucida.
— *ludifolius.
— *myrsinifolia.
— *myrtilloides.
— *nigra.
— *nigriceps: *S. myrsinifolia.
— *pentandra.
— *petiolaris; but misapplied to S. incana.
— *Petkothi: *S. blandia.
— *phyllicifolia.
— *Piperi.
— *podoteranana: *S. sordida.
— *purpurea.
— *regalis (Royal Willow): S. alba splendens.
— *repens.
— *rosamarinifolia: *S. incana, not S. rosamarinifolia of botanists.
— *rubens.
— *sacramentana: probably a form of *S. fragilis.
— *sericea.
— *sesquiteria.
— *Sieboldiana.
— *Sieboldia: probably *S. elegantisima.
— *sordida.
— *stipularis.
— *vivinalis (Osier Willow).
— *vivellina (Yellow Willow).

SALPIGLOSSIS. S. avara (Osier Willow).
— *grandiflora: S. sinuata.
— *sinuata.

SARRACENIA. S. saponaria (Sarracenia).
— *parviflora: *S. incana.
FINDING-LIST OF BINOMIALS

**SEMPEMIVUM,** continued.
- pyreniacum; but perhaps S. tectorum pyreniacum.
- soboliferum; this name is commonly used for S. globiferum.
- tectorum.
- violaceum: probably S. tectorum violaceum.

**SINECIO.** S. Cineraria.
- clivorum: Ligularia clivorum.
- cruentus (Cineraria).
- elegans (Jacobea).
- Kaempferi: L. Kaempferi.
- mikanioides (German Ivy).
- pulcher.
- scandens; some of the stock is perhaps S. mikanioides.
- tanguicuus.
- Wilsonianus: L. Wilsoniana.

**SEQOIA.** (Wellingtonia). *S. gigantea.
- ^Dulcamara* javanoides.
- *Hendersonii.*
- *galacifolia.
- *sempervirens.
- melmoidii: M. melmoidii.
- muricatum
- integrifolium.
- jasminoides.
- Melongena (Eggplant).
- Meltinus: S. Capsicastrum Melvinii.
- mucricatum (Pepino).
- nigrum.

**SOLANUM.** S. Capsicastrum.
- *Dulcamara* (Bitter-Sweet).
- *giganteum. (page 3575).
- *Hendersonii.
- integrifolium.
- jasminoides.
- Melongena (Eggplant).
- Meltinus: S. Capsicastrum Melvinii.
- mucricatum (Pepino).
- nigrum.

**SOLANUM,** continued.
- *Pseudo-Capsicum* (Jerusalem Cherry).
- *Rantonii* (arti.
- *Seaforthianum.
- *tuberosum (Potato).
- Warcecizici.
- *Wendlandi.

**SOLIDAGO.** S. caesia.
- canadensis.
- nemoralis.
- odorata.
- spectabilis.
- Virgarena.

Many native species of Solidago may appear in the lists, for which consult the current manuals of botany.

**SOLLYA.** *S. heterophylla.

**SOPHORA.** *S. japonica.
- *tetraptera.

**SORBARIA** (mostly sold as Spirea).
- *S. Aitchisonii.
- *arboresae.
- *Lindleyana.
- *sorbifolia.

**SORBUS** (often named under Pyrus).
- *S. americana (American Mountain-Ash).
- *Aria.
- *Aucuparia (European Mountain Ash).
- *domestica.
- hybrida: *S. quercifolia.

**SPARAXIS.** S. grandiflora (usually not sold under the species-name).

**SPARTIUM.** *S. junceum.
- scoparium: *Cytisus scoparius.

**SPECULARIA.** S. Speculum (Campanula).

**SPERGULA.** S. sativa (Spurry).

**SPHERALCSEA.** S. cip platinum (Malva miniata).

**SPHENOGYNE.** S. speciosa: Ursinia pulchra.

**SPIGELIA.** S. marilandica.

**SPINACIA.** S. oleracea (Spinach).

**SPIREA.** S. Aitchisonii: *Sorbaria Aitchisonii.
- *alba; an American plant usually catalogued as S. salicifolia, which is Asiatic.
- *argenta: *S. canescens.
- *arguta.
- *arifolia: *Holodiscus discolor artemisia.
- *Aruncus: Aruncus sylvestre.
- *Astilbe (see Astilbe).
- *astiboides: Astilbe aststboideas.
- *Billardii.
- *bracteata: *S. nipponica.
- *Bumalda.
- *callosa: S. japonica.
- *canescens.
- *cantonensis: *S. Revestesiana.
- *carpinifolia: *S. latifolia.
- *chinenis.
- *Davidii: Astilbe Davidii.
- *Douglasii.

