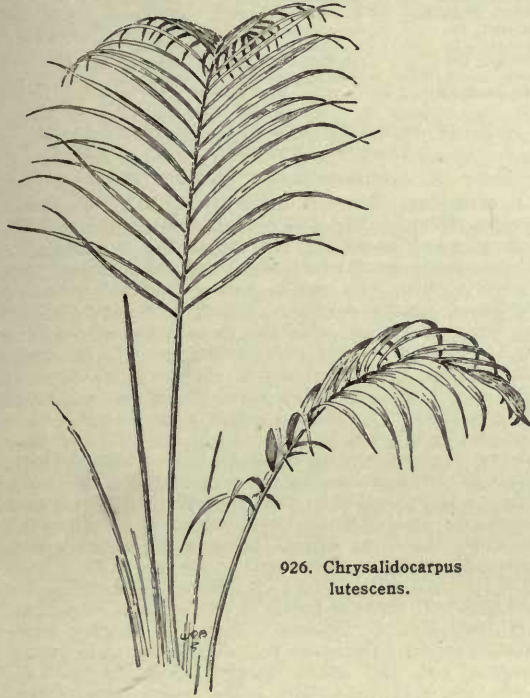


ovary 3-celled, 3-ovuled.—Nine, species chiefly of Old World deserts. *C. tinctoria*, Juss. (*Crôton tinctorius*, Linn.), TURNSOLE, a Medit. annual, formerly used for its blue dye, is listed in some European catalogues.

CHRYSALIDOCÁRPUS (Greek for *golden fruit*). *Palmáceæ*, tribe *Arécææ*. Spineless stoloniferous fan palms, with medium fasciculate ringed stems.

Leaves pinnatisect, long-acuminate; segms. about 100, bifid at the apex, the lateral nerves remote from the midrib; fr. usually violet or almost black.—Species 1, which is a popular florist's plant. Madagascar. Treated



926. *Chrysalidocarpus lutescens*.

as a part of *Hyophorbe* by Engler and Prantl, but here kept distinct, as it is commonly known as *Chrysalidocarpus* by cultivators.

lutescens, Wendl. (*Hyophorbe indica*, Gaertn. *H. Commersoniana*, Mart. *Aréca lutescens*, Bory). Fig. 926. St. 30 ft. high, 4-6 in. diam., cylindrical, smooth, thickened at the base; lvs. very long; segms. almost opposite, lanceolate, 2 ft. long, 2½ in. wide, acute, with 3 prominent primary nerves, which are convex below and acutely 2-faced above. Bourbon. A.G. 13: 141. A.F. 4:566.—In growing *Chrysalidocarpus* (or *Aréca*) *lutescens* in quantity, it will be found a good plan to sow the seeds either on a bench, in boxes or seed-pans, so prepared that the seedlings will remain in the soil in which they germinate until they have made 2 or more lvs. The first lf. made above the soil is small, and if plants are potted off at this stage they must be very carefully watered in order not to sour the soil. In the preparation of the receptacles for the seed, a little gravel in the bottom will be found good, as the roots work very freely through it, and when the time comes to separate the plants previous to potting, it is an easy matter to disentangle the roots without bruising them. Probably the plan which works best is to wash the soil and gravel entirely from among the roots. Pot in soil not too dry, and for the next few days keep the house extra warm and humid, and the plants shaded from the sun without any moisture applied to the soil.

JARED G. SMITH and G. W. OLIVER.

CHRYSANTHEMUM (Greek, *golden flower*). Including *Pyrethrum*. *Compositæ*. Plate XXX. A diverse group of herbaceous and sub-shrubby plants, mostly hardy, and typically with white or yellow single flowers, but the more important kinds greatly modified in form and color, grown in the open or flowered under glass in fall.

Annual or perennial herbs, sometimes partly woody, glabrous or loosely pubescent or rarely viscid, usually heavy-scented: lvs. alternate, various, from nearly or quite entire to much dissected: heads many-fl., terminating long peduncles or disposed in corymbose clusters, radiate (rays sometimes wanting); disk-fls. perfect and mostly fertile; ray-fls. pistillate, mostly fertile, the ray white, yellow, rose-colored, toothed or entire; receptacle naked, flat or convex; involucre-scales imbricated and appressed, mostly in several series, the margins usually scarious: achene of disk- and ray-fls. similar, striate or angled or terete or more or less ribbed, those of the ray-fls. often 3-angled; pappus 0, or a scale-like cup or raised border.—Probably nearly 150 recognizable species, in temperate and boreal regions in many parts of the globe, but mostly in the Old World.

The genus *Chrysanthemum*, as now accepted by botanists, includes many diverse species so far as general appearance is concerned, but nevertheless well agreeing within themselves in systematic marks and by these same marks being separated from related groups. The marks are in large part set forth in the preceding paragraph. Bentham and Hooker make twenty-two sub-groups (of which about six include the garden forms), based chiefly on the way in which the seeds are ribbed, cornered, or winged, and the form of the pappus. The garden pyrethrums cannot be kept distinct from chrysanthemums by garden characters. The garden conception of *Pyrethrum* is a group of hardy herbaceous plants with mostly single flowers, as opposed to the florists' or autumn chrysanthemums, which reach perfection only under glass, and the familiar annual kinds which are commonly called summer chrysanthemums. When the gardener speaks of pyrethrums, he usually means *P. roseum*. Many of the species described below have been called pyrethrums at various times, but they all have the same specific name under the genus *Chrysanthemum*, except the most important of all garden pyrethrums, viz., *P. roseum*, which is *C. coccineum*. The feverfew and golden feather are still sold as pyrethrums, and there are other garden species of less importance. The botanical conception of *Pyrethrum* is variously defined; the presence of a rather marked pappus-border on the achene is one of the distinctions; the pyrethrums are mostly plants with large and broad heads either solitary or in loose corymbose clusters, the rays usually conspicuous and commonly not yellow, and the fruits five- to ten-ribbed. Hoffmann, in Engler & Prantl "Natürlichen Pflanzenfamilien," adopts eight sections, one of them being *Tanacetum* (*tansy*) which most botanists prefer to keep distinct.

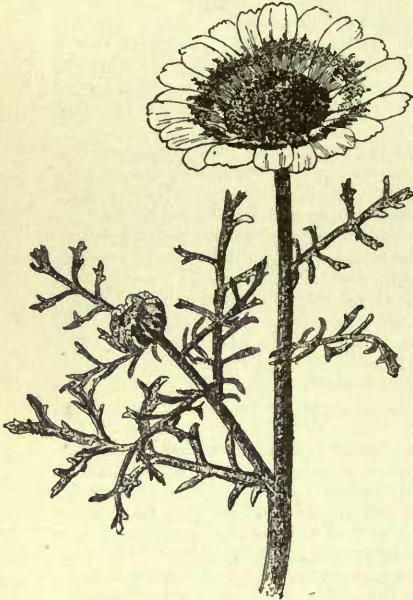
Although the genus is large and widespread, the number of plants of interest to the cultivator is relatively few. Of course the common garden chrysanthemum, derived apparently from two species, is the most useful. The insect powder known as "pyrethrum," is produced from the dried flowers of *C. cinerariæfolium* and *C. coccineum*. The former species grows wild in Dalmatia, a long narrow mountainous tract of the Austrian empire. "Dalmatian insect powder" is one of the commonest insecticides, especially for household pests. *C. cinerariæfolium* is largely cultivated in France. *C. coccineum* is cultivated in California, and the product is known as *buhach*.

There are over one hundred books about the garden chrysanthemum, and its magazine literature is probably exceeded in bulk only by that of the rose. It is the flower of the East, as the rose is the flower of the West.

Aside from oriental literature, there were eighty-three books mentioned by C. Harman Payne, in the Catalogue of the National Chrysanthemum Society for 1896. Most of these are cheap cultural guides, circulated by the dealers. The botany of the two common species has been monographed by W. B. Hemsley in the *Gardeners' Chronicle*, series III, vol. 6, pp. 521, 555, 585, 652, and in the *Journal of the Royal Horticultural Society*, vol. 12, part I. The great repositories of information regarding the history of the chrysanthemum, from the garden point of view, are the scattered writings of C. Harman Payne, his "Short History of the Chrysanthemum," London, 1885, and the older books of F. W. Burbidge and John Salter. For information about varieties, see the Catalogues of the National Chrysanthemum Society (England) and the *Liste Descriptive*, and supplements thereto, by O. Meulenaere, Ghent, Belgium.

There are a number of rather expensive art works, among which one of the most delightful is the "Golden Flower: Chrysanthemum," edited by F. Schuyler Matthews, Prang, Boston, 1890. "Chrysanthemum Culture for America," by James Morton, Clarksville, Tenn., published in New York in 1891, was the first authentic American work. Within the past few years have appeared "The Chrysanthemum," by Arthur Herrington, "Smith's Chrysanthemum Manual," by Elmer D. Smith, and recently "Chrysanthemums and How to Grow Them," by I. L. Powell.

927. *Chrysanthemum carinatum*, the form sold as *C. Burridgeanum*. ($\times \frac{1}{2}$)



Aside from the florist's chrysanthemum (*C. hortorum*), no particular skill is required in the growing of these plants, although great perfection is attained by some gardeners in the handling of individual plants of the marguerites (*C. frutescens*). The hardy border perennial chrysanthemums may be either small-flowered rugged forms of *C. hortorum*, as the "hardy pompons" and also the "artemisias" of old gardens, or they may be other species. Some of these other species are the "pyrethrums" of gardens, and some (as the *C. maximum* and *C. uliginosum* class) are the "moon daisies" and "moonpenny daisies" of the hardy perennial plantation. Some of the very dwarf tufted kinds (as *C. Tchihatchewii*) make excellent edging plants. The moon daisies deserve to be better known for mass planting and bold lines when a great display of heavy white bloom is wanted. Most of them bloom the first season from early-sown seed. The Shasta daisy and its derivatives are of the moon daisy group. They all profit by a covering of coarse mulch in the fall. See *Pyrethrum* and *Marguerite*.

The annual chrysanthemums are easily grown flower-garden subjects, suitable for a bold late display in places where delicate and soft effects are not desired.

C. carinatum, *C. coronarium* and *C. segetum* are the common sources of these annuals. They are hardy and rugged; and they need much room.

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A. Plant annual (at least so treated in cult.): the "summer chrysanthemums."

B. Rays typically white.

1. *carinatum*, Schousb. (*C. tricolor*, Andr. *C. matricaroides*, Hort.). Fig. 927. Glabrous annual, 2-3 ft. high: st. much branched: lvs. rather fleshy, pinnatifid: fls. in solitary heads which are nearly 2 in. across, with typically white rays and a yellow ring at the base; involucre bracts carinate (keeled). Summer. The two colors, together with the dark purple disk, gave rise to the name "tricolor." The typical form, intro. into England from Morocco in 1798, was pictured in B.M. 508 (1799). By 1856 signs of doubling appeared (F.S. 11:1099). In 1858 shades of red in the rays appeared in a strain intro. by F. K. Burridge, of Colchester, England, and known as *C. Burridgeanum*, Hort. (see B.M. 5095, which shows a ring of red on the rays, adding a fourth color to this remarkably brilliant and varied fl., and F.S. 13:1313, which also shows *C. venustum*, Hort., in which the rays are entirely red, except the original yellow circle at the base). G. 2:307. Gn.W. 24:675. *C. annulatum*, Hort., is a name for the kinds with circular bands of red, maroon, or purple. R.H. 1869:450. *C. Dunnetti*, Hort., is another seed-grower's strain. There are full double forms in yellow margined red, and white margined red, the fls. 3 in. across (see R.H. 1874:410), under many names. See, also, Gn. 26, p. 440; 10, p. 213; 21:22. R.H. 1874, p. 412. S.H. 2:477. G.W. 14, p. 99.—The commonest and gaudiest of annual chrysanthemums, distinguished by the keeled or ridged scales of involucre and the dark purple disk.

BB. Rays typically light yellow.

2. *coronarium*, Linn. (*Anthemis coronaria*, Hort.), Annual, 3-4 ft.: lvs. bipinnately parted, somewhat clasping or eared at the base, glabrous, the segms. closer together than in *C. carinatum*: involucre scales broad, scarious; rays lemon-colored or nearly white. July-Sept. Medit. Gn. 26:440. G.C. II. 19:541.—The full double forms, with rays reflexed and imbricated, are more popular than the single forms. This and *C. carinatum* are the common "summer chrysanthemums." This is common in old gardens, and is also somewhat used for bedding and for pot culture.

BBB. Rays typically golden yellow.

3. *segetum*, Linn. CORN MARI GOLD. Annual, 1-1½ ft.: lvs. sparse, clasping, oblong to oblanceolate, variable, the lower petioled and the upper clasping, incisions coarse or fine, deep or shallow, but usually only coarsely serrate, with few and distant teeth, the lower ones less cut: bracts of involucre broad, obtuse; rays obovate and emarginate, golden yellow. June-Aug. Eu., N. Afr., W. Asia. Escaped in waste places. Gn. 18, p. 195. R.H. 1895, pp. 448, 449. Var. *grandiflorum*, Hort., is a larger-fl. form of this weed, which is com-

mon in the English grain fields. Forms of the plant are cult.; the var. *Cloth of Gold*, J.H. III. 12:445, is one of the best. Var. *pumilum*, Hort., very compact, 8 in. high. This species is much less popular than *P. carinatum* and *P. coronarium*. It is forced to a slight extent for winter bloom.

4. *multicaule*, Desf. Glabrous and glaucous annual, 6–12 in. high: sts. numerous, simple or branched, stout, terete: lvs. fleshy, variable, usually linear-spatulate, 1–3 in. long and $\frac{1}{2}$ – $\frac{3}{4}$ in. broad, very coarsely toothed or lobed, sometimes shorter, with few narrow-linear, acute, entire segms. about 1 line broad: rays much shorter and rounder than in *C. segetum*, golden yellow. Algeria. B.M. 6930.—Rarer in cult. than the last. Said to be useless as a cut-fl.

AA. *Plant perennial.*

B. *The florist's chrysanthemum, and wild progenitors or near relatives, grown as pot or bench subjects because the seasons are not long enough, in the N., for full maturity in the open: rays of many forms and colors in cult.; heads often double: lvs. usually lobed or strongly notched.*

5. *morifolium*, Ram. (*C. sinense*, Sabine). Fig. 928. Perennial, one of the sources (with *C. indicum*) of the large florist's chrysanthemums: wild plant shrubby, erect and rigid, 2–3 ft., branching, few-lvd.: lvs. thick and stiff, 2 in. long, densely white-tomentose beneath, variable in shape from ovate to lanceolate, cuneate at base, margin entire or coarsely toothed: outer bracts of involucre thick, linear, acute, white-tomentose; fl-heads small, with yellow disk and white rays somewhat exceeding the disk. China. G.C. III. 31:302 (adapted in Fig. 928). Var. *gracile*, Hemsl. Lvs. thin or only moderately thick, palmately lobed or pinnately lobed, dentate, the teeth often mucronate: outer involucral bracts herbaceous, linear and acute, varying in pubescence; rays white, pink or lilac, equaling or exceeding the disk. China, Mongolia, Japan.

6. *indicum*, Linn. Fig. 929. Much like the last, but lvs. thin and flaccid, pinnately parted, with acute or



929. Wild form of *Chrysanthemum indicum*, as grown in England.

mucronate teeth: outer involucral bracts broad and scarious except the herbaceous midnerve; rays yellow, shorter than diam. of the disk. China and Japan. B.M. 7874. G.C. III. 8:565; 28:342; 31:303 (adapted in Fig. 929).—This species is not native to India, and therefore Linnæus' name is inappropriate. Abroad, *C. indicum* is often used in a wide sense, to include *C. morifolium*. In recent years, both *C. morifolium* and *C. indicum* have been grown in England from wild stock, and from such studies of them the present descriptions and figures are drawn. From these plants it is supposed, by endless variation and by hybridization, the highly developed glasshouse or florist's chrysanthemums have come, a group that may be distinguished as *C. hortorum*, Figs. 938–50.

7. *ornatum*, Hemsl. (*C. marginatum*, Hort.). Allied to the above two species, and perhaps a form of *C. morifolium*: bushy plant, 3–4 ft.: lvs. palmately lobed, ovate in outline, white-tomentose beneath and on the margin, $1\frac{1}{2}$ –2 in. long: fl-heads loosely corymbose, 2 in. or less across, the disk yellow and rays white and broad; bracts of involucre in about 3 series, all similar, white in center, purple-brown on margin: achenes small, oblique, glabrous. B.M. 7965. G.C. III. 35:51. Gn. 71, p. 53; 73, p. 90.—A recent introduction; grows well in the open in England, but does not bloom unless taken indoors.

BB. *The garden pyrethrums and others; heads usually not highly doubled and modified.*

c. *Lvs. cut to the midrib or nearly so.*

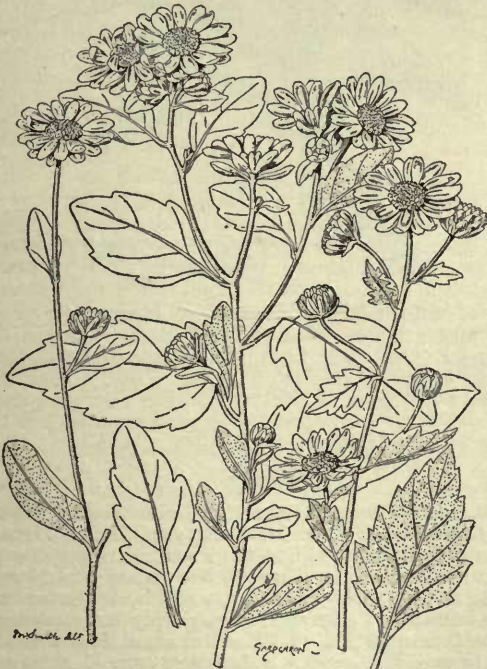
D. *Heads borne in corymbs, i.e., flat-topped, dense clusters.*

E. *Rays yellow.*

8. *achilleæfolium*, DC. (*Achillea aurea*, Lam.). Perennial, 2 ft.: st. usually unbranched, except along the creeping and rooting base: sts. and lvs. covered with fine soft grayish white hairs, oblong in outline, about 1 in. long, $\frac{1}{4}$ in. wide, finely cut: rays 7–8, short, a little longer than the involucre. Siberia, Caucasus.—Rare in cult. Less popular than the achilleas, with larger fl.-clusters.

EE. *Rays white.*

9. *corymbosum*, Linn. (*Pyrethrum corymbosum*, Willd.). Robust perennial, 1–4 ft.: st. branched at the apex: lvs. sometimes 6 in. long, 3 in. wide, widest at middle and tapering both ways, cut to the very midrib, the segms. alternating along the midrib. Eu., N. Afr., Caucasus. G.C. II. 20:201.—Rare in cult. Segms. may be coarsely or finely cut, and lvs. glabrous or villos beneath.



928. Wild form of *Chrysanthemum morifolium*, as grown in England.

10. *Parthênium*, Pers. (*Pyrethrum Parthênium*, Smith. *Parthênium Matricària*, Gueld.). FEVERFEW. Fig. 930. Glabrous strong-scented perennial, 1-3 ft., much branched in the taller forms: lvs. ovate or oblong-ovate in outline, pinnatisect or bi-pinnatisect, smooth or lightly pubescent; segms. oblong or elliptic-oblong, pinnatifid or cut, the uppermost more or less confluent.: fl.-heads small, many, stalked, corymbose; disk yellow; rays white, oblong, equaling or exceeding the disk. Eu. to the Caucasus.—Some authors regard this as one widely variable species; others make at least two species, one of them (*C. præaltum*, Vent.) being the Caucasian form, distinguished by more deeply cut lvs., longer-peduncled heads, and rays longer than the disk rather than equaling it (as in *C. Parthenium* type).—There are double-fl. and also discoid forms. Var. *aureum*, Hort. (*P. aureum*, Hort.), is the GOLDEN

ing dry, waste places; height 2-9 in.: sts. very numerous, rooting at the base: foliage handsome dark green, finely cut, the segms. linear, persisting into winter: fl.-heads solitary on axillary peduncles, borne profusely for several weeks; rays white, disk yellow. Asia Minor. R.H. 1869, p. 380, desc., and 1897, p. 470. Gn. 26, p. 443.—Prop. by division of roots or simply by cutting the rooted sts., but chiefly by seeds. Highly recommended abroad for spring and early summer bloom in edgings and low formal plantings. Said to thrive in dry places and under trees.