**SPIREA,** continued.
- *floribunda: probably Astilbe aststboideas floribunda.
- *Fortunei: S. japonica Fortunei.
- *Froebelii: S. Bumalda Froebeli.
- *gigantea: Filipendula camtschatica.
- *Henryi.
- *Humboldtii: Aruncus sylvestre.
- *japonica; often misapplied to Astilbe japonica.
- *kamtschatica: Filipendula camtschatica.
- *latifolia: an American plant usually catalogued as S. salicifolia, which is Asiatic.
- *Lindleyana: *Sorbaria Lindleyana.
- *lobata: Filipendula rubra.
- *Margarite.
- *multiflora.
- *nipponica.
- *opulifolia: Physocarpus opulifolia.
- *Opulaster: opulifolins.
- *palma: Filipendula purpurea.
- *prunifolia.
- *pyramidata.
- *Recevesiana: S. cantoniensis.
- *Rosthormii.
- *rothunbergi.
- *tomentosa.
- *trilobata.
- *Ulmaria: Filipendula Ulm aria.
- *Vanhouteei.
- *venusta: Filipendula rubra venusta.

**SPIRANTEH.** S. cernua.

**SPONDIAS.** S. axillaris: S. lutea.

**SREKELIA.** S. formosissima (Amaryllis).

**STACHYS.** S. Betonica (Betonica): S. officinalis.
- *grandiflora (Betonica).
- *lanata.
- *S. Sieboldii.

**STAPHYLEA.** S. Bumalda.
- *colchica.
- *pinatana.
- *trifolia.

**STATICE** (see Armeria). S. arborescens: Limonium arborescens.
- *Bondaellii: L. Bonduellii.
- *Gmelinii: L. Gmelinii.
- *incana: L. tataricum angustifolium.
- *latifolia: L. latifolium.
- *sinuata: L. sinuatum.
- *Suworowii: L. Suwrowii.
- *tatarica: L. tataricum.

**STEIRONEMA.** S. ciliatum (Ly-simachia).

**STELLARIA.** S. Holosteaa.

**STENACTIS.** S. speciosa: Erigeron speciosus.

**STENANTHUM.** S. robustum.

**STENOPTHRUM.** S. gabrum: S. secundatum.
SYRINGA. continued.
—*villosa.
—*vulgaris.
—*Wilsonii.
SYZYGGUM (see Eugenia). *S. operculatum.

TACSONIA. T. manicana: Passiflora manicana.
— mollissima: P. mollissima.

TAGETES. T. erecta.
— lucida.
— patula.
— signata.

TAMARINDUS. *T. indica.

TAMARIX. T. azalea: *T. pentandra.
—*africana; but stock usually T. gallica or T. parviflora.
— *algerica: not known botanically: possibly a form of T. gallica.
— *amurensis: a form of T. pentandra.
—*chinesis.
—*gallica.
—*germanica: Myricaria germanica.
—*hispida.
—*indica: *T. gallica indica.
—*japonica: *T. juniperina.
—*juniperina.
—*odessana.
—*parviflora.
—*pentandra.
—*plumosa: *T. juniperina.
—*tetrandra.

TANACETUM. T. vulgare.

TAXACUM. *T. officinale (Dande-

TAXODIUM. *T. distichum.

TAXUS. *T. baccata.
—*canadensis.
—*cuspidata.
—*hibernica: *T. baccata fastigiata.
—*koraiensis: probably *Cephalo-
taxus Harringtonia fastigiata.
—*major: *T. canadensis.
—*procumbens: *T. baccata proc-
cumbens.
—*repanda: *T. baccata repandens.
—*repandens: *T. baccata repandens.
—*tarda: *T. baccata adpressa.

TECOMA. T. australis: *Pandorea australis.
— capensis: *Tecomaria capensis.
—*capreolata: *Bignonia capreolata.
—*grandiflora: *Campsis chinesis: *Bignonia grandiflora.
—*jasminoides: *Pandorea jasminoides.
—*Mackenziei: *Pandorea Ricasoliana.
—*reydiana: *Campsis radicans: *Bignonia radicans.
—*Ricolasiana: *Pandorea Ricola-
siana.
—*Smithii.
—*stans.