EE. Height more than 1 ft.

F. Group of greenhouse plants (at the N.), shrubby at the base: sts branched at the top: rays white or lemon.

G. Foliage not glaucous.

12. *frutescens*, Linn. MARGUERITE. PARIS DAISY. Figs. 931, 932. Usually glabrous, 3 ft. high, perennial: lvs. fleshy, green: heads numerous, always single; rays typically white, with a lemon-colored (never pure yellow or golden) form. Canaries. G.C. II. 13:561; III. 35:216. Gn. 12, p. 255; 17, p. 5; 26, p. 445; 70, p. 310.—Intro. into England. 1699. This is the popular florists' Marguerite, which can



930. *Chrysanthemum Parthenium*. Feverfew. ($\times \frac{1}{2}$)



931. *Chrysanthemum frutescens*. The Marguerite or Paris daisy. ($\times \frac{1}{2}$)

FEATHER commonly used for carpet-bedding. It has yellow foliage, which becomes green later in the season, especially if fls. are allowed to form. It is used for edgings and cover. Var. *aureum crispum*, Hort., is dwarf, compact, with foliage curled like parsley. Var. *selaginoides*, and var. *laciniatum*, Hort., are distinct horticultural forms. Var. *glabrum*, Hort., has dusty white foliage, and does not bloom until the second year. Intro. by Damman & Co., 1895. All these varieties are prop. by seeds. The feverfew is common about old yards, and is much employed in home gardens as edging. In its undeveloped and prevailing forms, it is one of the "old-fashioned" plants.

DD. Heads borne singly on the branches or sts. (or at least not definitely clustered).

E. Height less than 1 ft.

11. *Tchihatchewii*, Hort. (*C. Tchihatcheffii*, Hort.). TURFING DAISY. Densely tufted perennial for carpet-

be had in flower the year round, but is especially grown for winter bloom. Var. *grandiflorum*, Hort., is the large-fl. prevailing form. The lemon-colored form seems to have originated about 1880. Under this name an entirely distinct species has also been passing, yet it has never been advertised separately in the American trade. See No. 13.

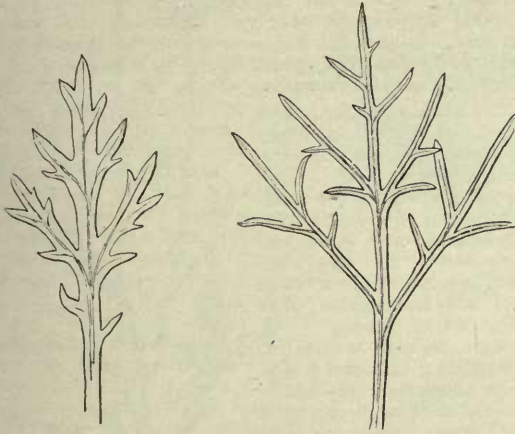
GG. Foliage glaucous.

13. *anethifolium*, Brouss. (*C. fœniculaceum*, Steud. *P. fœniculaceum* var. *bipinnatifidum*, DC.). GLAUCOUS MARGUERITE. Fig. 932. Perennial: rarer in cult. than *C. frutescens* (which see), but distinguished by its glaucous hue, and by the way in which the lvs. are cut. The segms. are narrower, more deeply cut, and more distant than in No. 12. The lvs. are shorter petioled. Canaries.—This species is doubtless cult. in American greenhouses as *C. frutescens*. A lemon-fl. form is shown in R.H. 1845:61 but called *C. frutescens*.

FF. Group of hardy outdoor herbs: sts. usually unbranched: rays white or red, never yellow.

G. Foliage not glaucous: fls. sometimes double.

14. *coccineum*, Willd. (*Pyrethrum roseum*, Bieb., not Web. & Mohr. *P. hybridum*, Hort.). Fig. 933. Glabrous perennial, 1-2 ft. high: st. usually unbranched,



932. Leaves of *Chrysanthemum frutescens* (left) and *C. anethifolium* (right). (×1)

rarely branched at the top: lvs. thin, dark green, or in dried specimens dark brown: involucre scales with a brown margin; rays white or red in such shades as pink, carmine, rose, lilac, and crimson, and sometimes tipped yellow, but never wholly yellow. Caucasus, Persia. F.S. 9:917. Gn. 26, pp. 440, 443. Gng. 2:7; 5:309. R.H. 1897, p. 521. Not B.M. 1080, which is *C. coronopifolium*. The first picture of a full double form is R. H. 1864:71.—This species is the most important and variable of all the hardy herbaceous kinds. There have been perhaps 700 named horticultural varieties. There is an anemone-fl. form with a high disk. The species is also cult. in Calif. and France for insect powder. *C. atrosanguineum*, Hort., is said to be a good horticultural variety with dark crimson fls. The *C. roseum* of Weber & Mohr being a tenable name, Hoffmann proposes Ascherson's name, *C. Marschallii*, for the *P. roseum* of Bieberstein; but Willdenow's *C. coccineum* is here retained.

GG. Foliage glaucous: fls. never double.

15. *cinerariæfolium*, Vis. Glaucous perennial, slender, 12-15 in. high: sts. unbranched, with a few short, scattered hairs below the fl.: lvs. long-petioled, silky beneath, with distant segms.: involucre scales scariosus and whitish at the apex. Dalmatia. B.M. 6781.—Said to be chief source of Dalmatian insect powder. Rarely cult. as border plant. Common in botanic gardens.

CC. Lvs. not cut to the midrib, pinnatifid or coarsely toothed (except perhaps in No. 22).

D. Heads borne in clusters, mostly flat-topped

16. *Balsámíta*, Linn. (*Tanacetum Balsámíta*, Linn. *Pyrethrum Balsámíta*, Willd. *Balsámíta vulgáris*, Willd.). COSTMARY. MINT GERANIUM. Sometimes erroneously called "lavender," from its sweet agreeable odor. Tall and stout perennial: lvs. sweet-scented, oval or oblong, obtuse, margined with blunt or sharp teeth, lower ones petioled, upper ones almost sessile, the largest lvs. 5-11 in. long, 1½-2 in. wide: pappus a short crown. W. Asia.—Typically with short white rays, but when they are absent the plant is var. *tanacetoides*, Boiss. Fig. 934. Rayless. This has escaped in a few places from old gardens: it seems to be the prevailing garden form.

DD. Heads borne singly on the branches or sts., or at least not in definite clusters; rays large, white.

17. *lacústre*, Brot. (*C. latifólium*, DC.). Fig. 935. Perennial; endlessly confused with *C. maximum* in gardens, and the two species are very variable and difficult to distinguish; the fls. can hardly be told apart. *C. lacustre* is a taller and more vigorous plant, and sometimes it is branched at the top, bearing 3 heads, while *C. maximum* is always 1-headed, and the lvs. in that species are much narrower. Height 3-6 ft.: st. sparsely branched: lvs. partly clasping, ovate-lanceolate, with coarse, hard teeth: rays about 1 in. long; pappus of the ray 2-3-eared. Portugal, along rivers, swamps and lakes. R.H. 1857, p. 456.

18. *máximum*, Ramond. Fig. 936. This perennial species has narrower lvs. than *C. lacustre*, and they are narrowed at the base: height 1 ft.: st. more angled than the above, simple or branched at the very base, always 1-headed and leafless for 3-4 in. below the head: lower lvs. petioled, wedge-shaped at the base, or long-oblancheolate; the upper lvs. becoming few, lanceolate but usually not very prominently pointed, the teeth not very large or striking: pappus none: involucre scales narrower and longer, whitish-transparent at the margin, while those of *C. lacustre* are broader, more rounded at the apex, and with a light brown scariosus margin. Pyrenees. J.H. III. 5:251. Gn. 26, p. 437; 73, p. 567. G. 5:445. G.M. 46:676. Var. *Róbinsonii*, Hort., has finely cut or fringed rays, giving the bloom the appearance of a Japanese chrysanthemum.

R. H. 1904:515. Var. *Dávidsii*, Hort., has sts. of great length, suitable for cutting. Var. *filifórmis*, Hort., has deeply serrate long and drooping rays. There are many other forms, differing in time of bloom as well as in habit and in form of fl. The *Shasta daisy* (said to be a



933. *Chrysanthemum coccineum*. The *Pyrethrum roseum* of gardens. (×½)

934. *Chrysanthemum Balsámíta* var. *tanacetoides*. Costmary or mint geranium. (×½)

hybrid) is an early-flowering very floriferous race, with several strains of fls., mostly large and pure white, although in one form the buds are reported as lemon-yellow but opening white; various sub-varieties are now offered. It is a good summer and autumn bloomer, and usually hardy in the northeastern states.



935. *Chrysanthemum lacustre*. A short-rayed form. ($\times \frac{1}{2}$)

19. *uliginosum*, Pers. (*Pyrethrum uliginosum*, Waldst.). GIANT DAISY. Stout, erect bushy leafy-stemmed perennial, 4-7 ft. high, with light green foliage: st. nearly glabrous, striate, branching above, roughish: lvs. long-lanceolate, prominently pointed, with large coarse sharp teeth: heads often several

together and not long-stalked, 2-3 in. across, white, late. Hungary. B.M. 2706. A.F. 4:523; 8:813. Gng. 2:375; 5:183. A.G. 19:403. R.H. 1894, p. 82. Gt. 46, p. 103. G.C.II. 10:493. Gn. 26, p. 442; 38, p. 523; 62, p. 180. G.W.15, p. 316. G.M. 51:453. Gn. W. 23:415. —It blooms the first year from seed or division, and has been forced for Easter somewhat as *Hydrangea paniculata* can be

treated. Excellent for cut-fls. The blossoms should be cut soon after opening, as the disks darken with age. The plant needs a rich moist soil; it deserves a greater popularity.

20. *Leucanthemum*, Linn. (*Leucanthemum vulgare*, Lam.). WHITEWEED. OX-EYE DAISY. Fig. 937. Glabrous perennial erect weed, 1-2 ft. high: root-lvs. long-petioled, with a large, oval blade and coarse, rounded notches; st.-lvs. lanceolate, becoming narrower toward the top, serrate, with few distant and sharper teeth. (Var. *pinnatifidum*, Lec. & Lam., has more divided lvs.): heads terminal, showy white. June, July. Eu., N. Asia: Gn. 70, p. 176. —One of the commonest weeds in the eastern states, being characteristic of worn-out meadows. The daisies are not cult., but they are often gathered for decoration, and make excellent cut-fls. The plant is very variable, and forms adapted to fl.-garden uses will probably be developed. Rayless plants are sometimes found.

21. *nipponicum*, Hort. (*Leucanthemum nipponicum*, Franch.). Differs from others of this set in being shrubby at base and lvs. broadest above the middle: to 2 ft., the sts. strong, simple, few-fld.: lvs. thick, oblong-spatulate to oblanceolate, sessile, irregularly denticulate but entire at base, 3-4 in. long, pale beneath: fl.-heads 2-3½ in. across, with a hemispherical involucre of oval

obtuse bracts; rays bright white, linear, minutely 5-toothed; disk pale greenish yellow. Japan. B.M. 7660. R.H. 1905, p. 47. F. E. 20:434. —Hardy in the N., in the root, but the sts. killed down by frost; has the general appearance of *C. lacustre*. A beautiful large-fl. species, producing its large blooms in late autumn.

22. *arcticum*, Linn. Low perennial, 3-15 in., glabrous or nearly so: lvs. cuneate, long-tapering at base, toothed or cut at the apex, sometimes 3-5-lobed, the uppermost ones small and very narrow and nearly entire: involucre-bracts broad and brown-margined; rays clear white, about 1 in. long: pappus wanting. Arctic Eu., Asia and Amer. —An attractive very hardy species, making a clump of dark green foliage and producing in autumn many large white fls., sometimes tinged lilac or rose.

C. coronopifolium, Willd. = *C. roseum*. — *C. grande*, Hook. f. (*Plagius grandiflorus*, L'Her.). Stout erect perennial of Algeria, 2-3 ft.: lvs. oblong to linear-oblong, often lyrate, coarsely toothed: fl.-heads large, solitary, rayless, golden yellow, to 2 in. across. B.M. 7886. — *C. grandiflorum*, Willd. Shrubby, smooth, from the Canaries, with cuneate lobed lvs., the parts lanceolate or linear and toothed or entire: fl.-heads solitary, the rays white and disk yellow: allied to *C. frutescens*; variable. — *C. inodorum*, Linn. = *Matricaria inodora*. — *C. macrophyllum*, Waldst. & Kit. Perennial herb, 3 ft.: lvs. very large, nearly sessile, pinnatisect, the lobes lanceolate and coarsely toothed; heads very many, corymbed; rays white with yellowish tinge, the disk yellow. June, July; an outdoor plant. Hungary. G.W. 12, p. 410. — *C. Mœvii*, Hook. f. Herbaceous, with woody rootstock, 1½ ft.: lvs. about 1 in. long, triangular to oblong, pinnatifid: fl.-heads 1½ in. diam., long-stalked; rays 3-toothed, white with reddish backs. Mts. Morocco: summer in the open. B.M. 5997. — *C. multiflorum*, Hort. Fls. greenish white: said to be a cross between a single-fl. chrysanthemum and *C. Pallasianum* (*Pyrethrum Pallasianum*, Maxim., of N. Asia, apparently not a garden species). — *C. ochroleucum*, Masf. Glabrous undershrub of the Canaries: lvs. obovate-cuneate, coarsely toothed: rays pale yellow. — *C. parthenifolium*, Willd., a form of *C. Parthenium*. — *C. parthenioides*, Voss. One of the feverfew forms: probably *C. præaltum*. — *C. roseum*, Web. & Mohr. (*C. coronopifolium*, Willd., not Vill.), not Bieb. Perennial herb, 2½ ft.: lvs. once-pinnate: fl.-heads solitary; rays rose-red or flesh-color. Caucasus. — *C. tomentosum*, Loisel. An alpine Corsican species: tufted, 2 in. high when in bloom: lvs. pinnatifid, densely tomentose: fl.-heads ¾ in. across, white-rayed, on sts. 1 in. long. — *C. viscidum*, Desf. Annual: disk orange-yellow, rays sulfur-yellow. Medit. — *C. vulgare*, Bernh. = *Tanacetum vulgare*. — *C. Zawadskii*, Heribich, of Galicia, is a tufted plant with rose-tinted fls. all summer.

WILHELM MILLER.
L. H. B. †

Types of the common chrysanthemum.

The common chrysanthemums of the florists (*C. hortorum*) are often called "large-flowering," and "autumn chrysanthemums," to distinguish them from the hardy outdoor kinds, although



937. *Chrysanthemum leucanthemum*. Ox-eye daisy, or whiteweed. ($\times \frac{1}{2}$)



936. *Chrysanthemum maximum*. ($\times \frac{1}{2}$)

neither of these popular names is entirely accurate or distinctive. They are the blended product of *C. indicum* and *C. morifolium*, two species of plants that grow wild in China and Japan. The outdoor or hardy chrysanthemums are derived from the same species, being less developed forms. The florist's chrysanthemum is not necessarily a glasshouse subject; but it is bloomed under glass for protection and to secure a longer season. Ten to fifteen dominant types of chrysanthemums have been recognized by the National Chrysanthemum Society of England. The words "types," "races," and "sections," have always been used by horticulturists to express much the same thing, but types can always be defined clearly, while sections cannot, and the word race should be restricted to cultivated varieties that reproduce their character by seed, which is not the case with the large-flowering chrysanthemums. The following explanation and scheme, it is hoped, will clearly set forth the main types, and explain some of the many terms that confuse the beginner. The horticultural sections are wholly arbitrary, being chiefly for the convenience of competitors at exhibitions, and therefore changing with the fashions. The present classification is based on the form of the flower, as each type can be had in any color found in the whole genus.

A. Single forms: rays in 1 series, or few series: disk low and flat.

1. *The Small Single Type*.—Fig. 950. Fls. about 2 in. across, star-like, i. e., with the rays arranged in one series around the yellow disk. "Single," however, is a relative term, and in Fig. 950 there is more than one series of rays, but this does not destroy the "singleness" of effect. All fls. are either single, semi-double, or double, but all the intermediate forms between the two extremes of singleness and doubleness tend to disappear, as they are not desired.

2. *The Large Single Type*.—Like the preceding, but the fls. 4 in. or more across, and fewer. The large and small single types are practically never grown outdoors and are best suited for pot culture, each specimen bearing 20-80 fls. They are also grown by florists in considerable quantity for cutting.



939. Japanese anemone chrysanthemum when fully expanded.



938. The small and regular anemone type.

AA. *Anemone-fl. forms: rays as in A: disk high and rounded.*

B. *Fls. (florets) small, numerous, regular.*

3. *The Small Anemone Type*.—Commonly called "Pompon Anemone." Fig. 938. Fls. 2-3 in. across, and usually more numerous than in the large anemone type. All the anemone forms are essentially single, but the raised disk, with its elongated tubular fls., usually yellow but often of other colors, gives them a distinct artistic effect, and they are, therefore, treated as intermediates in character between the single and double forms. Like the single forms, they are less popular than the double kinds, and the varieties are, therefore, less numerous and more subject to the caprices of fashion.

BB. *Fls. large, fewer, regular.*

4. *The Large Anemone Type*.—Fls. 4 in or more across and fewer. Heads must have large size, high neatly formed centers, and regularly arranged florets, the disk being composed of long tubes or quills and the rays flat and horizontally arranged.

BBB. *Fls. large, few, irregular.*

5. *The Japanese Anemone Type*.—Fig. 939. Fls. 4 in. or more across, and irregular in outline; fantastic and extreme anemone forms.

AAA. *Double-fl. forms: rays in many series: disk absent or nearly so.*

B. *Fls. small; rays short.*

6. *The Pompon Type*.—Figs. 940, 949. Fls. 1-2 in. across. The outdoor kinds are likely to be small, flat and buttonlike, while those cult. indoors are usually larger and nearly globular. Fig. 940 shows the former condition. It is from one of the old hardy kinds long cult. in the gardens as "Chinese" or "small-flowered" chrysanthemums, and commonly supposed to be the product of *C. indicum*, as opposed to the "Japanese" or "large-flowered" kinds intro. in 1862, which marked a new era by being less formal and more fanciful than any of the preceding kinds. Pompons are little cult. under glass in Amer., being regarded mostly as outdoor subjects.

BB. *Fls. large.*

c. *Blossoms hairy.*

7. *The Hairy Type*.—Fig. 941. Also called "Ostrich Plume" and "Japanese Hairy." The famous prototype is the variety Mrs. Alpheus Hardy, pictured in Gn. 35, p. 307, which was sold for \$1,500 in 1888, and started the American chrysanthemum craze. White fls. with long hairs are very delicate and pretty, but the hairs are often minute, and on many of the colored fls. they are



940. Type of pompon chrysanthemum. Grown outdoors, with no special care.

considered more curious and interesting than beautiful. So far, nearly all hairy chrysanthemums are of the Japanese Incurved type. Since the hairs are on the backs of the florets, they show best in incurved types.

cc. Blossoms not hairy.

d. Rays reflexed.

8. *The Reflexed Type.*—Also called "Recurved." Fig. 942. The reflexed forms can be easily broken up into 3 types. (a) the small and regular, (b) the large and regular, and (c) the large and irregular types. The latest standard requires that reflexed flowers have hemispherical heads, with no trace of thinness in the center, and broad overlapping florets.

DD. Rays incurved.