TECOMARIA. *T. capensis (Tecoma).

TELANTHERA (Alternanthera). T. amoena rosea.
—*Bettriciani.
—*versicolor.

TELEKIA. T. cordifolia: Buphthal-
mum speciosum.

TEMPLETONIA. *T. retusa.

TERMINALIA. T. Catappa.

TETRAGONIA. T. expansa (New Zealand Spinach).

TETRAPANAX. *T. papyrifera.

TEUCRIUM. T. canadense.
—*Chamdrys.

THEALLA. T. debilis.

THALICTRUM. T. adiantifolium: T. minus adiantifolium.
— anemonoides: Anemonella thalic-
troides (page 3296, under Syn-
desmon).
—aquilegifolium.
—*Carnea: either T. aquilegifolium or T. polygamum.
—*dasyacarpum.
—*dioecium.
—*dipentacarpum.
—*glauces.
—*minus.
—*paniculatum.
—*polygamum.

THEA. T. Bohea: *T. sinensis Bohea
(Camellia).
—*sinensis.

THELESPERMA. T. hybridum (Cos-
midium).

THEOBROMA. T. Cacao.

THERMOPSIS. T. Caroliniana.

THESPESIA. T. populnea.

THEVETIA. T. nereifolia.

THRINAX. T. Morri.

—*parviflora.

THUJA. (Thuja. See Biota). T. el-
gantissima: *T. orientalis el-
gantissima: perhaps also T. oc-
centalis lutea.
—*Ellwangeriana: *T. occidentalis
Ellwangeriana.
—*eriocidae: *T. occidentalis eri-
cidae.
—*fitiformis: *T. orientalis pendula;
the stock is perhaps sometimes
*T. occidentalis fitiformis.
—*gigantea: *T. plicata.
—*globosa: *T. occidentalis globosa.
—*japonica: *T. Standishii.
—*lobata: *T. plicata.
—*occidentalis.
—*orientalis.
—*plicata.
—*pumila: *T. occidentalis pumila.
—*pyramidalis: applied both to *T.
occidentalis pyramidalis and to
*T. orientalis pyramidalis.
—*Reidii: *T. occidentalis Reidii.
—*sibirica: *T. occidentalis Wareana.
—*Standishii (Thujaopsis).
—*Verweeana: *T. occidentalis Ver-
weeana.
—*Wareana: *T. occidentalis Ware-
a.

THUJOPSIS. T. borealis: *Chamae-
cyparis nootkatensis.
—*dolobrata.
—*Standishii: *Thuja Standishii.