E. Form absolutely regular.

9. *The Incurved Type.*—Fig. 943 shows the general idea, but such a fl. would hardly win a prize at an

English show, where anything short of absolute regularity is relegated to the "Japanese Incurved" section (No. 10). This form is by far the most clear-cut ideal of any of these types, and for many years this ideal of the florists so completely dominated the English chrysanthemum shows that the incurved section came to be known there as the "exhibition" or "show type." In America the Japanese types, which are less formal and fanciful, early prevailed, but in England this has been the most important section of all.

EE. Form more or less irregular.

10. *The Japanese Incurved Type.*—This section and the next have been the most important in America. There are many variations of this type. It often happens that the outer 4 or 5 series of rays gradually become reflexed, but if most of the rays are incurved, the variety may be exhibited in this section. Fig. 943.

DDD. Rays of various shapes: forms diverse.

11. *The Japanese Types.*—The word "Japanese" was originally used to designate the large-fl. fantastic kinds, intro. by Robert Fortune from Japan in 1862. It has never been restricted to varieties imported directly from Japan, but has always included seedlings raised in the western world. Before 1862, all florists' fls. in England were relatively formal and small. The informal, loose, grotesque, Japanese chrysanthemums, intro. by Fortune broke up the conventional era, and the demand for large specimen blooms that resulted in fl.-shows all over the world reached Amer. in 1889. The "Japanese section" now means little more than "Miscellaneous." The 10 types previously mentioned can be rather accurately defined, but the Japanese section is purposely left undefined to include everything else. All the tubular and quilled sorts are now included in it, although formerly kept distinct.

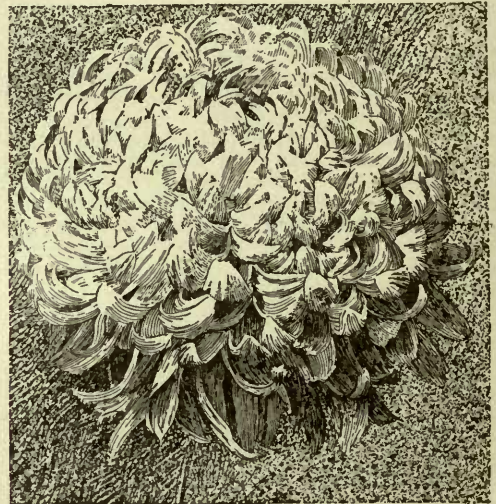


942. Reflexed type.

Relative importance and uses of the foregoing types.—

In general, the large-flowered forms are more popular than the small-flowered forms, especially at exhibitions, where great size is often the greatest factor in prize-winning. Types 9, 10 and 11 are the most important in America, especially the Japanese section. The flowers of types 9 and 10 are likely to be more compact and globular, and hence better for long shipments than the looser and more fanciful types. Types 9, 10 and 11 are those to which most care is given, especially in disbudding and training. They are the ones most commonly grown by the florists for cut-flowers, and whenever one large flower on a long stem is desired. The anemone-flowered forms are all usually considered as curiosities, especially the Japanese anemones, which are often exhibited as freaks and oddities. The single and anemone-flowered forms are used chiefly for specimens in pots with many small flowers, but all the other types are used for the same purpose. For outdoor culture, the hardy pompons, with their numerous small flowers, are usually better than the large-flowering or Japanese kinds.

As an indication of the constant change in standards of appreciation, may be cited the present popularity



943. Type of Japanese incurved chrysanthemum.

of short-stemmed chrysanthemums (Fig. 944) as distinguished from the greatly elongated stem that was exclusively desired some years ago; and also the demand for bushy many-flowered plants, producing small bloom as compared with the former excessively large detached flowers.

The current English classification.

The Floral Committee of the National Chrysanthemum Society (of England) in 1912 published the following "new classification of Chrysanthemums" (published also in *American Florist*, Sept. 21, 1912, by Elmer D. Smith):

SECTION I. INCURVED (Fig. 945).

The distinguishing characteristics of this section are the globular form and regular outline of the blooms. The flower should be as nearly a globe as possible, as depth is an important point in estimating its value. The florets ought to be smooth, rounded, or somewhat pointed at the tip, of sufficient length to form a graceful curve, and be regularly arranged. A hollow center or prominent eye are serious defects, as also are a roughness in the blooms, unevenness of outline and a want of freshness in the outer florets.

The section is now subdivided into:

Sub-section (a).—Large-flowered varieties.

Sub-section (b).—Medium- and small-flowered varieties.



944. New type with short stem, which is becoming very popular with commercial growers.

SECTION II. JAPANESE (Fig. 946).

Japanese varieties include a wide range of form, size and color. Their florets may be either flat, fluted, quilled or tubulated, of varying length, from short, straight, spreading florets, to long, drooping, twisted or irregularly incurved. In breadth the florets may vary greatly, ranging from those an inch in width to others scarcely broader than a stout thread. Some also either have the tips of the florets cupped, hollowed, curved or reflexed.

- Sub-section I. Japanese.
 - (a) Large-flowered varieties.
 - (b) Medium-flowered varieties.
 - (c) Small-flowered varieties.
- Sub-section II. Incurved Japanese.
 - (a) Large-flowered varieties.
 - (b) Medium- and small-flowered.
- Sub-section III. Hairy Japanese.

Reflexed section to be deleted as these varieties are now referred to other sections.

SECTION III. ANEMONES (Figs. 947 and 948; also Figs. 938, 939).

The distinctive characteristics of anemone varieties are their high, neatly formed centers and regularly arranged ray-florets. There are two distinct sets of florets, one quilled and forming the center or disk, and the other flat and more or less horizontally arranged, forming the border or ray. The flowers may have the ray or guard florets broad or twisted, or narrow, and forming a fringe, but should be so regularly arranged as to form a circle round the center, the latter should be a hemispheroidal disk, with no trace of hollowness and every floret in its place.

- (a) Large-flowered, i. e., with a diameter of 3 inches and upwards.
- (b) Small-flowered, i. e., with a diameter of less than 3 inches.

SECTION IV. POMPONS (Fig. 949; also Fig. 940).

Pompon varieties have blooms that may be somewhat flat or nearly globular, very neat and compact, formed of short, flat, fluted or quilled florets, regularly spreading or erect, the florets of each bloom being of one character.

- (a) Large-flowered, i. e., with a diameter of 2 inches and upwards.
- (b) Small-flowered, i. e., with a diameter of less than 2 inches.

SECTION V. SINGLES (Fig. 950).

Single varieties may be of any size and form; but the florets, whether short and rigid or long and drooping, should be arranged sufficiently close together to form a regular fringe.

Sub-section I. Varieties with one or two rows of ray florets.

- (a) Large-flowered, i. e., with a diameter of 3 inches and upwards.
- (b) Medium and small-flowered, i. e., with a diameter of less than 3 inches.

Sub-section II. Varieties with three to five rows of ray florets.

- (a) Large-flowered, i. e., with a diameter of 3 inches and upwards.
- (b) Medium and small-flowered, i. e., with a diameter of less than 3 inches.

Sub-section III. Anemone-centered varieties.

SECTION VI. SPIDERY, PLUMED AND FEATHERY.

Varieties in this section have small or medium-sized flowers of

eccentric shape, but most frequently of a light and graceful character; some have threadlike florets, and some have broader florets, but they may be either erect, horizontal or drooping and of various shapes and colors.

Market, Decorative and Early-flowering varieties will be deleted as such, but lists will be drawn up under each heading for general guidance.

WILHELM MILLER.

Culture of the florist's chrysanthemum (*C. hortorum*)

The first step towards success in chrysanthemum-culture is good healthy cuttings, and as they become established plants they should receive generous culture throughout their entire growing season. This requires close attention to watering, airing, repotting, and a liberal supply of nutriment.

Chrysanthemums are propagated in four ways,—by cuttings, division, seeds, and grafting. By far the most important is the first, because it is the most rapid. It is the method of the florists. In localities in which the plants can remain outdoors over winter without injury, they may be increased by division. This system is practised more by amateurs than florists, being the easiest method for the home garden but not rapid enough for the florist. Propagation by seeds is employed only to produce new varieties, and is discussed at length elsewhere (page 764). Grafting is seldom practised. Skilful gardeners sometimes graft a dozen or more varieties on a large plant, and the sight of many different colored fls. on the same plant is always interesting at exhibitions.

Section I.—Culture of chrysanthemums for cut-flowers.

This account is intended to describe the method chiefly employed by florists, the plants being grown in benches under glass.

1. Propagation by cuttings.—Plants of the preceding year afford stock from which to propagate the following season. They produce quantities of stools or suckers, which form excellent material

for the cuttings. These are usually taken from 1½ to 3 inches in length, the lower leaves removed, also the tips of the broad leaves, then placed in propagating-beds close together, where they are kept continually wet until rooted. To insure a large percentage, the condition of the cuttings should be moderately soft. If the stock plants are allowed to become excessively dry, the cuttings are likely to harden, and thus be very slow in producing roots. Single-eye cuttings may be used of new and scarce varieties when necessary. These are fastened to a tooth-pick with fine stemming wire, allowing half of the tooth-pick to extend below the end of the



947. Japanese anemone type.



945. Incurved type.



946. Japanese type.



948. Pompon anemone type.

cutting, and when inserted in the cutting-bed the end of the cutting should rest upon the sand. It requires more time to produce good plants by this system than when fair-sized cuttings can be taken, but it is often of service when stock is limited. The propagating-



949. A pompon chrysanthemum. ($\times \frac{1}{2}$)

house should be well aired, and it is advisable to change the sand after the second or third batch of cuttings has been removed, to avoid what is termed cutting-bench fungus. The cuttings should never be allowed to wilt, and this is avoided by giving abundance of air, and when the temperature reaches over 70° from sun heat, by shading with some material, either cloth or paper. Fig. 951 shows a good form of chrysanthemum cutting.

2. *Planting.*—Cuttings should not be allowed to remain in the cutting-bench after the roots are $\frac{1}{2}$ inch in length, or they will become hardened, which will check the growth. As soon as rooted, they should be potted into 2- or $2\frac{1}{2}$ -inch pots, using good mellow

soil, with a slight admixture of decomposed manure. Most of the large flowers are produced under glass, and the bench system is generally employed, which consists of 4 or 5 inches of soil placed upon benches. In these benches the small plants are planted 8 to 12 inches apart each way, from the latter part of May to the middle of July. Those planted at the first date usually give the best results. The soil should be pounded rather firm either before planting or after the plants have become established.

3. *Soil.*—There are many ideas as to what soil is best suited for the chrysanthemum, but good blooms may be grown on clay or light sandy loam, provided the cultivator is a close observer and considers the condition of the soil in which they are growing. Clay soil, being more retentive of moisture, will require less water and feeding than soil of a more porous nature. The chrysanthemum is a gross feeder, and, therefore, the fertility of the soil is very important in the production of fine blooms. Each expert has a way of his own in preparing the soil, but as equally good results have been secured under varied conditions, it is safe to conclude that the method of preparing the soil has little to do with the results, provided there is sufficient food within their reach. All concede that fresh-cut sod, piled late the preceding fall or in early spring, with one-fourth to one-fifth its bulk of half-decomposed manure, forms an excellent compost. Many use 1 or 2 inches of manure as a mulch after the plants have become established. Others place an inch of half-decomposed manure in the bottom of the bench. This the roots find as soon as they require it. Good blooms have been grown by planting on decomposed sod and relying on liquid applications of chemicals.

4. *Feeding.*—No definite rule can be given for this work, as so much depends on the amount of food

incorporated in the soil. If the soil be very rich, the liquid applications should be only occasional and very dilute. There is more danger of overfeeding by the use of liquids than by using excessively rich soil. Each grower must depend on his own judgment as to the requirements, being guided by the appearance of the plants. When the leaves become dark-colored and very brittle, it is safe to consider that the limit in feeding has been reached. Some varieties refuse to bud when overfed, making a mass of leaves instead. Others show very contorted petals, giving a rough unfinished bloom. Still others, particularly the red varieties, are likely to be ruined by decomposition of the petals, called "burning," especially if the atmosphere is allowed to become hot and stuffy. The same result will follow in dark weather, or when the nights become cool, if the moisture of the house is allowed to fall upon the blooms. Under such conditions, the ventilation should remain on during the night, or heat be turned in according to the outside temperature.

5. *Watering and shading.*—Let the foliage be the index to watering. If it appears yellow and sickly, use less water, and see that the drainage is perfect. There is little danger of over-watering as long as the foliage is bright green. A little shading at planting time is not objectionable, but it should be removed as soon as the plants are established. It is often necessary to shade the pink and red flowers, if the weather continues bright for some time, to prevent their fading.

6. *Training.*—When the plants are 8 inches high, they should be tied either to stakes or to jute twine. In the former system, use one horizontal wire over each row, tying the stake to this after the bottom has been inserted into the ground. Two wires will be necessary when twine is used, one above the plants and the other a few inches above the soil to which the twine is fastened. From the first of August until the flowers are in color, all lateral growths should be removed as soon as they appear, allowing only the shoots intended for flowers to remain. The above remarks refer to the training of benched chrysanthemums as grown by florists for cut-flowers. Other kinds of training are described under Section II, pages 763-4.

7. *Disbudding.*—No special date can be given for this work, as much depends on the season and the earliness or lateness of the variety to be treated. Buds usually begin to form on the early sorts about August 15, or soon after, and some of the late varieties are not in condition before October 10. Golden Glow and Smith Advance among the large-flowering, and several of the early-flowering of the hardy varieties, are exceptions to the foregoing, as they will set buds in June and July that will develop very good blooms during the month of August and later. The advent of these kinds has advanced the flowering season four to six weeks. The object of removing the weak and small buds and retaining the best is to con-



950. Single type.



951. One kind of chrysanthemum cutting.

centrate the whole energy of the plant and thereby increase the size of the flower.

There are two forms of buds, crowns and terminals. A crown bud (Fig. 952) is formed first, never coming with other flower-buds, and is provided with lateral growths which, if allowed to remain, will continue their growth and produce terminal buds later. Terminal buds come later, always in clusters (Fig. 954), are never associated with lateral growths, and terminate the plant's growth for that season. If the crown bud is to be saved, remove the lateral growths as shown by Figs. 952, 953, and the operation is complete. If the terminal bud is desired, remove the crown and allow one, two or three (according to the vigor of the plant) of the growths to remain. In a few weeks these will show a cluster of buds, and, when well advanced, it will be noticed that the largest is at the apex of the growth (the one saved, if perfect, as it usually is), and one at each of the leaf axils (see Fig. 955). The rejected buds are easiest and safest removed with the thumb and forefinger. Fig. 956. Should the bud appear to be one-sided or otherwise imperfect, remove it and retain the next best. In removing the buds, begin at the top and work down. By so doing there are buds in reserve, in case the best one should accidentally be broken, while if the reverse course were taken, and the best bud broken at the completion of the work, all the labor would be lost. A few hours' disbudding will teach the operator how far the buds should be advanced to disbud easily. Early and late in the day, when the growths are brittle, are the best times for the work. Some growers speak of first, second and third buds. The first is a crown, and usually appears on early-propagated plants from July 15 to August 15. If removed, the lateral growths push forward, forming another bud. In many cases in which the crowns are removed early, the next bud is not a terminal, but a second crown, which is termed the second bud. Remove this, and the third bud will be the terminal. Plants propagated in May and June usually give the second and third bud, not forming the typical crown. Those struck in July and planted late give the terminal only. Most of the best blooms are from second crown and terminal. Pink, bronze and red flowers from first crowns are much lighter in color than those from later buds. They are large, but very often abnormal to such an extent as to be decidedly inferior. This is doubtless due to the large amount of food utilized in their construction, owing to the long time consumed in development. The hot weather of September and October must have a detrimental effect upon the color.

Enemies.—Green aphid (*Aphis rufomaculata*) and the black aphid (*Macrosiphum sanborni*) are sometimes very troublesome. They may be controlled by spraying with "Black Leaf 40" tobacco extract, one part to 800 parts water with soap added. Fumigation with hydrocyanic acid gas is also widely practised by commercial growers. In moderately tight greenhouses, use one ounce potassium cyanide for each 3,500 cubic feet of space for all-night fumigation. For details, see *Fumigation*. Red Spider (*Tetranychus bimaculatus*) becomes injurious if neglected. It may be easily controlled by spraying with water, using much force and little water to avoid drenching the beds. The use of sulfur has also a beneficial effect.

Thrips. (See *Carnation*).

Leaf-tyer (*Phlyctenia ferrugalis*) is frequently very abundant in some parts of the country. It is essentially a greenhouse pest although it can live out-of-doors. The greenish whitish striped caterpillars, $\frac{3}{4}$ inch in length when full grown, feed on the under side of the leaves which they roll or tie together. The moth is pale brownish with an expanse of about $\frac{3}{4}$ inch. The leaf-tyer is most destructive during the summer months when the temperature is highest. It can be controlled by spraying with arsenate of lead. It is advisable to

begin the work early in the season when the insects are less numerous and the plants are small. Care should be taken to hit the under surface of the leaves.

The tarnished plant-bug (*Lygus pratensis*) often injures the blossom buds by its feeding punctures. This causes wilting and blind growths. The bugs may be excluded from greenhouses with screens. Out-of-doors no satisfactory means of control has been devised. But it has been noticed that plants growing in partial shade are less subject to injury.

Grasshoppers are sometimes injurious. They may be controlled by the use of arsenate of lead or by hand-picking.

Diseases.—Damping-off in the cutting-benches is not uncommon. See *Damping-off*, page 961. Rust (*Puccinia chrysanthemi*) is the only serious fungous disease of the chrysanthemum. It is characterized by the reddish brown pulverulent masses on the foliage consisting of the spores of the fungus. The disease is usually not destructive but may make the foliage unsightly. Any leaves appearing diseased should be removed promptly. In watering care should be taken not to wet the foliage, as moisture on the leaves allows new infections. Leaf-blight (*Cylindrosporium*) and leaf-spot (*Septoria*) occur on mature or languishing foliage and usually do little damage.

Section II.—Culture of chrysanthemums in pots.

The same principles are employed in pot culture as when planted upon the bench, with the exception that the plants are generally allowed to produce more blooms. The most popular type of pot-plant for home growing, or for sale by florists and intended for home use, is a compact, bushy plant, $1\frac{1}{2}$ to 2 feet high, branched at the base, and bearing four to twenty flowers averaging 3 to 4 inches across. They are here called "market plants." "Single-stem plants" are also popular. Great quantities of large flowers (say twenty to one hundred) are rarely grown on a potted plant, except for exhibitions. Such plants are commonly called "specimens," and the three leading forms are the bush, the standard and the pyramid, the first mentioned being the most popular.

1. *Market plants.*—Dwarf plants of symmetrical form, with foliage down to the pots, are the most salable, and when thus grown require constant attention as to watering and stopping, allowing each plant plenty of room to keep the lower leaves in a healthy condition. Cuttings taken June 1 and grown in pots, or



952. The crown bud.



953. Crown bud after it has been selected or taken.

planted on old carnation benches or in spent hotbeds (light soil preferable), and lifted by August 15, will make very good plants 1 to 1½ feet high. The reason for lifting early is to have them well established in their flowering pots before the buds are formed.

2. *Single-stem plants*.—Same culture as market plants, except that they are restricted to one stem and flower. Those from 1 to 2 feet in height are more effective and useful than tall ones. For this reason, many prefer plunging the pots out-of-doors where they have the full benefit of the sun and air, making them more dwarf than when grown under glass.

3. *Pot-plants for cut-flowers*.—Culture same as for specimen plants, except that the nipping should be discontinued July 1 to give sufficient length to the stems. If large flowers are desired, restrict the plants to eight or ten growths. Such plants can be accommodated in less space than specimens,

when the chief object is symmetry.