THUNBERGIA. *T. alata.
—*coccinea.
—*fragrans.
—*grandiflora.
—*Harrisoni: *T. laurifolia.
THYSACANTHUS. *t. ruticans: Odontonema Schomburgkianum.
TIARELLA. T. cordifolia.
TIBOUCHINA. T. semidecandra (Lasiandra macrantha).
TIGRIDIA. T. canariensis.
— conchiflora: T. Pavonia conchiflora.
— grandiflora: T. Pavonia grandiflora.
— immaculata: T. Pavonia alba immaculata or lutea immaculata.
— lilaee: T. Pavonia lilaee.
— Pavonia.
— rosea: T. Pavonia rosea.
TILLA. T. alba: a confused name applying to forms of T. tomentosa, T. petiolaris, and T. neglecta.
— *americana.
— argentea: *T. tomentosa.
— asplenifolia: *T. platyphylllos laciniata.
— *cordata.
— dasystyla: *T. eucharlora.
— eucharlora.
— eucharlora: *T. vulgaris; sometimes misapplied to T. platyphylllos and T. cordata.
— *heterophylla.
— macrophylla: *T. americana macrophylla.
— mieniseppieniensis: *T. americana macrophylla.
— *petiolaris.
— *platyphylllos.
— *tomentosa.
— *ulmifolia: *T. cordata.
— *Vulgaris.
TILLANDSIA. T. usnios (Spanish Moss).
TIPUANA. T. speciosa.
— Fournieri.
TORREYA (Tunion under American Code). *T. californica.
— *nucifera.
TOXYLON. See Maclura.
TRACHELUM. T. caruleum.
TRACHELOSPERMUM. T. jasminoides (Rhynchospermum).
TRACHYCARPSUS. *T. excelsa (Chamaerops).
— Fournieri (Chamaerops).
— *Martiniana.
TRACHYMENE. T. carules (Cidiscus).
TRADESCANTIA. T. multicolor: Zebrina pendula quadricolor.
— repensa: T. fluminensis.
— *virginica: T. virginiana.
— *variegata: unknown botanically.
— *zebrina: Zebrina pendula.
TRAGOPOGON. T. porrifolius (Salify).
TRAPA. T. natans.
TRICHLØENA. T. rosea.
TRICHO ANTHES. T. colubrina: T. Anguina.
TRICYRTIS. T. macropoda.
— hirta.
TRIFOLIUM. T. hybridum (Alsike Clover).
— incarnatum (Crimson Clover).
— medium (Mammoth Clover).
— minus: a form of T. repens (White Clover).
— pratense (Common Red Clover).
— suaveolens: T. resupinatum.
TRILLIUM. T. cernuum.
— erythrocarpum: T. undulatum.
— grandiflorum.
— niveale.
— ovatum.
— petiolatum.
— recurvatum.
— sessile.
— stylorum.
— undulatum.
TRISTANIA. T. conferta.
TRITICUM. T. aestivum (Wheat).
TRITOMA. T. corallina.
— *americana.
— *glabra.
— *rubra.
TRITONIA (Montbretia). T. auran-
— crocosmeflora.
— Pottsii.
— rosea.
TROLLIUS. T. asiaticus.
— caucasicus.
— chinensis.
— europaeus.
— japonicus.
— Ledebouri.
— pulillus.
TROPHELOM. T. atropurpureum: probably a color form of T. peltophorum, of T. majus, or of T. majus nanum.
— canariensis: T. peregrinum.
— Heinemannii: a color form of T. majus.
— hemisphericum: a color form of T. majus.
— Lobbianum: T. peltophorum.
— luteum: a color form of T. minus or of T. majus.
— majus.
— minus.
— nanum: T. majus nanum.
— pentaphyllum.
— peregrinum.
— Regelianum: a color form of T. majus or of T. majus nanum.
— speciosum.
— tricolor.
TSUGA. *T. canadensis.
— *caroliniana.
— *diversifolia.
— *heterophylla.
— Hookeriana: *T. Mertensiana.
— *Mertensiana; but sometimes misapplied to T. heterophylla.
— *Sieboldii.
TULIPA. T. Gesneriana.
— suaveolens.
TUMION. See Torreya.
TUSSILAGO. T. Farfara.
TYPHA. T. latifolia.
ULEX. *U. europaeus.
ULMARIA. U. Filipendula: Filipendula hexapetala.
— palmata: F. palmata.
— purpurea: F. purpurea.
— rubra: F. rubra.
— venusta: F. rubra venusta.
ULMUS. *U. alata.
— *americana.
— Camperdownii: *U. glabra Camp.
— Camperdownii.
— Campestris (English Elm); often misapplied to U. foliaceae.
— Clemmeri: *U. hollandica Klem.
— *f oliacea.
— *fulva.
— *glabra (Scotch Elm).
— *hollandica.
— horizontalis: *U. glabra pendula.
— Huntingdonii: *U. hollandica vegeta (Huntingdon Elm).
— latifolia: *U. hollandica belgica.
— montana: *U. glabra.
— plumosa: *U. glabra fastiglata.
— *pumila.
— *purpurea: *U. campestris purpurea.
— *racemosa.
— *scabra: *U. glabra.
— *suberosa: either U. campestris or U. foliacea suberosa.
— *ubraculifera: *U. foliacea umb.
— vegeta: *U. hollandica vegeta.
— Wentworthii: *U. campestris Wentworthii.
UMBELLULARIA. *U. californica.
UNIOLA. U. latifolia.
URGINEA. U. Scilla (Scilla maritima).
URSINA. U. pulchra (Sphenogyne).
UVULARIA. U. grandiflora.
— perfoliata.
— sessiliflora: Oakesia sessiliflora.
VACCINIUM. *V. corymbosum.
— *erythrocarpum.
— *macrocarpon.
— *palidum.
— *pennsylvanicum.
— *stamineum.
— *vaccinans.
— *Vitis-idea.
VERBENA.  