4. *Bush plants*.—For large bush plants, the cuttings should be struck early in February, and grown along in a cool airy house, giving attention to repotting as often as necessary. The final potting into 10- or 12-inch pots generally takes place in June. They are potted moderately firm, and watered sparingly until well rooted. As soon as the plants are 5 or 6 inches high the tips should be pinched out, to induce several growths to start. As the season advances and the plants make rapid growth, pinching must be attended to every day up to the latter part of July, to give as many breaks as possible and keep them in symmetrical form. By the middle of August (if not previously attended to), staking and getting the plants in shape will be a very important detail. If stakes are used, they must be continually tied-out, as the stems soon begin to harden, and this work can be best accomplished by looking them over daily. Light stakes of any material may be used. Many other methods are in use, such as wire hoops and wire framework, to which the growths are securely tied.

5. *Standards* differ from bush plants in having one stout self-supporting stem, instead of many stems. They require the same culture as bush plants, with the exception that they are not stopped, but allowed to make one continuous growth until 3, 4 or 5 feet high, and are then treated the same as bush plants. They require the same attention as to stopping and tying to secure symmetrical heads.

6. *Pyramids* are only another form of bush plants, and it is optional with the grower which form he prefers.

Section III.—Culture of chrysanthemums for the production of new varieties.

The object of seed-saving is the improvement of existing varieties. It is not conclusive, however, that all seedlings will be improvements; in fact, it is far from this, as the greater proportion are inferior to their antecedents. Only those who give the most careful consideration to cross-fertilization are certain of marked success. Hand-hybridized seeds possess value over those haphazardly pollinated by wind and insects only according to the degree of intelligence employed in the selection of parents. What the result will be when a white flower is fertilized with a yellow one, the operator cannot determine at the outset. It may be either white, yellow, intermediate, or partake of some antecedent, and thus be distinct from either. Improvements in color can be secured only by the union of colors,

bearing in mind the laws of nature in uniting two to make the third. Red upon yellow, or vice-versa, may intensify the red or yellow—give orange or bronze, as nature may see fit. The operator is more certain of improving along other lines, such as sturdiness or dwarfness of growth, earliness or lateness of bloom, or doubleness of flowers. The selection of those most perfect in these particulars is very sure to give similar or improved results. Always keep a record of this work showing the parents of a seedling. The satisfaction of knowing how a meritorious variety was produced more than pays for the trouble, and may lead to further improvements along certain lines.—The operation begins when the flower is half open, cutting the petals off close to their base with a pair of scissors, until the style is exposed. Should the flower show signs of having disk or staminate florets, remove these with the points of the scissors and thus avoid self-fertilization. When the styles are fully grown and developed, the upper surface or stigma is in condition to receive the pollen. By pushing aside (with the thumb) the ray-florets of the flower desired for pollen, the disk-florets which produce the pollen will become visible. The pollen may be collected on a camel's-hair pencil or toothpick and applied to the stigma of the flower previously prepared. If a toothpick is used, never use it for more than one kind of pollen. By allowing the camel's-hair pencil to stand in an open-mouthed vial of alcohol a few moments after using, it may be again used, when dry, upon another variety without fear of the pollen of the former operation affecting the present.—Cuttings struck in June and July and grown to single bloom in 4-inch pots are the most convenient for seeding. Such flowers, if not given too much food are more natural and furnish an abundance of pollen, as well as being easier to trim than the massive blooms produced for the exhibition-table. The pollinating should be done on bright, sunny days, and as early in the day as possible. As soon as the seed plants are trimmed, they should be placed by themselves to avoid fertilization by insects, and should there remain until the seeds are ripe. Keep the plants rather on the dry side, and give abundance of air. Seeds, which ripen in five to six weeks, should be saved without delay, and carefully labelled. In sowing seeds,



954. The terminal bud.



955. Terminal buds of chrysanthemum at an early stage. None too early for disbudding.

they should be covered very lightly and kept in a temperature of 60°. When the seedlings are large enough to handle easily, remove to small pots, or transplant farther apart in shallow boxes. Chrysanthemums flower the first season from seed.

Section IV.—Varieties.

Of the long list of new varieties sent out each year, but few are retained after the second year's trial. This is probably due to the fact that most American growers are more interested in the commercial value of the flower than the curious forms or striking colors they present. Exhibitions have not reached the people here

as in England and France. There are a few varieties that have stood the test for several years; such as Ivory, 1889; Geo. W. Childs, 1892; Golden Wedding, 1893; Major Bonnaffon, 1894; Yanoma, 1896; W. H. Chadwick, 1898; John K. Shaw and Nagoya, 1899; Monrovia, Col. D. Appleton and White Bonnaffon, 1900. There are many other varieties that have stood the test for four or five years.

It is not the purpose of this article to recommend varieties of chrysanthemums, but the following list includes the best varieties known in North America at the present time. The list will be valuable as showing a serviceable classification, and also for reference when other varieties have come into existence:

Selection of varieties based on main types.—(1) *Incurved*: *Æsthetic*, Emberta, Major Bonnaffon, Pink Gem, Mary Donellan, Naomah, Smith's Sensation, William Turner. (2) *Japanese*: Pacific Supreme, Crocus, Ramapo, December Gem, F. S. Vallis, Glen Cove, Golden Robin, Reginald Vallis. (3) *Japanese Incurved*: Chrysolora, Col. D. Appleton, W. H. Chadwick, Mlle. Jeanne Nonin, Artistic Queen, Christy Mathewson, Elberon, Nakota. (4) *Hairy*: Arvede Barine, Beauty of Truro, Frison d'Or, Leocadie Gentils, Louis Boehmer, L'Enfant des Deux Mondes, R. M. Grey, White Swan. (5) *Reflexed*: Smith's Advance, Dick Witterstaetter, Harvard, Yanoma, Mrs. J. Wells, Rose Pockett, Thanksgiving Queen, Madison. (6) *Large Anemone*: Satisfaction, Surprise, Ernest Cooper, Geo. Hawkins, Gladys Spaulding, John Bunyan. (7) *Japanese Anemone*: Eleanor, Mrs. F. Gordon Dexter, Zoraida. (8) *Pompons*: Alma, Baby, Clorinda, Fairy Queen, Helen Newberry, Minta, Julie Lagravere, Quinola. (9) *Pompon Anemone*: Diantha, Ada Sweet, Gertrude Wilson, Lida Thomas, Vayenne, Bessie Flight. (10) *Large-flowering Singles*: Arlee, Catherine Livingstone, Felicity, Itaska, Lady Lu, Red Light. (11) *Small-flowering Singles*: Ladysmith, Anna, Blazing Star, Little Barbee.

Selection of varieties based on color.—*White*: Smith's Advance, Chadwick Improved, Christy Mathewson, Mrs. Gilbert Drabble, Naomah, William Turner. *Yellow*: Chrysolora, Comoleta, Golden Glow, Golden Eagle, Ramapo, Lenox. *Pink*: Pacific Supreme, Unaka, Patty, Glen Cove, Morristown, Smith's Sensation. *Crimson*: Dick Witterstaetter, Harvard, Intensity, J. W. Molyneux, Pockett's Crimson, Mrs. Harry Turner. *Bronze and buff*: Glenview, Mrs. J. A. Miller, Mrs. H. Stevens, Ongawa, Rose Pockett, William Kleinheinz. *Crimson, golden reverse*: Harry E. Converse, Howard Gould, Mrs. O. H. Kahn, W. Woodmason. *Amaranth or purplish crimson*: George J. Bruzard, Mrs. G. C. Kelly, Reginald Vallis, T. Carrington, Leslie Morrison.

Selection based on special uses.—*Bush plants*: Golden Age, Brutus, Dick Witterstaetter, Dr. Enguehard, Garza. *Single stemmed pot-plant*: Naomah, Chrysolora, *Æsthetic*, President Roosevelt, Ben Wells, Glen Cove, Mrs. George Hunt, Mrs. O. H. Kahn, Pockett's Crimson. *Exhibition blooms*: Artistic Queen, Christy Mathewson, Chrysanthemiste Montigny, F. S. Vallis, George J. Bruzard, Glen Cove, Glenview, Harry E. Converse, Lady Hopetoun, Lenox, Elberon, Morristown, M. Loiseau-Rousseau, Mrs. Gilbert Drabble, Mrs. H. Stevens, Mrs. Harry Turner, Naomah, Pockett's Crimson, Rose Pockett, William Turner, W. Woodmason, Ben Wells, Merza, Reginald Vallis. *Commercial blooms.*—*Extra-early-flowering, July to October*: Golden Glow, Smith's Advance. *Second-early-flowering, last of September into October*: Early Snow, Glory of Pacific, Monrovia, October Frost, Roserie. *Early-midseason-flowering, middle of October*: Chrysolora, Comoleta, Gloria, Ivory, Pacific Supreme, Unaka, Virginia Pohlmann. *Midseason-flowering, last of October to November 10*: Col. D. Appleton, Crocus, Dick Witterstaetter, Pink Gem, Ramapo, Mrs. W. E. Kelley. *Late-midseason-flowering, November 10 to Thanksgiving*: Dr. Enguehard, Emberta, Golden Eagle, Golden Wedding, Major Bonnaffon, Patty, President Roosevelt, Timothy Eaton, W. H. Chadwick, Mrs. Jerome Jones, White Bonnaffon. *Late-flowering, Thanksgiving and later*: December Gem, Harvard, Helen Frick, Intensity, John Burton, Mlle. Jeanne Nonin, Thanksgiving Queen, Yanoma.

Section V.—Culture of chrysanthemums for exhibition.

This branch in which the highest standard must be attained if the slightest hope of success at the exhibitions is entertained, requires a thorough knowledge of the most suitable kinds for the purpose and the ability to bring them to the highest state of perfection. The methods are not very different from those employed in the production of high-grade commercial blooms. The most successful growers usually propagate earlier, and if grown on benches they are also planted earlier to secure all the vigor possible. The finest blooms are those produced on the private estates, where one man has charge of a few hundred plants, giving them his undivided attention, so that every need is provided at the proper time. During the past few years, the majority of such expert growers have adopted a system of growing in pots, each plant restricted to one bloom, which is practically the same method as the one used

throughout England for many years. Here they are kept under glass the entire season, while in England the climate permits them to be grown out-of-doors during the summer months. By this method, the roots are more closely confined, which has a tendency to produce short-jointed plants with stronger stems, and gives the grower perfect control, so that each variety may be treated according to its needs, especially when liquid fertilizers are necessary to promote the maximum in size and finish. The other factors necessary to the successful exhibitor are full consideration of the requirements of the schedules, so as to select the best varieties for the various classes, and a complete knowledge of packing and staging the blooms. During the past decade, those originating new varieties have scrutinized more closely in making a decision, and, as the commercial and exhibition varieties are considered from an entirely different standpoint, these two sections are drifting farther and farther apart. Size is the foremost quality from the exhibition point of view.