VERBASCUm.  

VALLISNERIA.  

VALLONIA.  

VERNONIA.  

VERSCHAFFELTIA.  

*carnea;  

*imperialis.  

*rupestri;  

*maritima:  

*incana.  

*repens.  

*speciosa.  

*Traversii.  

*rerbenacea:  

*americanum  

*dentatum.  

*cassinoides,  

*japonicum.  

*ellipticum.  

venosa.  

*phceniceum.  

*olympicum.  

*rubra:  

*officinalis.  

*dfcussata:  

*pectinata.  

*subsessis:  

*spuria.  

*viride.  

Venosa.  

There are other Latin names in  

Verbes, designating garden  

forms.  

VERNONIA.  

V. arkansana:  

V. crinata.  

— neovascularis.  

VERONICA.  

*V. Allioni.  

—alpina.  

—amethystina:  

*V. spuria.  

—Andersonii.  

—carnea; but may apply to a form  

V. spuria.  

— decussata:  

*V. elliptica.  

—glandulosa.  

—imperialis.  

—incana.  

—longifolia.  

—maritima:  

*V. longifolia.  

—punctata.  

—repens.  

—rosae: V. longifolia rosea, V.  

spicata rosea or V. punctata  

rosea.  

—rapistris; a form of V. Teucrion.  

—speciosa.  

—subsessilis.  

—spuria.  

—subsessilis:  

*V. longifolia sub-  

sessilis.  

—Teucrion.  

—Traversii.  

—veronicae: unknown botanically.  

—virginica.  

VERSCHAFFELTIA.  

V. splendida.  

VIBURNUM.  

*V. acerifolium.  

—*alnifolium.  

—*americanum (American High-  

bush Cranberry).  

—*Carlesi.  

—*cassinoides.  

—*dentatum.  

—*distatum.  

—*ellipticum.  

—*japonicum.
WASHINGTONIA, continued.
— gracilis.
— robusta: W. filifera robusta (Brahea).
— Sonora.

WATSONIA. W. Ardernei: 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 florida, or perhaps sometimes D. coraensis.
*arborea: D. coraensis arbores.
*candida: D. hybrida candida.
*Desboisi: D. hybrida Desboisi.
*floribunda: D. floribunda.
*frutescens: D. floribunda.
*frutescens major: *W. frutescens major.
*multijuga: D. floribunda macrobotrys.
*sinensis; but often it is W. floribunda.
*speciosa: *W. frutescens speciosa.
*venusta.

WOODSIA. W. ilvensis.
— obtusa.

WOODWARDIA. W. angustifolia: W. areolata. virginica.

XANTHISMA. X. texanum (Centaureidum).

XANTHOCERAS. *X. sorbifolia.

XANTHORRHIZA. X. apifolia: *Zanthorrhiza apifolia.

XANTHOSOMA. X. Lindenii (Phylotomenium).

XANTHOXYLUM. See Zanthoxylum.

XERANTHEMUM. X. annuum.

XOLISMA. X. liguerina: *Lyonia ligustrina.

YUCCA. *Y. aloifolia.
— angustifolia: *Y. glauca.
— baccata.
— filamentosae.
— flaccida.
— glauca.
— gloriosa.
— Treculeana.
— Whipplei: *Hesperoyucca Whipplei.

ZALUZIANSKYA. Z. capensis (Nycteria).

ZANTEDESCHIA (Richardia. Florists' Calla), Z. aethiopica.
— albo-maculata.
— Elliottiana.

ZANTHORHIZA. *Z. apifolia (Xanthorrhiza).

ZANTHOXYLUM. *Z. americanum.
— pipertum.

ZEA. Z. japonica: Z. Mays japonica.
— Mays (Maize. Indian Corn).

ZEBRINA. Z. pendula (Tradescantia).

ZELKova. Z. acuminata: *Z. serrata.

ZENOBI. *Z. pulverulenta (Andromeda).

ZEPHYRANTHES. Z. alba.
— Atamasco (Amaryllia).
— candida.
— rosea.

ZINGIBER: Z. officinale (Ginger).

ZINNIA. Z. elegans.
— Haageana.

ZIZANIA. Z. aquatica: Z. palustris.

ZIZYPHUS. *Z. piperitum.

ZEPHYRANTHES. Z. alba.

ZYGOCACTUS. Z. truncatus (Epiphyllum).
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