956. Terminal bud after the disbudbing operation.

At the present time (1912), the varieties generally shown in prize-winning exhibits are: *White*.—Beatrice May, Lady Carmichael, Merza, Mrs. David Syme, Naomah, Wm. Turner. *Yellow*.—F. S. Vallis, Lenox, Mrs. Geo. Hunt, Mrs. J. C. Neill, Yellow Miller. *Pink*.—Lady Hopetoun, M. Loiseau-Rousseau, Mrs. C. H. Totty, O. H. Broomhead, Wm. Duckham, Wells' Late Pink. *Bronze*.—Glenview, Harry E. Converse, Mrs. O. H. Kahn, Mrs. H. Stevens. *Red*.—J. W. Molyneux, Pockett's Crimson, W. Woodmason.

A few of the commercial section are suitable for this purpose, especially when the schedule calls for twelve or more blooms of a kind for one vase and at exhibitions at which artificial supports are prohibited. The best are as follows: *White*.—Lynnwood Hall, Timothy Eaton, Chadwick Improved, Mrs. Jerome Jones. *Yellow*.—Col. D. Appleton, Golden Eagle, Golden Wedding, Yellow Eaton, Golden Chadwick, Major Bonnaffon. *Pink*.—Dr. Enguehard, Mayor Weaver, Maud Dean. *Red*.—Dick Witterstaetter, Geo. W. Childs.

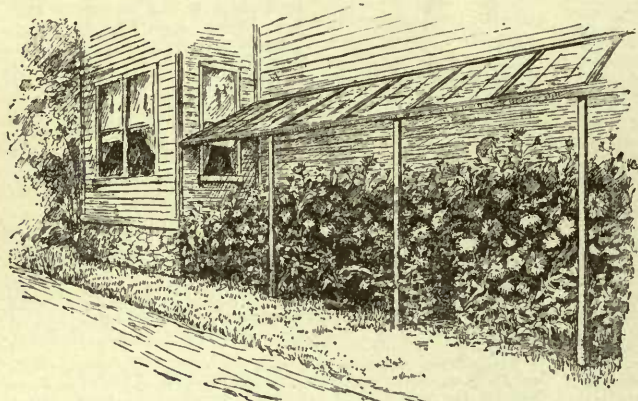
Section VI.—Culture of chrysanthemums out-of-doors.

The kinds most suitable for out-of-door culture are those making abundance of rhizomes or underground stems, which withstand the winter and furnish the new growths for the successive years. The Pompons are more hardy than the large-flowering sorts, and, as hardness is of vital importance to those interested in this subject, especially north of the Ohio River, it should be fully considered in selecting for this purpose. It is more practicable to choose varieties which perfect their flowers early, during August, September and October when grown in the northern states, as the buds are less likely to be injured while in a soft growing state by frost. In the South many of the later varieties will live over and be satisfactory, owing to the continuance of mild weather. In the past few years, some improvements in this section have been attained, many of which are the results of crosses between the Pompons and the large-flowering Japanese, in which the progeny have combined the hardness and dwarf habit of the former with the larger and more irregular-formed flowers of the latter, producing aster-like flowers rather than the symmetrical form of the pompons. All of the types may be successfully grown out-of-doors if provision is made to protect the bud, blooms and roots from severe frost. A temporary covering of cloth or sash in early autumn will protect the blooms, but the roots will require artificial heat or should be removed to the greenhouse or frame where the temperature can be maintained a few degrees above freezing. In growing exhibition blooms out-of-doors, all the important details, such as watering, airing, disbudbing, feeding,

staking and tying, must be complied with, if the grower expects to be rewarded for his efforts.

The oldest of the outdoor types are the Pompons, which produce from forty to one hundred buttons an inch or two across, with short and regular rays. Such plants can be left outdoors all winter.

Since the large-flowering or Japanese types have come in, numberless attempts have been made to grow them outdoors, but with poor results. The greenhouse varieties are not so hardy. In the North they are likely to be killed by the winter. Their flowers usually lack in size, depth and symmetry, largely because there are more of them on a plant than a florist allows for his best blooms, but chiefly because they do not have so much care in general as is given to plants under glass, where space is precious. For the very best results, chrysanthemums must be flowered under glass, and they need the greatest care and forethought practi-



957. Suggestion for protecting chrysanthemums that are to bloom outdoors.

cally all the year round. Half-way measures are unsatisfactory. Thus it happens that the Japanese varieties are usually unsatisfactory out-of-doors, and the Pompons are chosen by those who can give very little care to plants and would rather have many small flowers than a few large ones. This also partly explains why no two dealers recommend anything like the same list of Japanese varieties for outdoor culture. Nevertheless, it is possible to grow excellent flowers 4 and 5 or even 6 inches across outdoors, but it requires staking, disbudding, and some kind of temporary protection, as of a tent or glass, during frosty weather. Fig. 957 shows a cheap and simple structure of coldframe sashes resting on a temporary framework. In severe weather a canvas curtain can be dropped in front, and the window of a warm cellar in the rear opened to temper the air. For general outdoor culture, however, when no special care is given to the plants, the Japanese kinds are usually less satisfactory than the Pompons. These Pompons are a much-neglected class since the rise of the large-flowered Japanese kinds, but they are unlike anything else in our garden flora. Their vivid and sometimes too artificial colors harmonize with nothing else at Thanksgiving time, and they are so strong and commanding that they should have a place by themselves. It is not uncommon for the flowers to be in good condition even after several light falls of snow, and they may be considered the most resistant to frost of any garden herbs. In fact, their peculiar merit is blooming after the landscape is completely desolated by successive frosts. The flowers are not ruined until their petals are wet and then frozen stiff. They are essentially for mass effects of color, and great size is not to be expected. Masses of brown and masses of yellow, side by side, make rich combinations. The whole tribe of crimsons, amaranths, pinks, and the

like, should be kept by themselves, because their colors are variable and because they make a violent contrast with yellow, which few persons can find agreeable.

WILHELM MILLER.

ELMER SMITH.†

CHRYSOBÁCTRON (*golden wand*, from the Greek). *Liliaceæ*. Two New Zealand rhizomatous herbs, usually classed with "bulbs" by gardeners, bearing many small yellow fls. in a long raceme on the top of an elongated scape: plant often diœcious or polygamous: perianth 6-parted, the segms. nearly equal; stamens 6: caps. 3-celled and 3-valved. The genus is now commonly united with the S. African *Bulbinella*, the combined species becoming 13 or 14. *C. Hoòkeri*, Colenso (*Bulbinella Hoòkeri*, Benth & Hook., now the accepted name. *Anthëricum Hoòkeri*, Colenso) is in cult. in this country. It is a hardy plant 2-3 ft. high, with sword-like foliage: fls. $\frac{1}{2}$ in. diam., bright yellow, perfect, on slender pedicels, the segms. linear-oblong, and obtuse and spreading. B.M. 4602.—Cult. in the ordinary border, and treated like the asphodel, they do well. But they are improved in rich, deep and rather moist soil; strong clumps, 4-6 years old, are then at their best and are very excellent plants. After that they should be divided. Prop. by division or seed. Blooms in June and July.

J. B. KELLER and L. H. B.

CHRYSOBÁLANUS (*golden acorn*, from the Greek, referring to the fruit). *Rosacææ*. Bushes or trees, planted far south for ornament; fruit often edible.

Leaves thick and coriaceous, entire, glabrous: fls. white, rather small, in axillary or terminal short cymes; calyx 5-parted; petals 5, clawed; stamens 15 to many, some of them perhaps sterile: fr. a dryish-pulpy drupe, with stone pointed at base and ridged.—Two species in tropics of Amer. and Afr., reaching Fla., and another one in S. U. S.

ICACO, Linn. *COCOA-PLUM*. *ICACO*. On coasts and along streams in S. Fla., to S. Amer., and also in Afr., and is sometimes planted in the extreme S. (and in the tropics) as an ornamental shrub and for its sweetish but insipid and dry plum-shaped frs. which are sometimes used for preserves. It is a mere bush on the northern limits of its distribution, and on elevations, but in extreme S. Fla. it reaches a height of 25-30 ft. Lvs. glossy, thick, obovate (sometimes obcordate): fls. small and white, in axillary erect racemes or cymes; calyx 5-cleft, pubescent; petals 5; stamens about 20: fr. 1-seeded, 1-1 $\frac{1}{2}$ in. long, varying from nearly white to almost black, globular or nearly so. Wood close-grained and heavy, hard, brown or reddish. It is best prop. by seeds, but may also be had from cuttings of half-ripened wood. *C. pellocárpus*, Meyer, the small-fruited cocoa-plum, is a smaller plant, with smaller lvs., petals spatulate, drupe obovoid or oblong, about half the size of that of *C. Icaco*; it grows in extreme S. Fla. and farther south; probably not planted. *C. oblongifólius*, Michx., occurs from Ga. to Fla. and Miss. It is a low shrub, spreading widely by means of underground sts.: lf.-blades longer than broad, sharp-tipped: fr. ovoid or obovoid, about 1-1 $\frac{1}{2}$ in. long: not in cult. L. H. B.

CHRYSÓCOMA: *Linosyris*.

CHRYSÓDIUM: *Elaphoglossum*.

CHRYSÓGONUM (Greek-made name, *golden knee* or *joint*). *Composítæ*. A few composites, of which *C. virginànum*, Linn., is a perennial yellow-fl. plant of S. Pa. and south; sometimes cult. as a border plant. It blooms in spring or early summer on sts. which become 1 ft. high, the heads being solitary and pedun-